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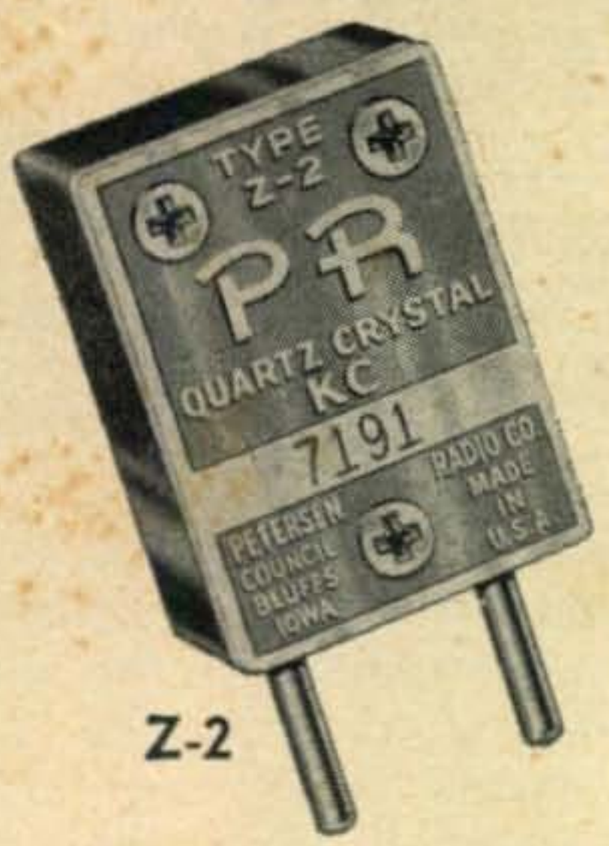
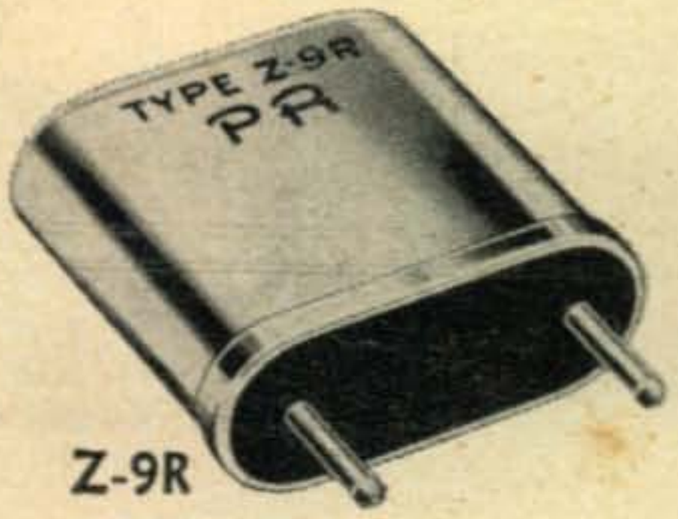


Z-2

Z-9A



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VOL. 18, NO. 1 JANUARY 1962

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TABLE OF CONTENTS

DEPARTMENTS

hallicrafters is 1st.

R-47 Speaker· HA-4 Keyer
HT-32B Transmitter SX-115 Receiver HT-33B Linear Amplifier

The time-proven excellence of hallicrafters' HT-32B and HT-33B . . . the incomparable performance of the new SX-115 . . . the HA-2 and HA-6 transverters . . . and the fully transistorized HA-4 electronic keyer . . . now team up to bring you maximum flexibility and full coverage of 80 through 2 meters on SSB, CW and AM

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EATURES: Rated conservatively at the maximum gal input. Third and fifth order distortion products own in excess of 30 db. Built-in R.F. output meter reatly simplifies tune-up. All important circuits netered. Maximum harmonic suppression obtained hrough pi-network. Variable output loading. Proection of power supply assured by circuit breaker. IT-33B is a perfect match to Hallicrafters' famous IT-32B in size, appearance and drive requirements. *IRCUIT DETAILS:* This power amplifier utilizes PL-172 high efficiency pentode operating in class B1. The tube is grid-driven across a non-inductive esistor, thus assuring the maximum stability under ll possible conditions. Band switching is accomlished by one knob which selects the proper inuctance value for each band. The output circuit a pi-network with an adjustable output capacitor, ccommodating loads from 40 to 80 ohms. 2 panel neters are provided: one is circuit switched to easure grid current, screen current, plate voltage nd R.F. output voltage. A second meter continuusly monitors cathode current of the PL-172.

SX-115 RECEIVER.
FEATURES: High order of mechanical and electrical stability; linear tuning; constant tuning rate; separate noise limiters for SSB/CW/AM; amplified dual loop AVC with fast attack-slow release; spurious signal and image rejection better than 60 db. 1 kc calibration marks; transmitter-type VFO with differential TC; 100 kc crystal calibrator; crystal controlled 1st and 3rd conversion oscillators; selectable sidebands; selectivity variable in five steps from 500 to 5000 cycles; product detector for SSB/CW envelope detector for AM; I.F. type noise limiter for SSB/CW automatic threshold series type for AM; band gain equalization; audio inverse feedbacks; "S" meter functions with AVC off. *SENSITIVITY:* Less than 1 microvolt on AM—less than ½ microvolt on SSB/CW. *FREQUENCY COVERAGE:* Nine 500 kc segments covering 3.5-4.0 Mc.; 7.0-7.5 Mc.; 14.0-14.5 Mc.; 21-21.5 Mc.; 28.0-30.0 Mc.; (4 segments); and WWV.

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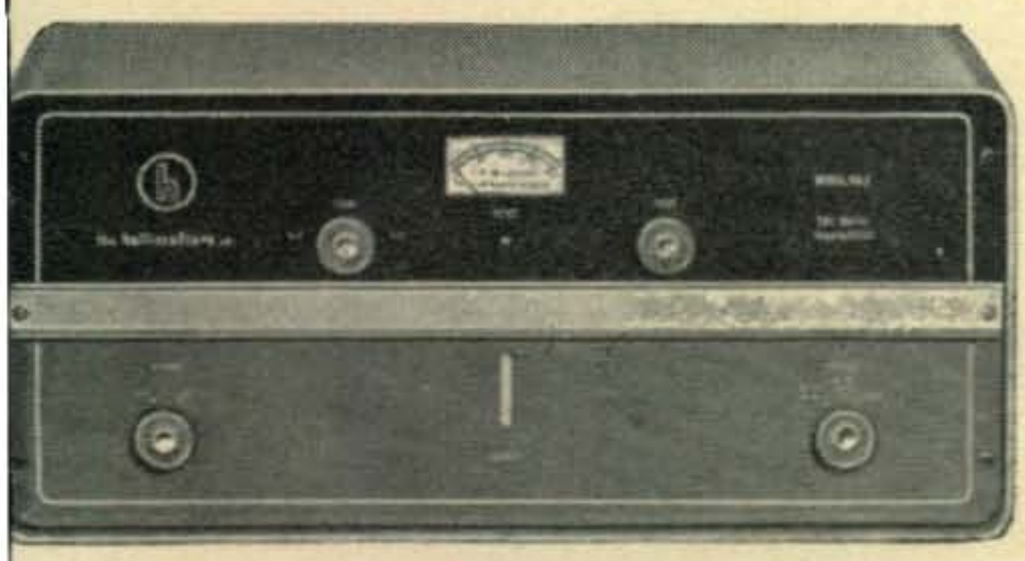
HA-4 "T.O." KEYER. Compact design, employs digital techniques. Fully transistorized. **R-47 SPEAKER.** Designed for communications. Flat response from 300 to 2850 cps. Input impedance: 3.2 ohms.



HA-2—HA-6

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Nothing to buy! Contest closes March 1st, 1962.

NEW-TRONICS DIVISION 3455 Vega Avenue Cleveland 13, Ohio

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10-15-20-40-75 bands mobile with one mount . . . one mast . . . one lead and band matched (center loaded) resonators.

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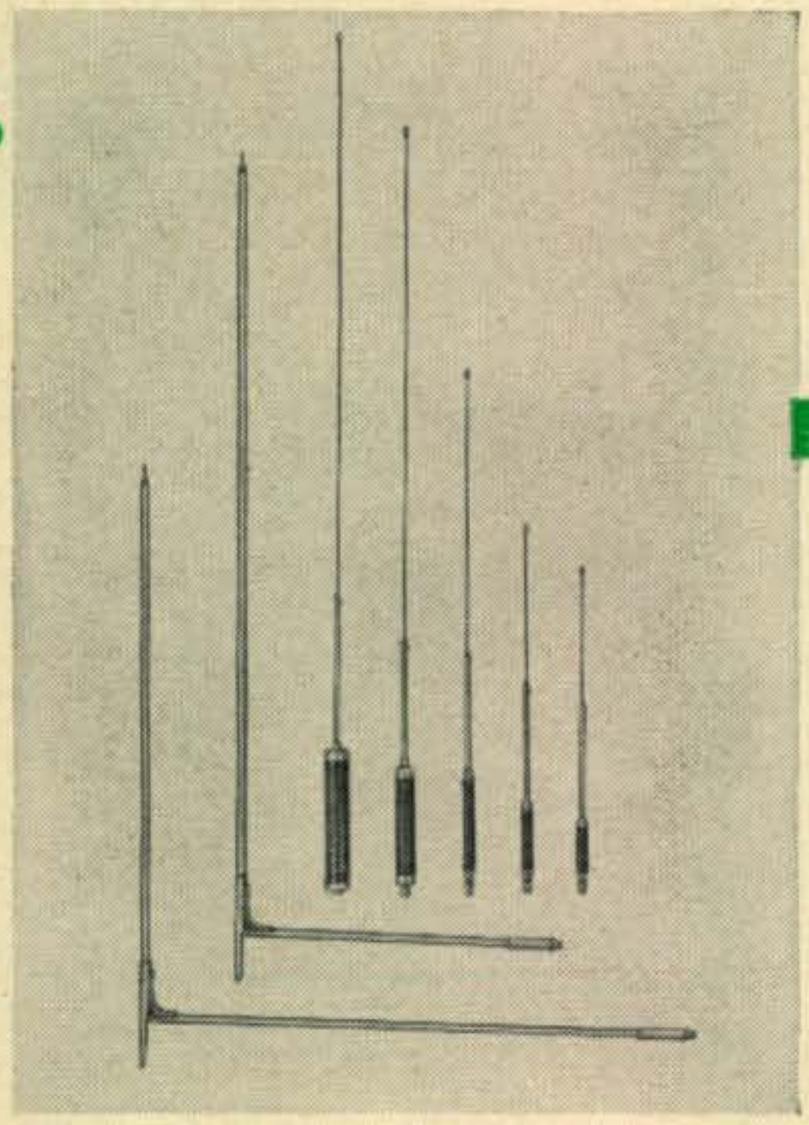

A new, efficient concept of center loading.

Buy only what you need—one mast and the resonators for the bands you work.

The 54-inch fold-over, heat treated aluminum mast allows the resonators to be interchanged conveniently in seconds. This feature also makes it possible to lower the assembly to clear openings in garages, carports, or low overhanging obstructions. When opened to full height, the two sections of the permanently hinged mast are rigidly held in place by a shake-proof sleeve clutch arrangement.

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RM-15	15 Meter Resonator	Amateur Net **$ 6.95**
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RM-40	40 Meter Resonator	Amateur Net **$ 9.95**
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Get all the technical information at your distributor or write for literature.

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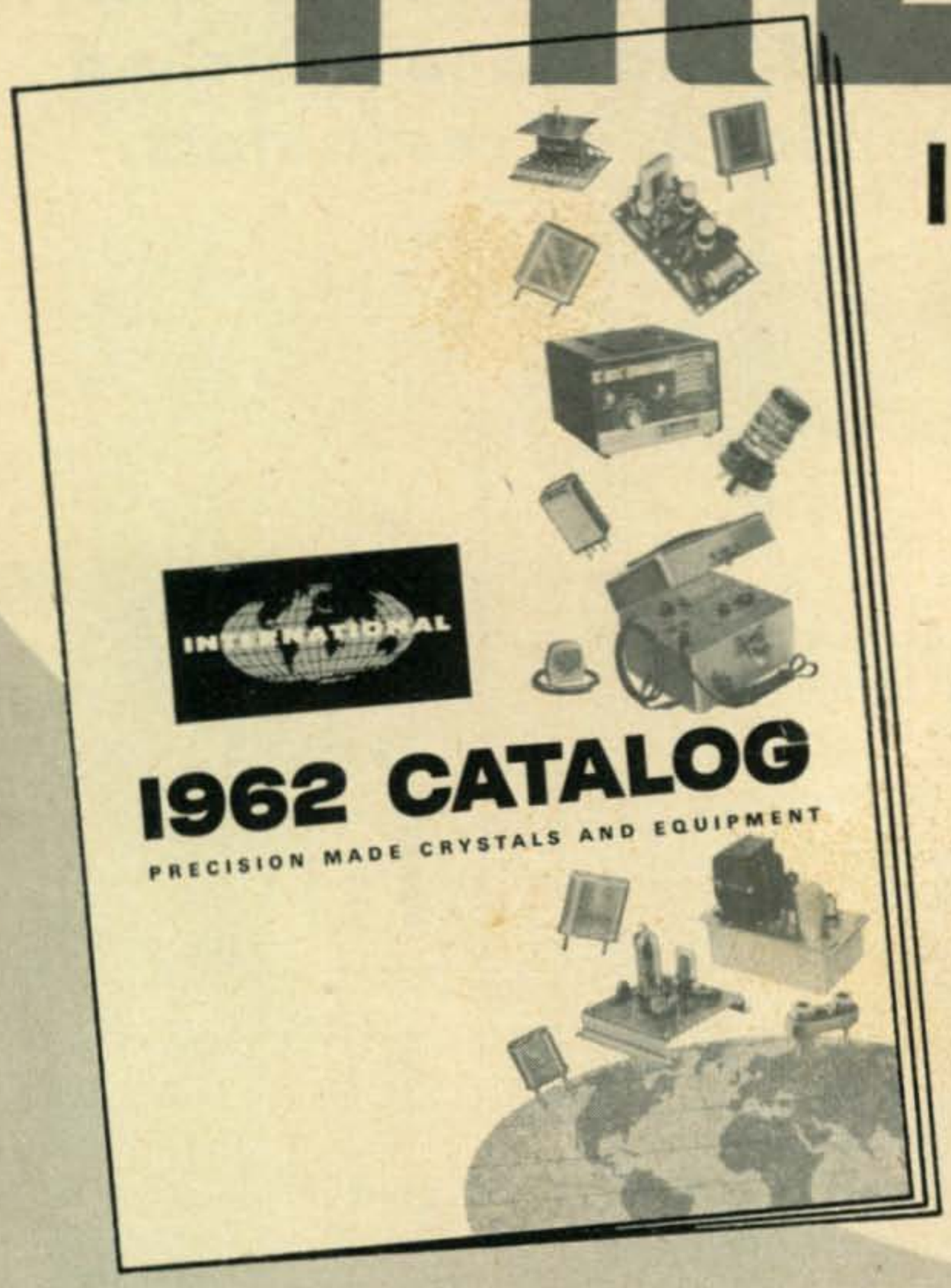
INTERNATIONAL 1962 CATALOG



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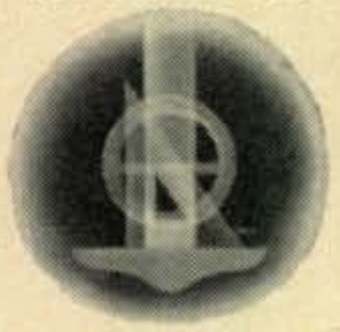

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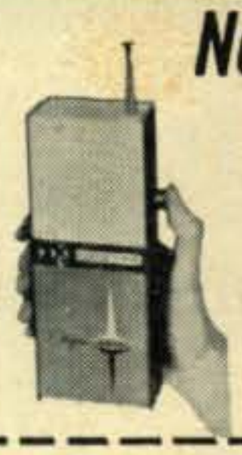

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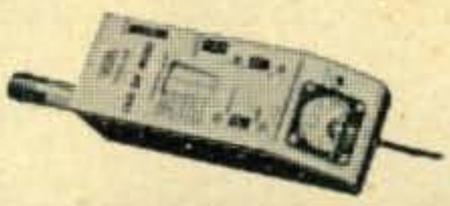

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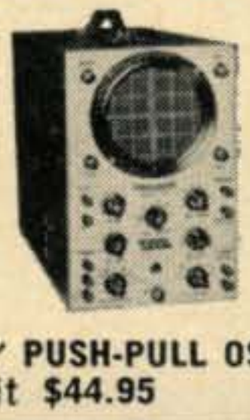

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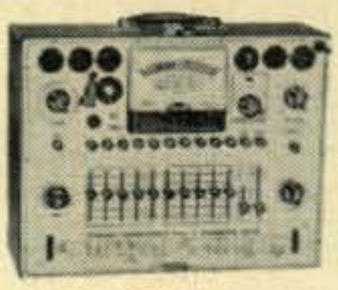

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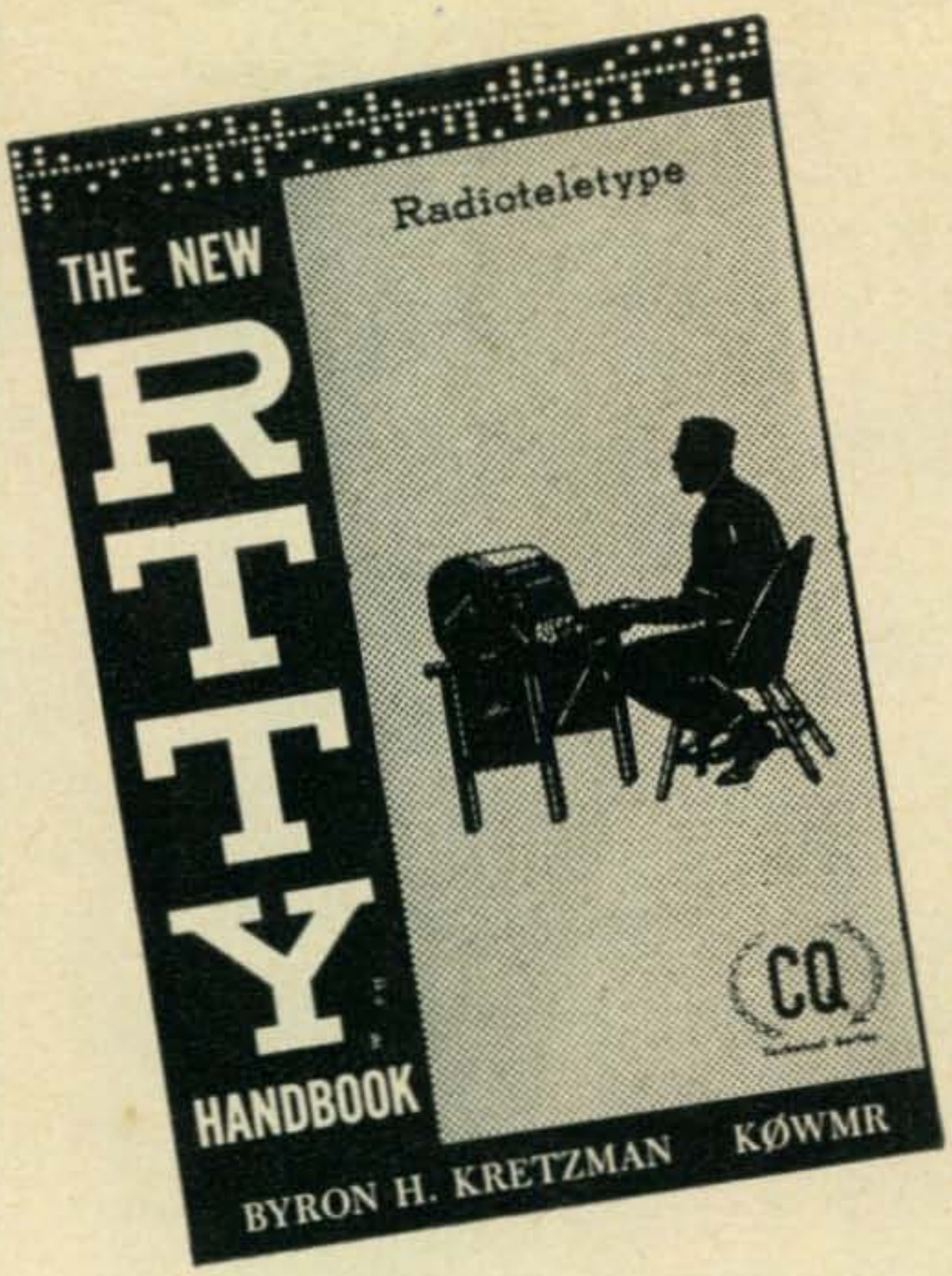

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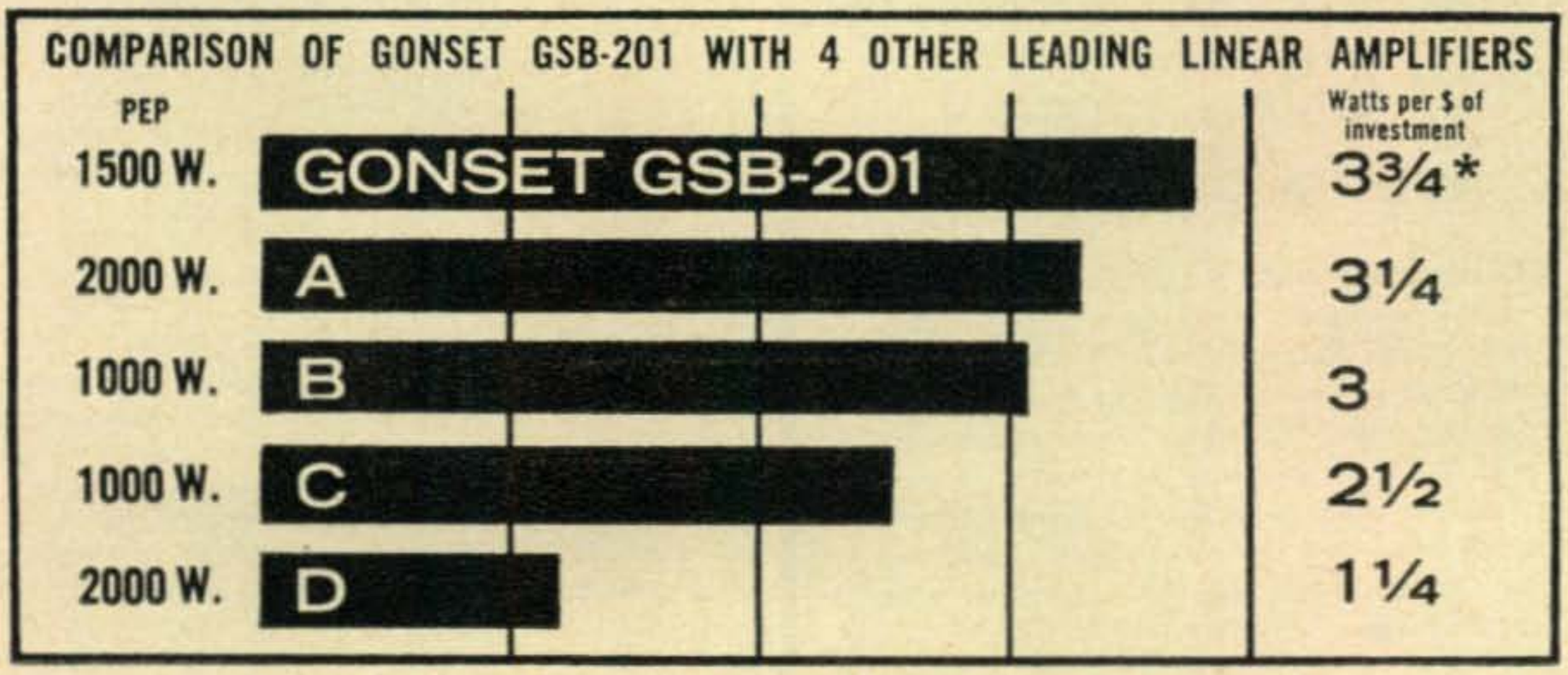

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The Gonset Linear delivers a FULL GALLON of PEP output.

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For further information, check number 10, on page 110

Letters..... to the Editor

Happy New Year

Readers, *CQ:*

From the staff here at *CQ* comes a warm wish that amateurs everywhere will enjoy a happy and rewarding new year. Happy 1962!

The Editor, *CQ*

A DXer Speaks

Editor, *CQ:*

I hope you will find room for this opinion which I gathered from dozens of DX stations. The ARRL Bulletin Nr. 803 about DX frequency of 14,335-14,350 does not work. It is a lousy spot, too near jamming and QRM from commercials and very few foreign hams like it or will use it, I'm afraid.

This note is a plea for the USA DX-man, not for the Foreign DX types (of which I am one). We are OK and very happy at 14,110-14,140.

If USA hams want cooperation from DX stations—to get us back—they must lobby the ARRL to have a round-table of hams outside the States to advise on a plan which *all* can agree. For example, KWM users, etc. are all set for 14,300-14,315 and expedition stations are copied very well on these frequencies. The 15 kc kept clear would be agreeable to us and we would, as before work thousands of USA DX-callers. A band edge is of no use to the low-powered expeditions and foreign hams.

If you want us—make room for us—if you don't, don't expect *all* DX to transmit on 14,120 and listen on 14,330. As I said before, "We are OK down the band on our own." A deplorable and selfish attitude —but whose fault is that?

E. Robson, VQ4ERR
P. O. Box 1313
Nairobi, Kenya

Plates

Editor, *CQ:*

I think that the hams in New York State have waited long enough to have call letter license plates issued. It has been kicked around long enough by politicians; now we should get together and demand that they be issued as has been done by 46 of the 50 states.

When Gov. Harriman ran for re-election, he issued an official order to the effect that hams would be able to get their call letters for the following year upon payment of an additional payment of five dollars. Now, how much extra do the members of the State Magistrates Association pay for the letters SMA, etc.

Of course, we all know that the present Governor recinded the above order soon after he was elected, because some office holder thought that to issue same would involve a lot of extra work.

In an emergency like the one that took place in Texas, you can rest assured that the State would not hesitate to call on us to furnish emergency communications and use the equipment that we worked hard to obtain. They also want us to joint Civil Defense, but still no license plates for us hams.

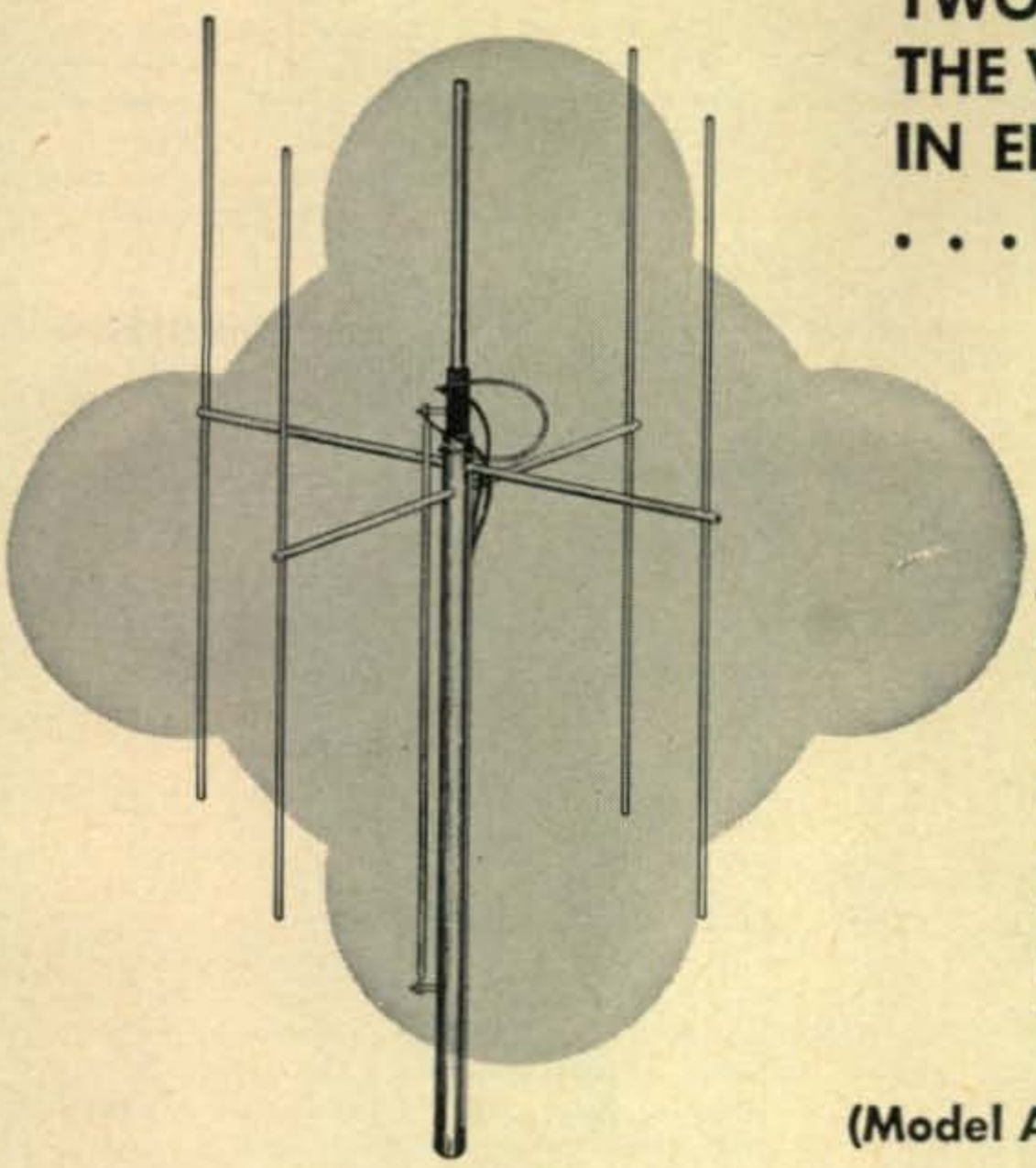
Politics in this state is sure behind the times. Wake up New York State you have been asleep long enough!

Harry Cohen, K2ADE
Box 692, Liberty, N.Y.

– For further information, check number 11, on page 110

NEW from Master Mobile

TWO NEW 2-METER ANTENNAS FOR THE VHF HAM WHO WANTS THE MOST IN EFFICIENCY AND SIGNAL QUALITY . . . AT REASONABLE PRICES



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TWO-METER TWIN-SIX BEAM

Provides 12 db. forward gain, with excellent front-to-back ratio. Rugged aircraft-type construction for strength and light weight. Will withstand high winds and heavy ice loading. Rotate with any TV rotor. Vertical or horizontal polarization. Supplied complete with baluns, matching harness and 3 foot mast. Matches 52 ohm coax.

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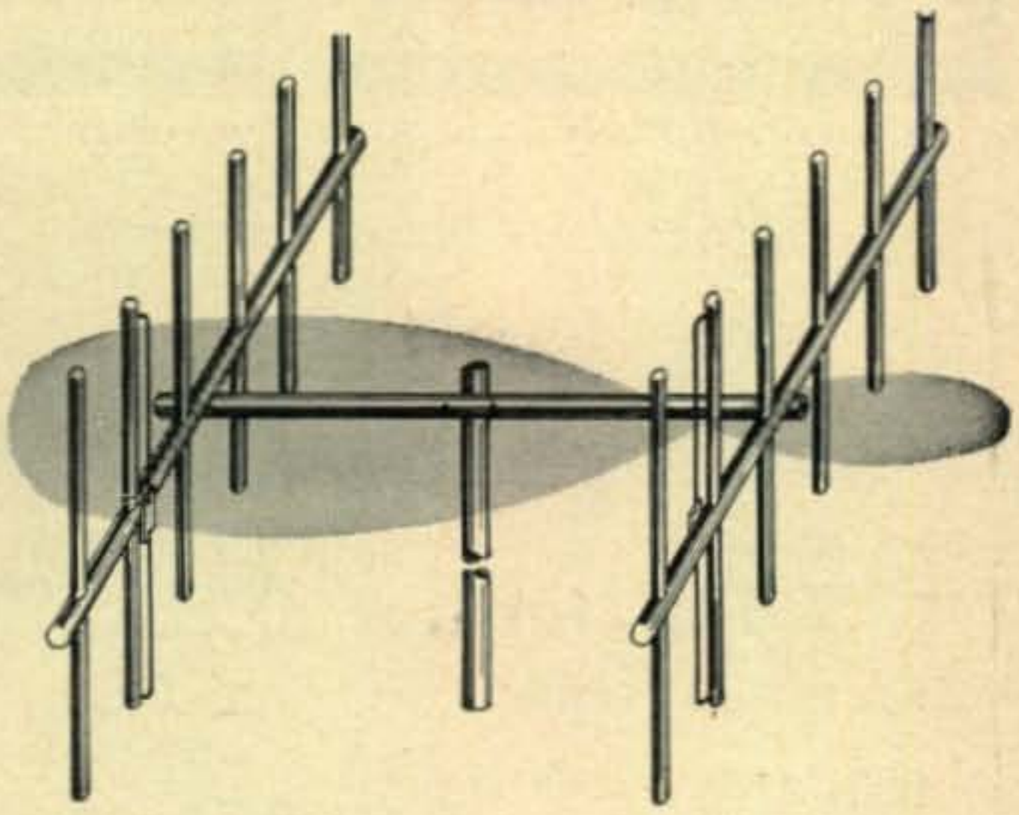

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For further information, check number 12, on page 110

Phone Expansion

Editor, *CQ:*

I am confused a bit after reading your editorial on the 15 kc to be set aside for DX on 14,335 kc to 14,350 kc.

Your last two letters in November regarding this situation are most interesting, and especially the one by KZ5LC, Mr. Len Collett.

I could never understand the thinking of ARRL in having special allocations for c.w., and restricting phone to just a small segment in relation to the number of stations using phone (a.m. and s.s.b.) and the bandwidth that phone actually uses for each individual station. Why try and protect this c.w. special segment at the expense of the majority of the U.S. Amateurs?

I am thinking directly of the 14,100 kc to 14,200 kc segment in particular.

In my book, there is no earthly reason why at least 50 kc, from 14,150 kc to 14,200 kc should not be allocated to phone. This would ease the tension on 20 meters in respect to DX and allow a.m. phone to further move down the band, too. DX could be worked very nicely from 14,150 to 14,165 and at least we American amateurs would be using these frequencies, which now are almost devoid of amateurs occupying this spectrum of the band at all.

Chas. W. Boegel, Jr., WØCVU
1500 Center Point Road, NE,
Cedar Rapids, Iowa

No Censorship

Editor, *CQ:*

Opening eagerly your usually excellent magazine I was somewhat shocked to read your ZERO BIAS in the November issue of *CQ*. That is the least I can say when I found that you blame the proposal "99" of European amateur societies to be "in direct contradiction to democratic principles." That is pretty strong language to use about a proposal made by IARU Region 1 Division Conference in Folkestone, England, 1960, representing 19 European amateur societies. Of course you are entitled to *your* opinion, but even the democracy applied here in the free countries of Europe knows the old Roman rule of justice: *audiatur et altera pars*—let's hear what the other chap has to say.

As the proposal about awards originated of a paper I read in behalf of my society, SRAL, at the Folkestone conference, I feel that I should explain the reasoning behind this proposal. During the last few years there has been a tremendous increase of amateur awards of all kinds. There is nothing bad in this development itself, most of these awards are first class and quite worth the hunt. But—and this, we feel, is the bad thing—there are also awards which we think have nothing to do with amateur radio. We have seen awards with clear political meaning. We have also seen awards that are nothing but business: the main qualification to get them seems to be that you send an amount of dollars to the (usually) private person who issues the awards. We felt that these awards do not represent "ham spirit" and we resent that the amateur activity is used this way as a means of business.

These matters were discussed at the Folkestone conference and it was unanimously recommended that the Irish society IRTS write officially to IARU Hq "with a view to the preparation of a list of awards in good standing which could bear the official approval of IARU Headquarters" (Folkestone minutes).

Please, note that we did not mention anything about banning or forbidding further awards. We only wanted IARU to prepare a list (like ARRL Countries List) of awards "in good standing." Anybody can, of course, publish as many awards as they want without any interference or censorship. Every branch of international sport have their own international organizations, which make internationally accepted rules for that particular sport. To win a World Championship in 110 meter hurdles you have to use hurdles accepted internationally but nobody can prevent you using hurdles ten inches high in your own backyard.

If a proposal is carried by the majority of IARU societies it is accepted. You may excuse me, but I fail to see what is "undemocratic" about it. Or, for that

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(or for his xyl!)

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KN8VHO	*Mary Townsend*
K8YDO	*"Milt" Sullivan*
W8NUQ	*"Jim" Waits*
KN8UIO	*"Pete" Drake*
K8HYD	*"Jim" Kittel*
KN8ZZL	*"Herb" Meyer*

For further information, check number 14, on page 110

matter, what is "undemocratic" in the proposal itself, the question is to publish a list of awards by an international society accepted by the member societies. Nothing more.

If you want to publish an award, do so by all means. But we, the members of our international society, have the (is it too much to say: democratic?) right to take your award in *our* list or not, according to the rules accepted by the members of the society.

Osmo A. Wiio, OH2TK
SRAL, President
P.O. Box 306, Helsinki
Finland

U.K. Amateurs

WA6GLF, Will Schuman is anxiously looking for amateurs who now reside in W/VE-land who are formerly from the United Kingdom. His QTH is 111 W. Hillcrest Blvd., Monrovia, Calif.

Arctic Ham Club

Special certificates will be awarded all stations participating in "Operation 49 Below" sponsored by the Arctic Ham Club, KL7KC. The event runs from 2200 GMT Jan. 19 to 2400 GMT Jan. 20. ARRL Field Day rules are in effect and logs go to the above, at Fairbanks, Alaska.

Stolen

A couple of days after Ted La Barba, ex-W6CJN received his SX-140, serial No. ORA-54061—it was stolen by burglars. Amateurs in the Los Angeles area are cautioned to be on the lookout for this one.

Surplus Club

Dick Hinz, W6DIE, "president" of the "Surplus of the Month Club" welcomes members. A yearly fee of $2.00 is charged. 833 Seventh Avenue, Sacramento 18, Calif. is his QTH.

W7DK

The Radio Club of Tacoma, Washington (W7DK) is sponsoring a contest to start at 1400, February 17th and last until 1400 February 18, 1962. A "Logger" Certificate will be issued to those who work any ten W7DK members. Endorsements will be issued for higher numbers worked. Full info and list of club members is available from K7NKZ, at 1249 S. Washington St., Tacoma, Washington.

Bachelor of Amateur Radio

A very nice diploma-type certificate, issued by the City College of New York radio club is being offered to anyone offering proof of working five of their members. The club call is W2HJ and a list of members can be obtained direct.

CHC Officers

Elections were recently held for the Certificate Hunters' Club and for 1962 the officers are as follows: President, W5AWT 1st v.p. SM5WI; 2nd v.p. W2SAW; Queen of the Hunt, K2UKQ; 1st princess of the Hunt, KØIKL and 2nd Princess of the Hunt, KH6DLD. CHC now claims over 400 members in 43 states and 50 countries. Their QSO party scheduled for February is listed in this month's CALENDAR.

N.Y. License Plates

Through the efforts of the Westchester (New York) Amateur Radio Club, a list of Senate and Assembly members of the New York legislature has been completed. All club secretaries are urged to write for this list and inform their club members of the petition being circulated in an effort to enact the call letter plate Bill in the New York State Legislature. Chairman of the License Plate Committee is Stan Zak, K2SJO, 485 Westchester Ave., Portchester, N.Y. and he'll be happy to send you this list. Self addressed stamped envelope *please!*

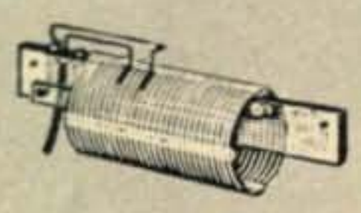
operation: 40 meters!

Not working 40 meters? We suggest you give this band serious thought! There's fine ''rag-chewing'' and good DX to be found on 40. You'll enjoy this fun-filled band even more with efficient, maintenance free Mosley antennas. DX-Rated for top performance.

40-D DIPOLE LOADING COIL

Make an inexpensive, fine performing dipole transmitting and receiving antenna at about ½ the length of a full size dipole-just 37 feet! Only one coil necessary. Rated to a full KW.

Amateur Net **$8.36**



TD-2 TRAP DOUBLET

Resonates at 40 and 75/80 meters providing a typical figure eight, ½ wavelength pattern at each resonant frequency. Overall length is 114 feet, 11 inches. Mosley ''Sr.'' traps are aluminum enclosed and are frequency stable through wide climatic conditions. End insulators are high grade ceramic. Center connector securely holds No. 14 copper-weld wire. Rated to 1 KW. A complete antenna ready to go!

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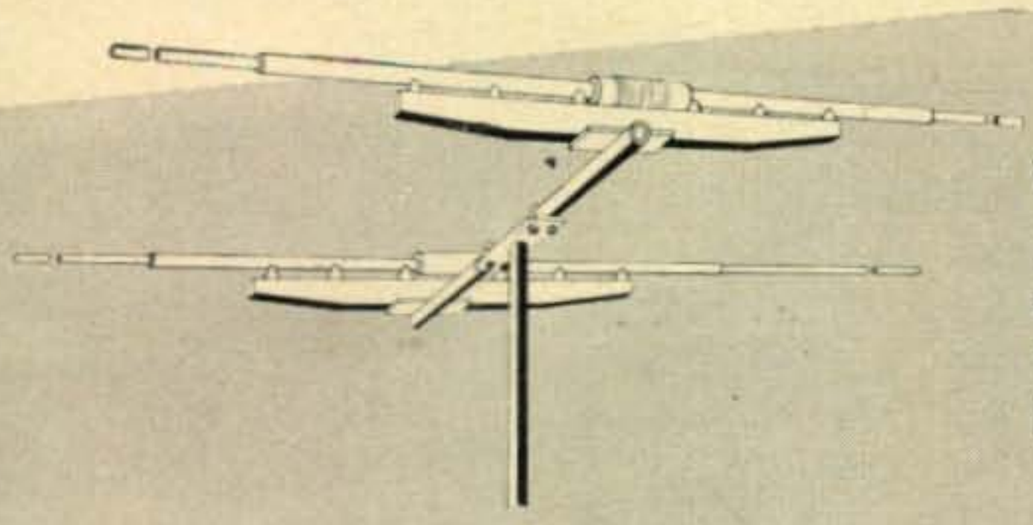


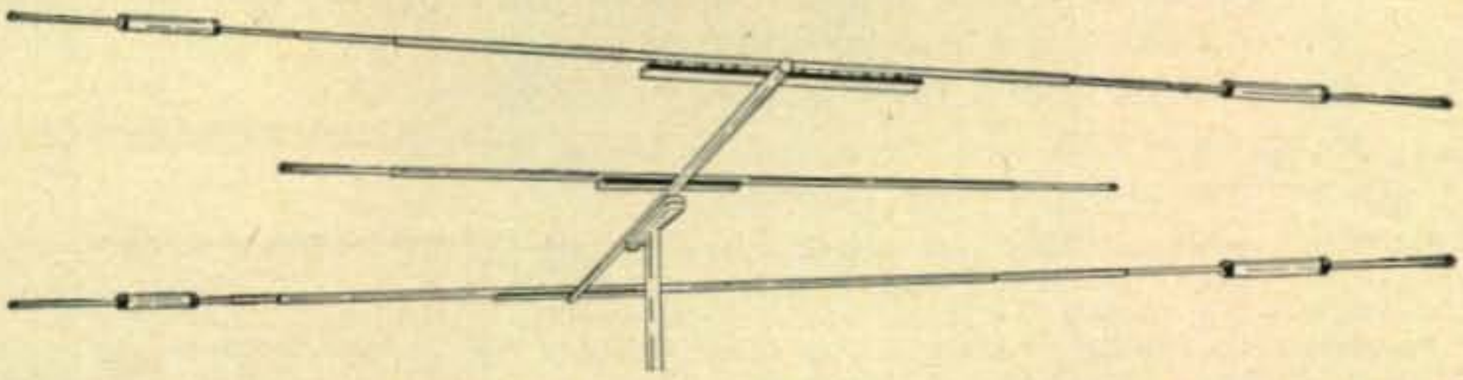
VPA-40-2 ''Vest Pocket'' BEAM

Ideal for low cost 40 meter operation - and this wonderful little DX antenna is only the size of an ordinary 20 meter beam! Rated to in excess of 1 KW.

Amateur Net **$82.45**

TA-20-40 THE BIG SIGNAL BEAM FOR 20 AND 40 METER OPERATION

For those radio amateurs who will not accept less than the finest . . . Performance to satisfy the DX enthusiast!



Built for operation at maximum amateur legal power. Frequency stability under all weather conditions. Tilting head included for ease of installation. Fully rust and corrosion proof - guaranteed! Holes are factory pre-drilled and elements color coded. Just one coaxial feed-line needed. Assembled weight with tilting head, 150 pounds.

Amateur Net $337.50

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Mosley Dipole Connectors and Insulators are available to make it easy for you to construct your own 40 meter antenna using the 40-D Dipole Loading Coil.

For further information, check number 16, on page 110

COUNT EM! 33 GREAT FEATURES ON

Presenting the "Marauder" . . . performance and features that cannot be duplicated for less than twice the price!

Over two years were spent in the development of this new Heathkit Single Sideband transmitter to bring you performance, quality and dependability unheard of in this price range! The outstanding array of features listed, plus its beautifully styled exterior all add up to an unprecedented amateur radio value!

The attractive front panel layout with edge-lighted meter and slide-rule tuning dial is accented by chrome-plated die-cast zinc knobs. All controls are located in front, where you want them, for maximum ease of operation . . . no doors or hatches to open or equipment to move! Here is a transmitter that was designed with "you" in mind, a transmitter to fill the requirements of the most demanding amateur radio operator, a transmitter you will be proud to own and operate for years to come! Order your Heathkit HX-10 SSB transmitter today! Send for free schematic. 92 lbs.

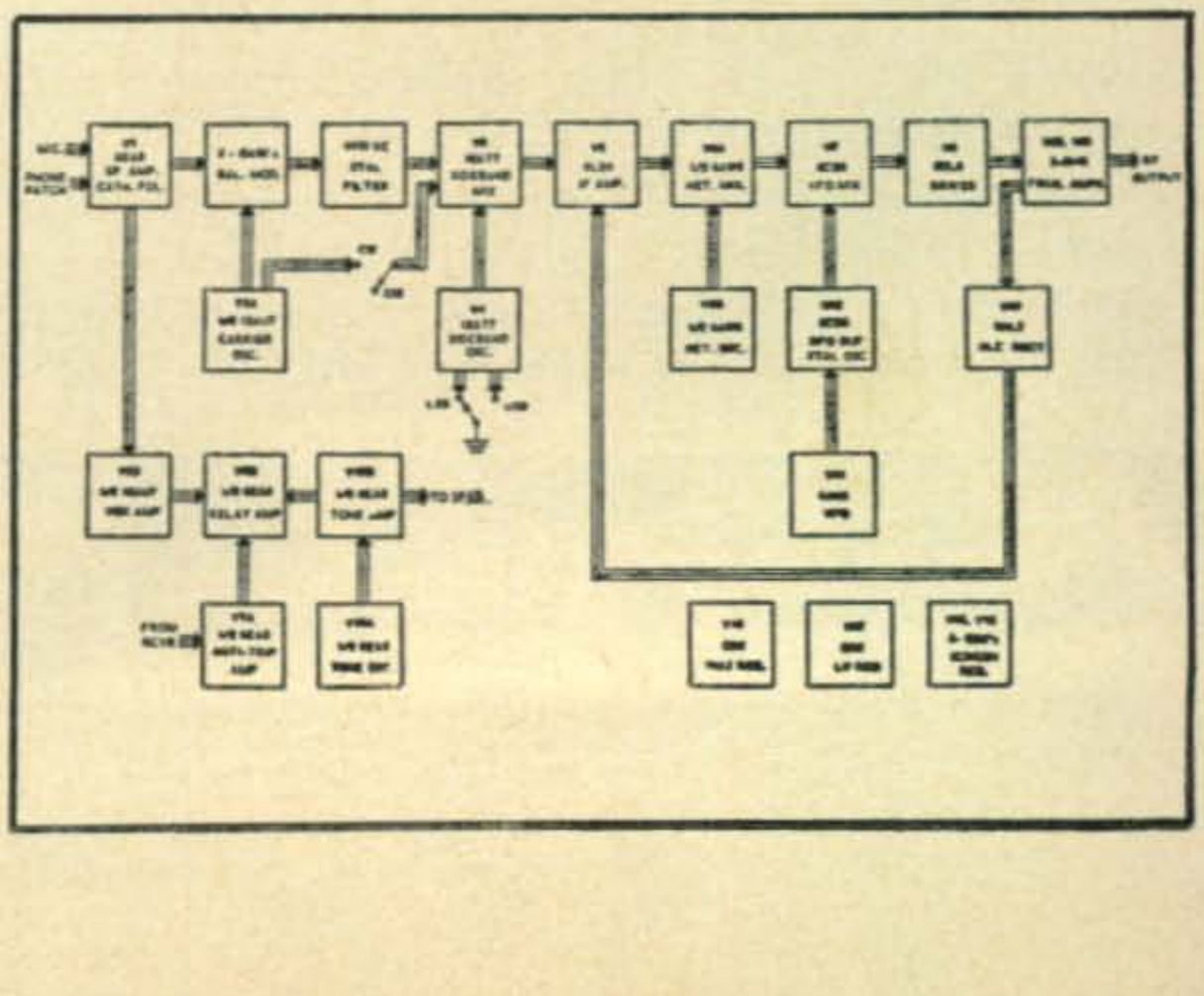
Heathkit HX-10...no money dn., as low as $22 mo.....**$334.95**

Available After February 25, 1962

SPECIFICATIONS—Emission: SSB (upper or lower sideband), CW, AM and FSK. **Power input:** 180 watts PEP—SSB and CW, 75 watts AM. **Output impedance:** 50 to 75 ohms with not more than approximately 2:1 SWR. **Frequency range (MC):** 3.5 to 4.1; 6.9 to 7.5; 13.9 to 14.5; 20.9 to 21.5; 27.9 to 28.5; 28.5 to 29.1; 29.1 to 29.7. **Frequency stability:** within 100 cps, overall. **Carrier suppression:** 50 db below peak output. **Unwanted sideband suppression:** 55 db below peak output. **Keying characteristics:** Break-in CW provided by operating VOX from a keyed tone using grid-block keying. **Audio input:** High impedance microphone or phone patch. **Audio frequency response:** 400 to 3000 cps at ± 3 db. **Power requirements:** OFF 14 watts; STANDBY—200 watts; KEY DOWN—400 watts at 117 volts, 50/60 cycles AC. **Cabinet size:** 19" W x 11½" H x 16" D.

MICROPHONE ACCESSORY—Ideal for use with the HX-10, this Electro Voice dynamic microphone has been modified to our specifications especially for SSB operation. Frequency response is limited from 300 to 3,000 cps with sharp cutoff above 3,000 cps. Chrome-plated mike stand has grip-to-talk switch with lock. Hi-Z output. Complete with 6' single and 6' multiple conductor shielded cable and instructions to accommodate any installation. 2 lbs.

HDP-21 . . . No money dn., $5 mo.....**$29.40**



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1. FIRST FILTER-TYPE SSB TRANSMITTER IN KIT FORM!
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10. DUAL CONVERSION; CRYSTAL CONTROLLED HETERODYNE OSCILLATOR
11. PREHEATED, TEMPERATURE COMPENSATED VFO FOR HIGH STABILITY
12. AUTOMATIC LEVEL CONTROL FOR HIGHER TALK POWER WITHOUT DISTORTION
13. BREAK-IN CW OPERATION (VOX CONTROLLED)
14. STRAIGHTFORWARD CIRCUIT LAYOUT AND WIRING HARNESS FOR EASY ASSEMBLY
15. UNIQUE ALIGNMENT PROCEDURE, REQUIRES ONLY A CALIBRATED GENERAL COVERAGE RECEIVER AND VTVM WITH RF PROBE
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17. APPROXIMATELY 10 KC PER TURN FOR SHARP, EASY FREQUENCY SELECTION
18. SPINNER KNOB FOR RAPID FREQUENCY EXCURSIONS
19. LOGGING SCALE FOR EXCELLENT RESETABILITY
20. AIR COOLED, SHIELDED FINAL AMPLIFIER—NOISE-FREE FAN
21. SPOT CONTROL ALLOWS "ZERO BEAT" OR "TALK-ON" FREQUENCY SPOTTING
22. FRONT PANEL CONTROLLED VOICE CONTROL (VOX) & PUSH-TO-TALK (PTT)
23. MONITORING OSCILLOSCOPE JACK WITH BUILT-IN VARIABLE AMPLITUDE CONTROL
24. SEPARATE HIGH Z PHONE PATCH INPUT ON REAR CHASSIS APRON
25. METERED GRID, PLATE, ALC, RELATIVE POWER & HIGH VOLTAGE CIRCUITS
26. FSK JACK FOR DIRECT RTTY POLAR RELAY KEYING
27. FULL FUNCTION ACCESSORY OCTAL SOCKET FOR RECEIVER MUTING, AMPLIFIER CUTOFF BIAS, 117 VAC ANTENNA RELAY POWER, RECEIVER SPEAKER MUTING.
28. SWITCHED 117 VAC OUTLET FOR ACCESSORY EQUIPMENT SUCH AS MONITOR SCOPE.
29. PARALLELED 6146's IN FINAL OPERATING CLASS AB1
30. HEAVY-DUTY 16 GAUGE STEEL CHASSIS AND CABINET CONSTRUCTION
31. COPPER-FLASHED CABINET INTERIOR FOR EXCELLENT SHIELDING
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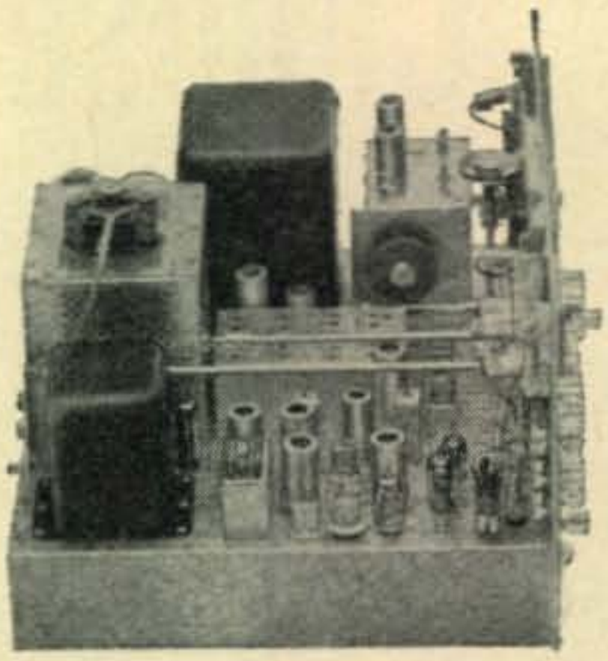
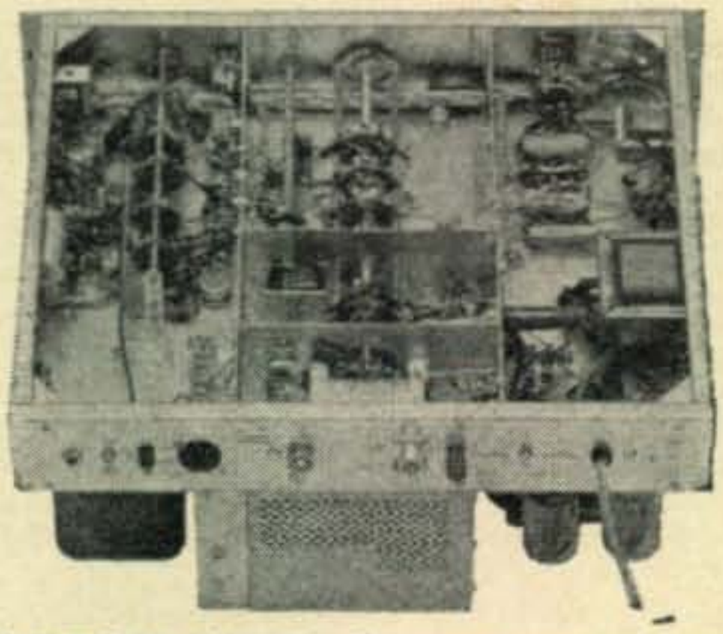
33. ALL CONTROL FUNCTIONS ARE LOCATED ON THE FRONT PANEL—NO DOORS OR HATCHES TO OPEN—CONVENIENT TO OPERATE



TOP VIEW—Quality components used throughout assure years of dependable, trouble-free performance. Shielded final amplifier is forced-air cooled by a noise-free fan. Chassis screening clearly identifies all tubes, adjustments, etc. for future reference.



BOTTOM VIEW—Compartmental construction provides necessary isolation and shielding of transmitter sections for top performance . . . adds rigidity to the chassis for rugged, dependable service and long life. Neat circuit layout through careful design and a precut, cabled wiring harness permit easy assembly.

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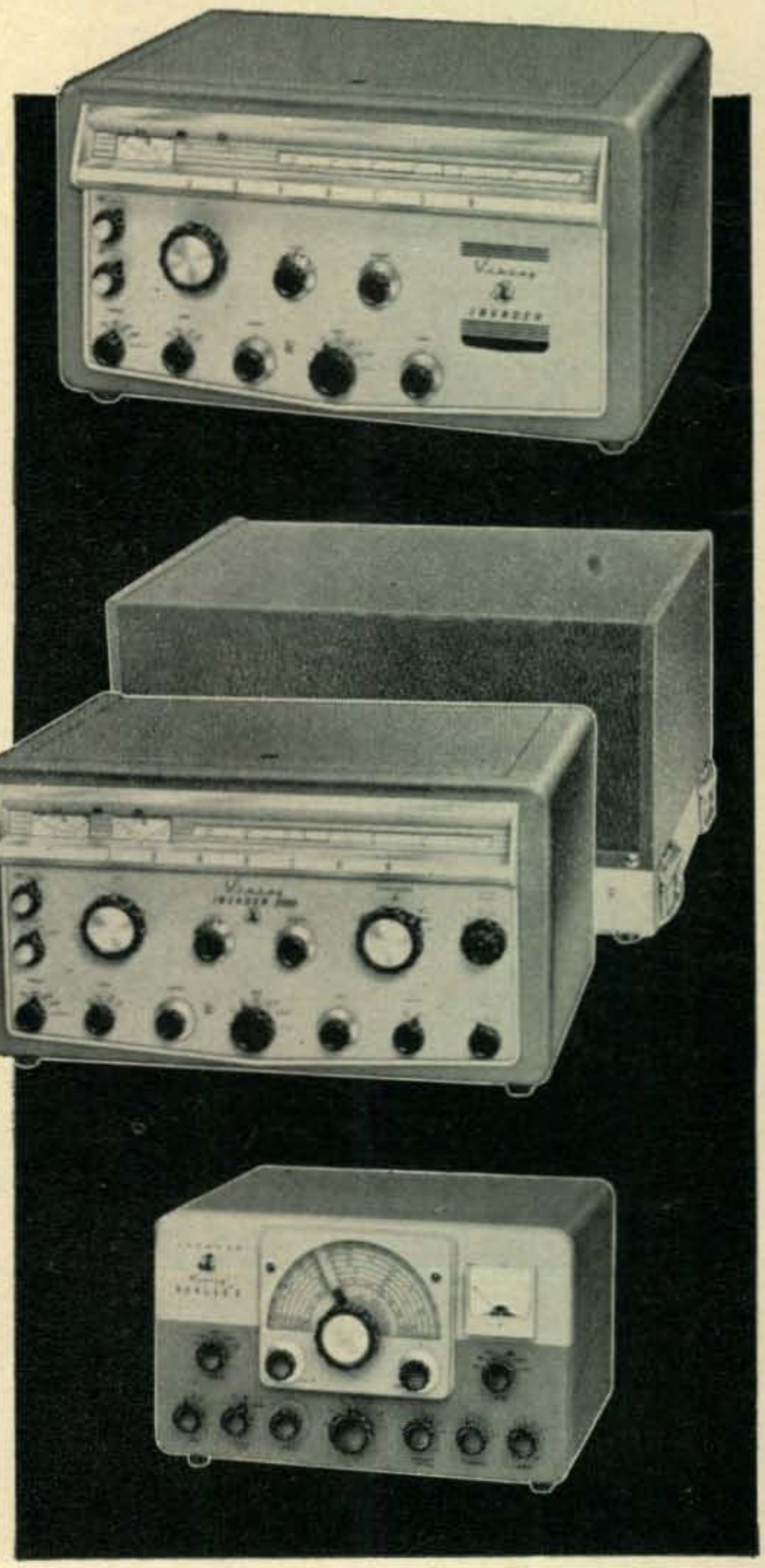

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Cat. No. 240-302-2—Amateur Net $619.50

HIGH POWER CONVERSION—Take the features and performance of your "Invader" . . . add the power and flexibility of this unique Viking "Hi-Power Conversion" system . . and you're "on the air" with the "Invader 2000". Completely wired and tested, includes everything you need—no soldering necessary—complete the entire conversion in one evening.

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INVADER 2000—Here are all of the fine features of the "Invader", plus the added power and flexibility of an integral linear amplifier and remote controlled power supply. Rated a solid 2000 watts P.E.P. (twice average DC) input on SSB; 1000 watts CW; and 800 watts input AM! Wide range output circuit (40 to 600 ohms adjustable). Final amplifier provides exceptionally uniform "Q". Exclusive "push-pull" cooling system. Heavy-duty multi-section power supply. Wired and tested with power supply, tubes and crystals.

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RANGER II—Now—a new version of the popular 75 watt CW or 65 watt AM "Ranger". The "Ranger II" transmitter also serves as an RF/audio exciter for high power equipment. Completely self-contained instant bandswitching 160 through 6 meters! Operates by built-in VFO or crystal control. High gain audio-timed sequence keying, TVI suppressed. Pi-network antenna load matching from 50 to 500 ohms. With tubes, less crystals.

Cat. No. 240-162-1
Viking "Ranger II" Kit—Amateur Net . . . $249.50
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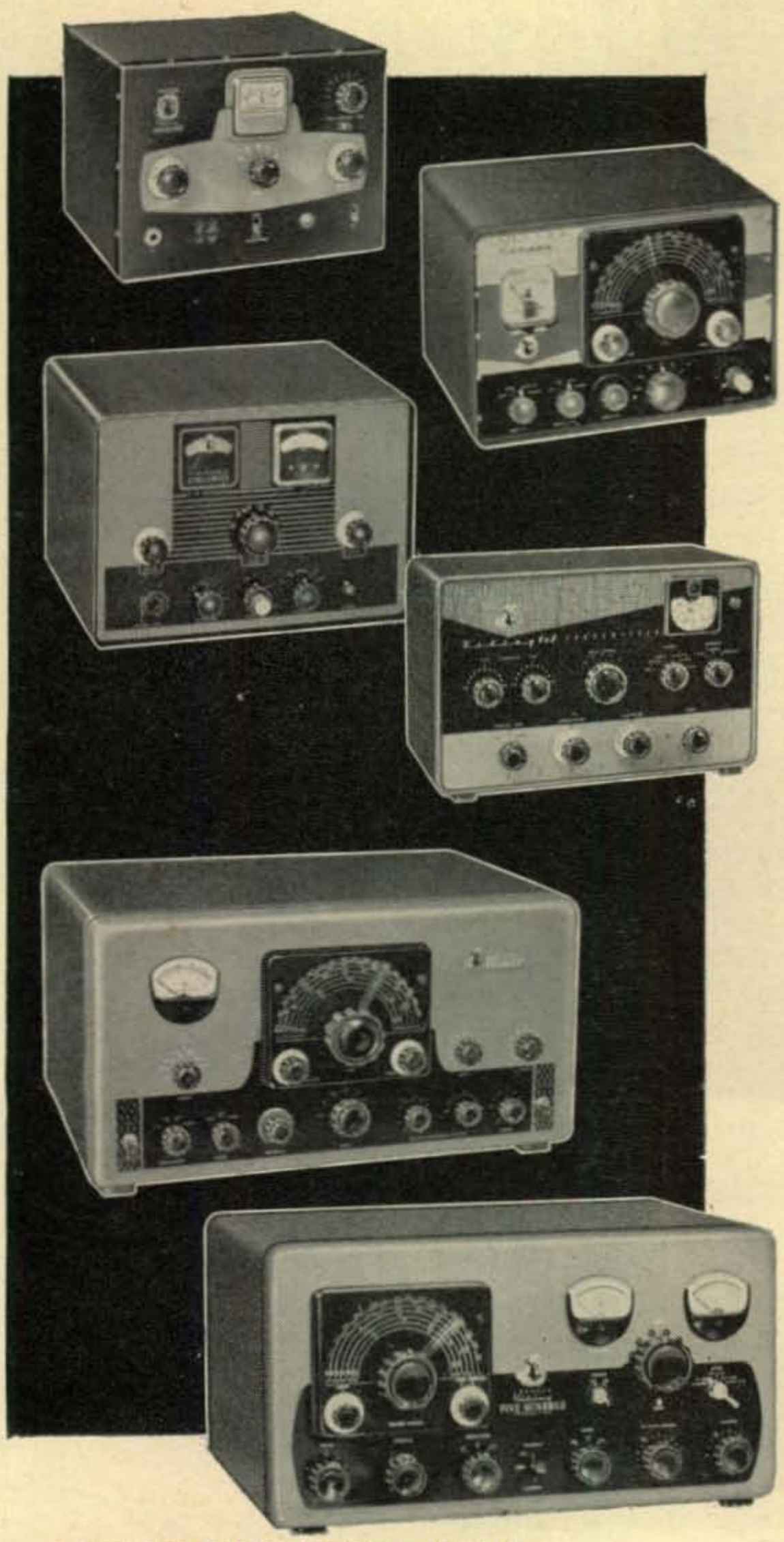

ADVENTURER—Self-contained . . . 50 watts CW input . . . rugged 807 transmitting tube . . . instant bandswitching 80 through 10 meters. Crystal or external VFO control—wide range pi-network output—timed sequence keying. With tubes, less crystals.

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NAVIGATOR—40 watts CW input . . . also serves as a flexible VFO exciter. 6146 final amplifier tube—bandswitching 160 through 10 meters. Built-in VFO or crystal control. With tubes, less crystals.

Cat. No. 240-126-1 Kit—Amateur Net . . $149.50

Cat. No. 240-126-2
Wired and tested—Amateur Net $199.50

CHALLENGER—70 watts phone input 80 through 6; 120 watts CW input 80 through 10 . . . 85 watts CW on 6 meters. Two 6DQ6A final amplifier tubes. Crystal or external VFO control—TVI suppressed—wide range pi-network output. With tubes, less crystals.

Cat. No. 240-182-1 Kit—Amateur Net . . $114.75

Cat. No. 240-182-2
Wired and tested—Amateur Net $154.75

6N2—Rated 150 watts CW and 100 watts phone—offers instant bandswitching coverage of both 6 and 2 meters. Fully TVI suppressed—may be used with "Viking I, II", "Ranger I, II", "Valiant" or similar power supply/modulator combinations. Operates by crystal control or external VFO with 8-9 mc. output. With tubes, less crystals.

Cat. No. 240-201-1 Kit—Amateur Net . . $129.50

Cat. No. 240-201-2
Wired and tested—Amateur Net $169.50

VALIANT—275 watts input CW and SSB (P.E.P. with auxiliary SSB exciter) 200 watts phone. Instant bandswitching 160 through 10 meters—built-in VFO or crystal control. Pi-network output matches antenna loads from 50 to 600 ohms. TVI suppressed—timed sequence keying—built-in low pass audio filter—self-contained power supplies. With tubes, less crystals.

Cat. No. 240-104-1 Kit—Amateur Net . . $349.50

Cat. No. 240-104-2
Wired and tested—Amateur Net $439.50

FIVE HUNDRED—Full 600 watts CW—500 watts phone and SSB (P.E.P. with auxiliary SSB exciter). Compact RF unit designed for desk-top operation. All exciter stages ganged to VFO tuning—may also be operated by crystal control. Instant bandswitching 80 through 10 meters—TVI suppressed—high gain push-to-talk audio system. Wide range pi-network output. With tubes, less crystals.

Cat. No. 240-500-1 Kit—Amateur Net . . $749.50

Cat. No. 240-500-2
Wired and tested—Amateur Net $949.50

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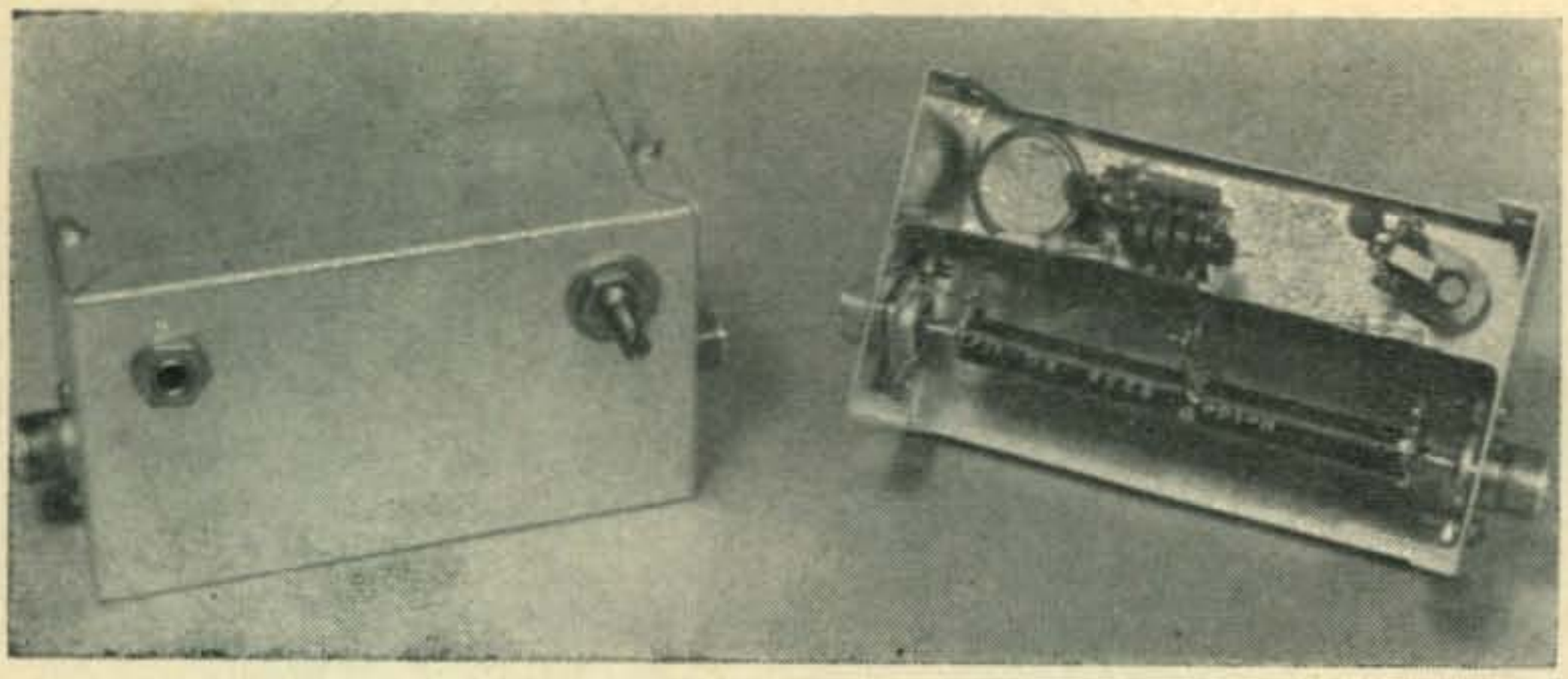


Inside and outside views of the coax phase detector. The phone jack accepts the sensitive meter and the potentiometer is the Meter Adjust, R_1. The chassis measures 5¼" × 3" × 2⅛".

Building and Using the Coax Phase Detector

BY DAVID T. GEISER*, WA2ANU

Why build a phase detector? The device makes antenna tuning, pruning, and feeding a pleasure instead of a pain. It saves time, prevents mistakes, and helps give your transmitter a decent load. It increases the value of an s.w.r. bridge, and, should your desires lean in this direction, makes possible an automatic home or mobile antenna system.

THE coaxial phase detector is useful, inexpensive, old, and forgotten among amateurs—which are quite enough reasons for writing another article on the device. This time, however, the emphasis is on ways to use the device, and only bare essentials of theory will be given on why it works. To prove that it *does* work, the first part of the article pirates a design from Hay[1] that costs less than $15 and is simple enough for anyone to build.

Theory

On a.c., a resistive load draws current that increases as voltage increases, current dropping as voltage drops. All this happens several million times a second at amateur frequencies, far too fast for an ordinary meter to follow.

Loads at least partially inductive have currents that rise and fall later in time than the applied voltage, while partially capacitive loads have leading current. Any device that tells whether load current lags behind or leads applied voltage can be used as a phase detector. This detector puts out one polarity d.c. on inductive loads, opposite polarity on capacitive loads, and zero output on resistive loads. This unit gives useful indication on transmitted powers as low as ten to fifteen watts.

Operation is by sampling the applied voltage (across C_2 of the C_1 and C_2 voltage divider in fig. 1) and adding two voltage samples (derived from load current through the transformer) to the applied voltage sample. These two combinations, rectified, give two d.c. outputs. Polarity is such that the d.c. outputs add to zero on resistive loads. If the load has inductance, one voltage will be larger than the other, and the meter will indicate that polarity, the opposite occurring with capacitive load.

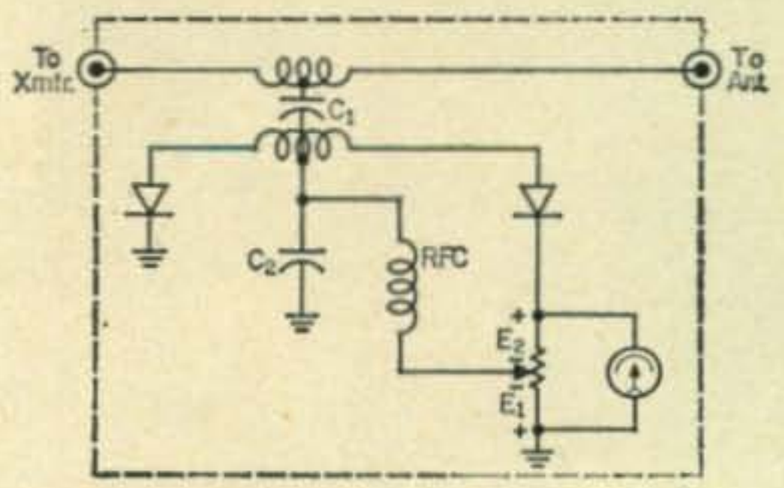


Fig. 1—Simplified circuit of the coax phase detector.
C_1—See Text.
C_2—500 mmf ceramic feedthru (Erie).

In practice, the circuit (fig. 2) is somewhat more complicated to keep the power r.f. where it belongs and to increase the d.c. indication slightly. A piece of RG-11/U cable acts as both the transformer W_1 and C_1.

To make W_1, strip ½ inch of black jacket at each end of the 5" length of coax, and comb the braid wires out straight. Twist them into

*Light Military Electronics Dept., General Electric Company, Utica, N. Y.

[1]Hay, "Additional Notes on the True-Matcher," *CQ*, July, 1953, p. 30.

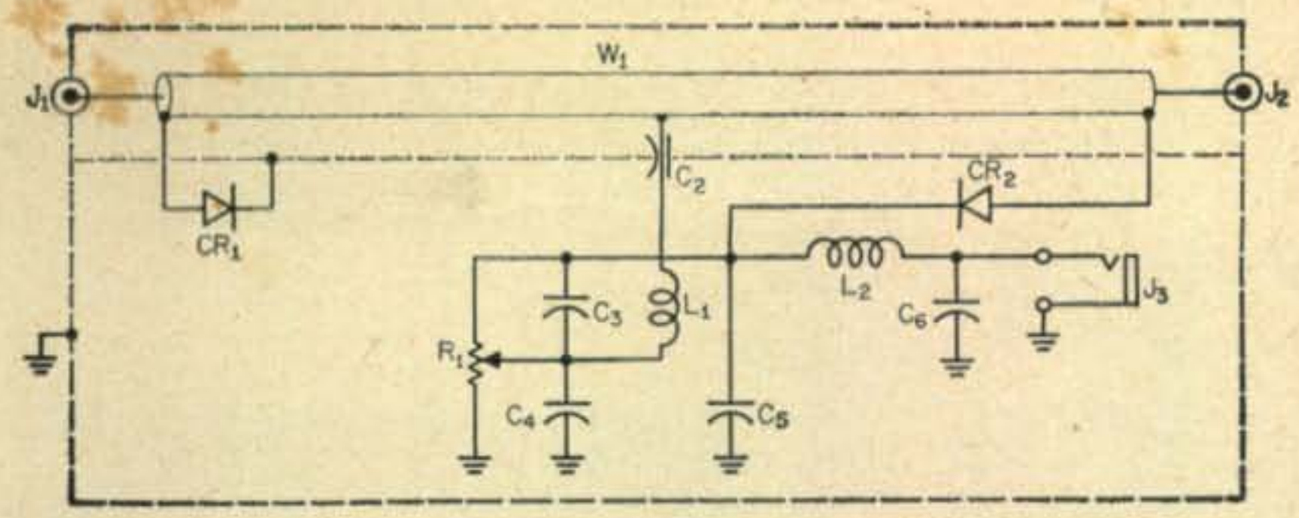


Fig. 2—Practical circuit of a coax phase detector. The construction of W_1 is fully described in the text.

C_2—500 mmf ceramic feedthru (Erie).
C_3, C_4—300 mmf silvered mica, CM15 or CM20 (both same).
C_5, C_6—560 mmf general purpose ceramic.
CR_1, CR_2—pair 1N34A, 1138A (See Text).
J_1, J_2—SO-239 (Amphenol 83-1R).
J_3—headphone jack.
L_1 L_2—2.5 mh r.f.c., National R-50.
R_1—10K, 2 watt, composition (Ohmite type AB, linear taper).
Minibox—5¼" × 3" × 2⅛", Bud CU-3006A.

a pigtail even with the cut edges of the black vinyl, pointing perpendicular from the body of the coax. The two pigtails should point the same way. Flow solder into the pigtail to keep loose wires from spreading and to make later connection easy. Bare about ⅛ of braid around the coax halfway between the two pigtails. Solder a lead here for later connection to C_2.

Follow the wiring diagrams and photographs and construction should be easy.

Mechanical tips: Drill or punch two ⅝" holes for the coaxial connectors *first*, and then drill the mounting holes for each connector using opposite corners of the connectors as a template. Do not hold either the box or the coax receptacle with unprotected hands during this step. Mount the connectors *inside* the box, with the lip of the internal shield between the box and one corner of each connector. Make the inside shield of "tin can", with the tin (shiny) side away from the coaxial transformer.

Comment on the Design

The circuit was borrowed from Hay and modified for parts available and a less expensive meter (500-0-500 microamps). Capacitors C_5 and C_6 are quite uncritical, and I suspect the same goes for C_3 and C_4, provided they are within 5% or so of each other. In this modification, I suspect that L_1 and L_2 could be as low as 500 microhenries without significant change. With R_1 equal to 10K, type 1N34A diodes should work as well as 1N38's. The author has tried only the variations indicated in the parts list.

If a more sensitive meter is available for instance, 20 to 50 microamperes, it may be profitable to increase R_1 as high as 250K, use 1N38A diodes, and stick closely to the parts list.

Hay's original design was intended to feed a 75-0-75 microammeter or the equivalent of a vacuum-tube voltmeter, and power in these cases (or on a strongly reactive load) may make it desirable to use a shunt or other high-current meter protection. Figure 3 shows one way to get some protection.

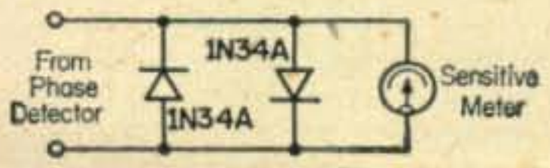


Fig. 3—Using diodes as a high current shunt to protect the meter.

Calibration

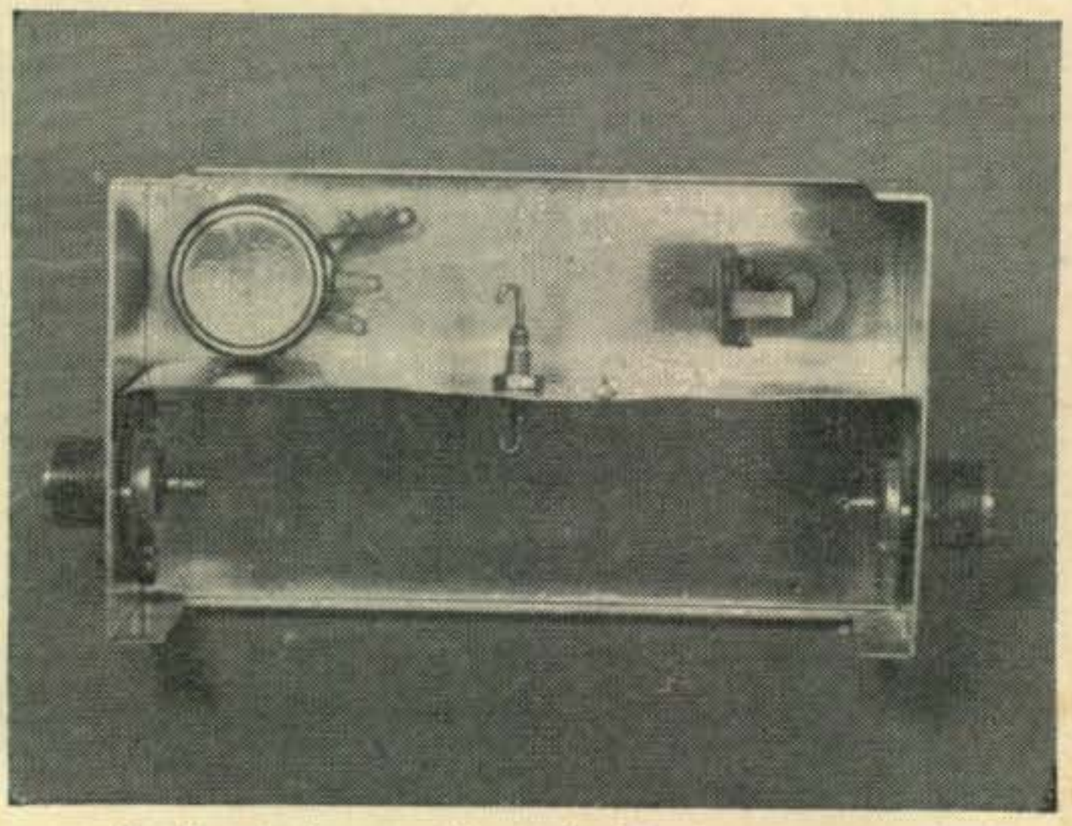
The meter described holds calibration at least as high as 21.5 mc, but requires "touching up" on 10 meters. Calibration is performed by transmitting power through the detector to a dummy load that is a pure resistance, and adjusting R_1 to give zero meter output. Several resistive loads have been described in articles[2, 3, 4], the author personally preferring the first listed.

Use

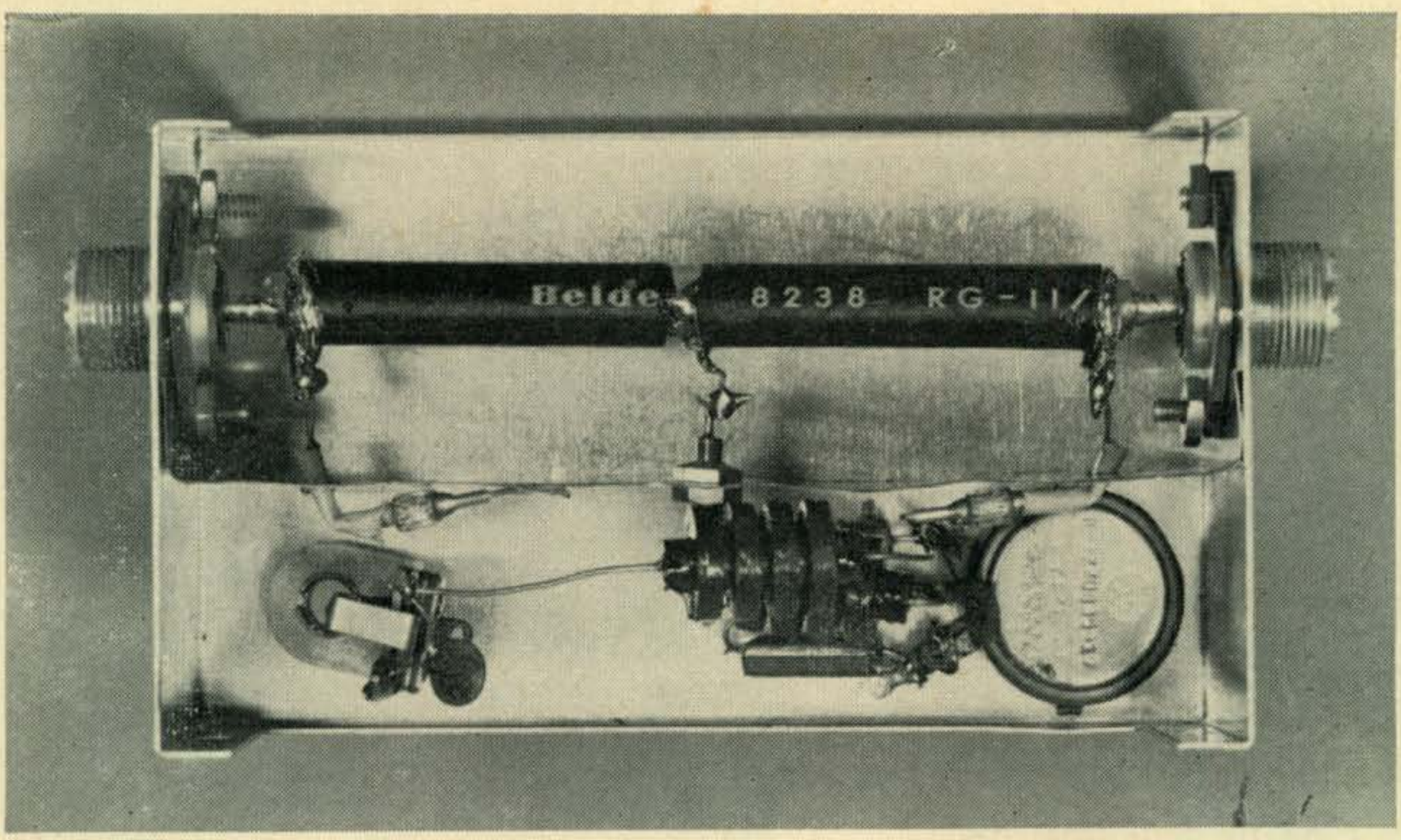
It is not necessary to use a zero-center meter, for polarity indicates the type of reactance. If the meter swings downscale from zero, reactance is one type; upscale the other. Should some idea of magnitude be desired, it is easy to reverse meter leads. It is strongly suggested that a one-milliampere (or more sensitive) full scale meter be used. A v.t.v.m. also makes an excellent detector and may be adjusted for zero center.

To find out which polarity is which, shunt the dummy load with a broadcast-type tuning capacitor, and mesh the plates until a deflection occurs. This is the polarity for a capacitive load. Shunting the dummy load with an inductance (1 to 10 microhenries, depending on frequency) will verify that the opposite polarity indicates inductance.

[2]Geiser, "Wide-Band Moderate Power Dummy Loads," *QST*, Dec., 1958, p. 18.
[3]Milner, "Dummy Loads," *QST*, April, 1959, p. 47.
[4]Glanzer, "A 1500 Watt Dummy Load," *CQ*, March, 1961, p. 30.



Mechanical mounting of chassis components.



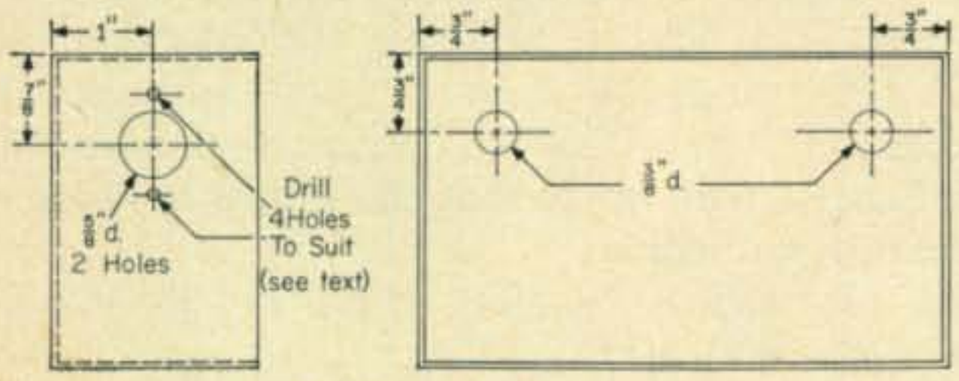
Close up view of the phase detector parts layout and construction of W_1. Note that the internal shield bolts under one end of the input and output jacks. Output jack J_2 is at the right.

Exercises

One of the best ways that a device's capabilities can be learned is by trying it out. Here are some exercises.

EXERCISE #1. Connect the transmitter to the input of the detector and connect the output coaxial connector of the detector to the antenna. Is your antenna capacitive or inductive? (The detector causes no measurable mismatch on a 50 to 75 ohm line.)

EXERCISE #2. Sweep the v.f.o. across the band. Do you find a "purely resistive" frequency? I'll bet the transmitter loads up best there.



Cabinet drill plans.

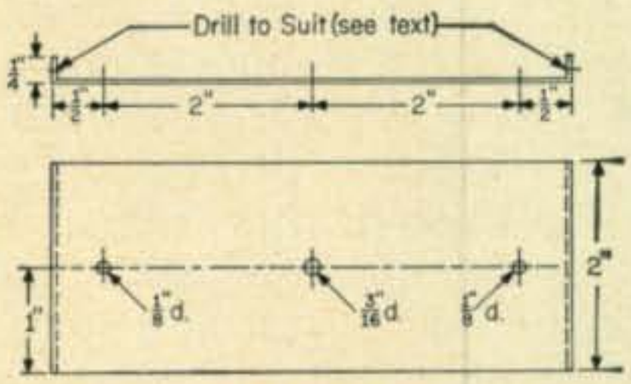
EXERCISE #3. What is the s.w.r. at the purely resistive frequency? If it isn't 1:1, you can find out if the transmitter output impedance is higher or lower than the coax cable impedance by shunting it with about 500 ohms. If the s.w.r. goes down, the feedline is presenting a high impedance.[5]

EXERCISE #4. Repeat exercises 1 through 3 with the detector at the antenna (or the end of the coax cable nearest the antenna). Why is there a difference? (Hints: Remember transmission lines have attenuation that tends to make any load look resistive. Remember also that transmission lines transform impedance if the load differs from the characteristic impedance of the transmission line.)

EXERCISE #5. If the feed-point at the antenna does not look like a pure resistance at your favorite frequency, is it resonant at this frequency?[6]

EXERCISE #6. Install the detector at the antenna end of the coax in your mobile rig. Repeat exercises 1-3. How does your signal strength and loading compare away from the purely resistive frequency?

EXERCISE #7. Change the mobile antenna resonant frequency using this detector as an indicator. Was it difficult?



Internal shield drill plans.

EXERCISE #8. With any antenna tuning network fed with coax from the transmitter and having two independent adjustments (L and C, or C and coupling, for instance) install the phase detector and an s.w.r. bridge between the coax and the antenna tuner. Make the adjustments watching *both* indicators. Show a Novice the desirable detector and s.w.r. readings, and ask him to perform the tuning. Notice how little experience it takes to do a good quick job provided the tuning network is capable of making the match.

[5]This is true provided the presented resistance is not reduced by this shunting *below* the s.w.r. bridge impedance. It may be double-checked by removing the 500 ohm shunt and replacing it with a 1000 ohm shunt. (Both should behave the same with the 500 ohm giving the lower s.w.r. if the actual load impedance is considerably high.)

[6]Maybe. However, end-fed and balanced center-fed antennas are purely resistive at their resonant frequencies. Certain feed-line lengths may make an antenna *system* appear resonant (or rather, resistive) at frequencies, on which the antenna is not resonant.

[*Continued on page 94*]

How's Your Antenna?

BY JOHN E. MAGNUSSON*, WØAGD

The effectiveness of an antenna is often questionable. WØAGD makes some suggestions on how to check and improve the efficiency of many antenna installations.

With the present trend toward fixed output impedance equipment, in both the low power as well as the high power level, it becomes necessary to make an evaluation of the antenna system. We will then assure ourselves, that the equipment will operate and load properly, and that we have given it an even chance to deliver maximum performance. The trend is also to multiband antennas which serve very adequately. And since the average amateur does not have the real estate or the wherewithall to have an elaborate antenna farm with separate antennas for each band of operation, he has to get the most out of a simple antenna system. The trend is also to feed all antennas with an unbalanced line so that it can be connected through the accessory equipment, such as low pass filters, TR-switches, directional couplers and indicators, into the unbalanced output of the pi-network. There are also excellent balanced fed antennas that require the use of balun coils, antenna tuners or the commercially available Matchboxes to provide all band operation, and to make the transformation from the single ended output of the pi-network to the balanced feed requirements of the antenna. Connecting a folded dipole or a Windom antenna directly to the coax fitting of any transmitter is a practice that should be avoided.

Impedance Matching To The Antenna

One of the biggest problems in matching the transmitter equipment to the antenna system is the transformation effect that takes place in the transmission line between the antenna and the transmitter. Too often the main concern has been the loss through the transmission line because of the s.w.r. It is equally as important to take into consideration the transformaion of impedance through a section of transmission line. In fig. 1, we have represented the s.w.r. on a 50 ohm transmission line. (For the sake of brevity, we will call all 51½ and 52 ohm coaxial cables 50 ohms.) You will notice that a 2 to 1 mismatch can be either 100 ohms or 25 ohms. A 3 to 1 mismatch may be 150 ohms or 16 ohms, and 4 to 1 can be either 200 or

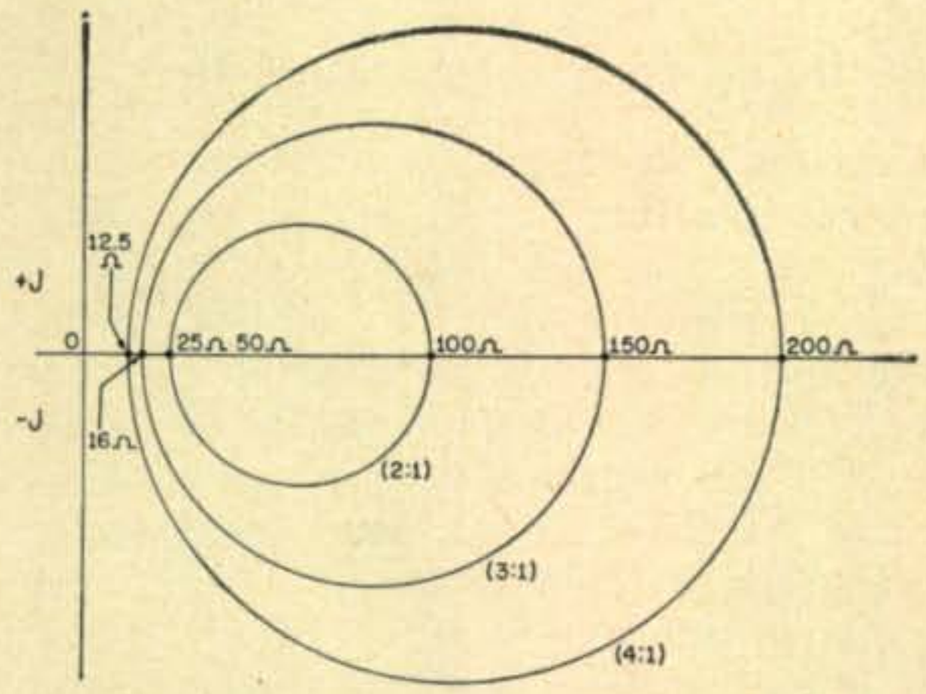


Fig. 1—Graphic presentation of s.w.r. based upon a 50 ohm transmission line.

12½ ohms. Let's take a hypothetical case where an individual has just installed a new three band beam and he measures the s.w.r. as being 2 to 1, but is unable to load the transmitter properly. If the length of the antenna lead-in is harmonically related to the frequency of operation, or is an odd multiple of quarter wave lengths thereof, a transformation effect takes place in the transmission line. In this case, if the impedance is 2 to 1 (or 100 ohms) at the antenna end of the coax, the impedance would be 25 ohms (which is still 2 to 1) at the transmitter. A pi-network will not match an impedance lower than 30 ohms, thus making it very difficult for the individual to load the transmitter adequately, although he has what appears to be an acceptable s.w.r. This explains the difficulty in loading the transmitter because of the low impedance presented to the pi-network. The clue to this condition is a broad tuning indication with a very shallow plate current dip. Let's not kid ourselves, there are hundreds of amateurs who don't know what their s.w.r. actually is and would be surprised to learn it is probably 4, 6 or sometimes greater than 8 to 1. They have never been too excited about finding out what it actually is, or do not own the equipment it takes to indicate the s.w.r. This is unfortunate, because there is a good selection of s.w.r. bridges, directional couplers and indicators, power or wattmeters for transmission lines available and the costs are very reasonable. In the same hypothetical case we can actually lengthen the coax by five

*Customer Service Supervisor, E. F. Johnson Co.

feet and the loading of the transmitter will improve considerably. This would cause us to lose sight of the fact that we still experience a given loss through this transmission line as long as this 2 to 1 mismatch prevails. The antenna should be readjusted to present an impedance closer to 50 ohms in order to have the maximum transfer of energy to the antenna in the first place, and secondly, to avoid this transformation effect. Being realistic, the advantages of reducing the s.w.r. below 1.5 to 1 is usually academic. When calculating the electrical length of the coax it is important to consider the velocity factor, (RG-8-U has a velocity factor of 0.66).

Using Transformation Effect

This same transformation effect that we have experienced in this hypothetical case with the three band beam, can also be used to our advantage in a mobile installation. The 75 meter mobile antenna usually presents an impedance between 5 and 15 ohms. This low impedance is beyond the range of any pi-network, even marginal in the case of some pi-L sections. We can take a given length of coaxial cable, and taking advantage of the transformation effect, have an impedance at the transmitter end of the coax that will be well within the range of the pi-network. For instance, a quarter wave length in free space at 3.9 mc is approximately 60 feet. The velocity factor of RG-8-U is 0.66. Multiplying 0.66 times 60, we find that the physical length of the section of the transmission line should be approximately 39 feet long. It may be a little inconvenient to accommodate 39 feet of coax in the trunk of a car, or between the trunk and the dash, so we could divide this by two and still experience enough transformation effect, plus reducing the loss through this section of line. Here is a case where we have to take the loss in order to have the correct impedance match.

Reflected Power

Reviewing the losses and reflected power should be of primary concern to everyone. Assuming a transmitter with 100 watts input to the final and a final tube dissipation of 50 watts, we can easily see the disadvantage of s.w.r. We know that the final will be between 65 and 70 percent efficient, so that 30 to 35 watts are dissipated in the plate of the tube and the associated wiring. Now we know that we have between 65 and 70 watts of output to couple into the antenna. If we connect this transmitter to an antenna system that has a s.w.r. of more than 2 to 1, the reflected power will be somewhere between 10 to greater than 40 percent of the output power the transmitter is trying to deliver into the transmission line. We soon see that this causes a pronounced reduction of the effective radiated power from the antenna system.

Radial System

Installing a radial ground system is time well spent, and can be done easily with a hunting knife and screw driver. The hunting knife is used to cut a slot in the sod so the copper wires can be forced down below the roots of the sod using the screw driver. The roots of the sod will hold the radials in place so they do not become a hazard when mowing the lawn, or when the family is using the lawn for their daily pleasure. By placing the copper radials below the surface of the sod, you know where the true ground is and it is easy to determine the theoretical impedance of the antenna. As most amateurs find it impractical to raise an 80 meter antenna a quarter wave length above ground, they usually install the antenna at the 35 to 40 foot level. Therefore, the antenna is closer to 50 ohms than it is to 72 ohms, and the 80 meter dipole can be fed with 50 ohm coax. There is little reason for concern about using unbalanced feedline. This is an ideal arrangement as the 50 ohm coax matches the 50 ohm low pass filter, and the 50 ohm coax fitting on the back of the transmitter.

The effectiveness of a low pass filter can be greatly reduced by the s.w.r. and line impedance.

The higher the standing wave ratio the greater will be the voltages across the filter components until the filter may be destroyed by arc-overs or component breakdown. The lengths of an antenna, as given in any manual, are theoretical and will have to be changed with each installation in order to bring the s.w.r. down to a tolerable level. This is due to the proximity effects of other objects in the immediate area as well as the end effect of the antenna itself. A perfectly adjusted beam antenna may vary as much as 20% in the drive point impedance, when it is rotated through 360°, by the proximity effect of nearby objects.

Antenna Bandwidth

An antenna is a series resonant circuit and will have a reactance curve similar to the one shown as a dotted line in fig. 2. You will notice

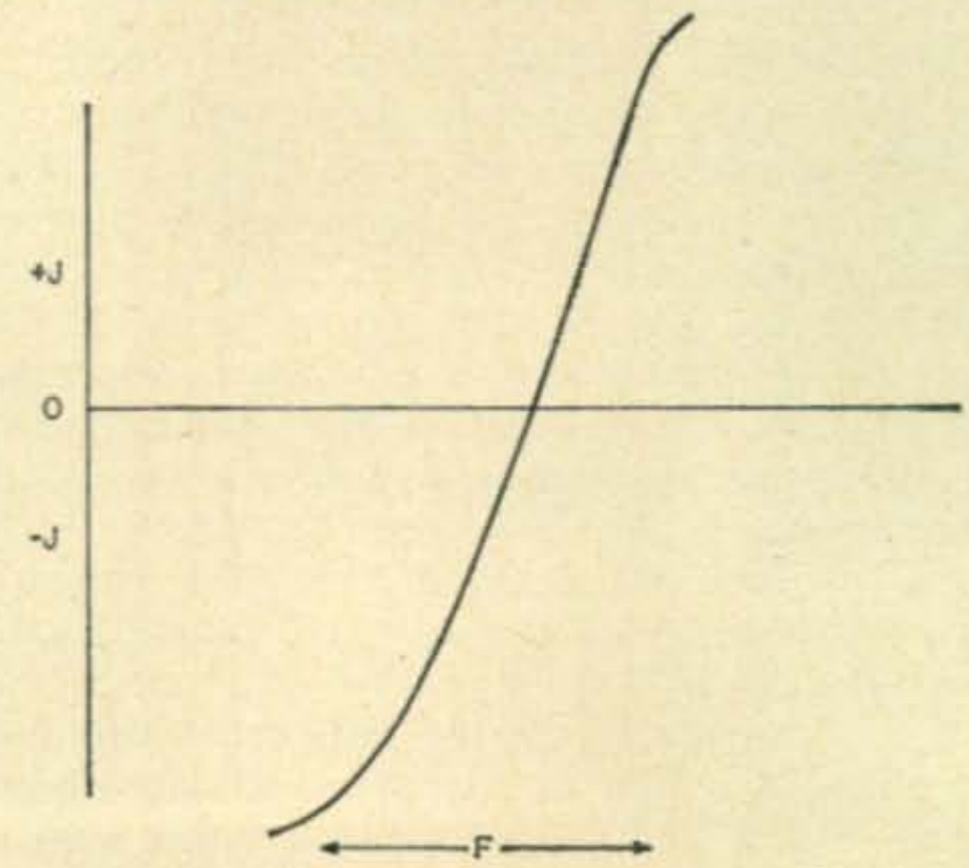
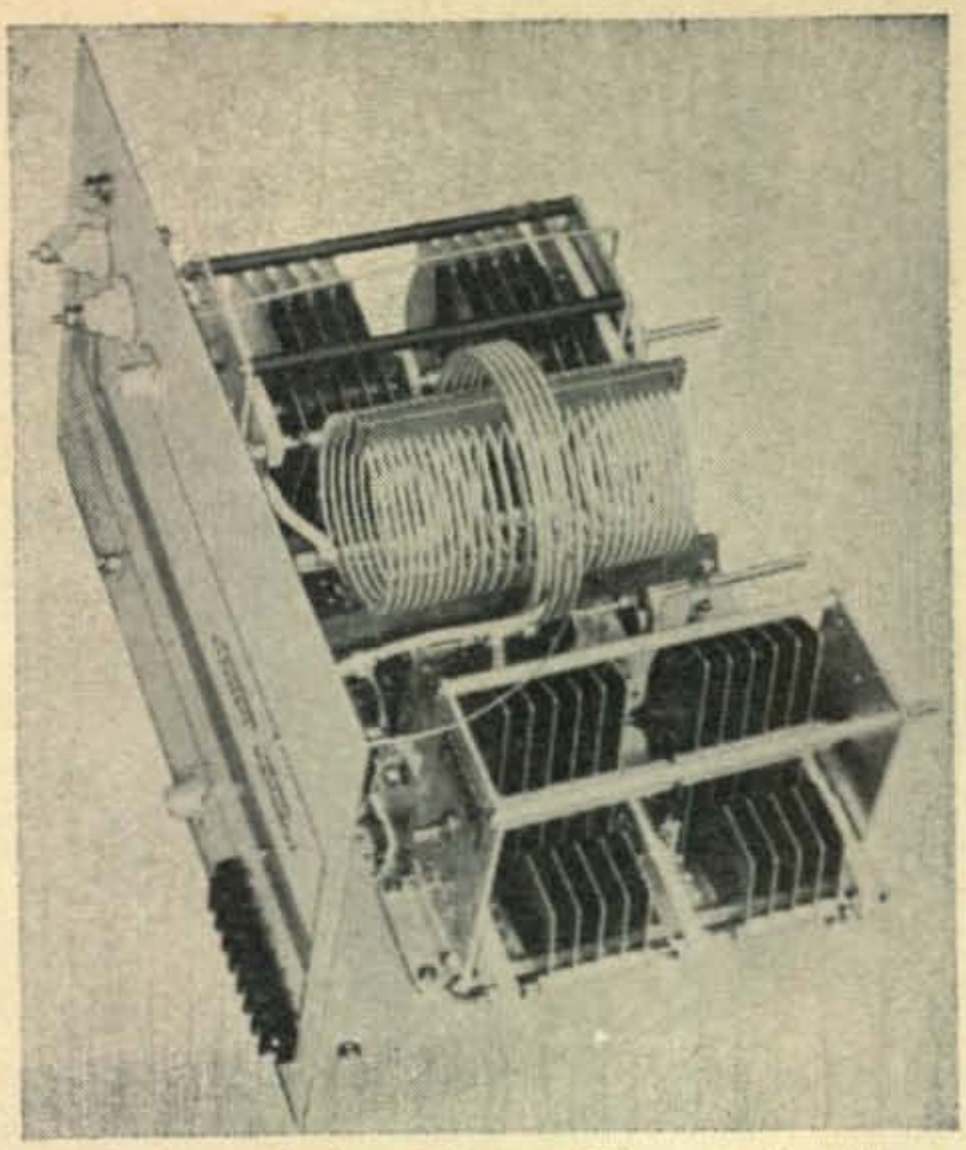


Fig. 2—Curve illustrating the reactance of a series resonant circuit such as an antenna.



Internal view of the Johnson Kilowatt Matchbox. It will match balanced antennas from 50 to 1500 ohms and unbalanced antennas from 50 to 2000 ohms. It also measures s.w.r.

that the point where you have a pure resistance is the point where the reactance curve intersects the line. This point is a function of the spacing of the elements, the length and diameter of the elements, and the height above ground for a beam antenna as well as a dipole. The resistance can be made to be exactly 50 ohms by these factors.

The more familiar Viking Matchboxes provide an excellent solution to all band operation with one antenna. This is made possible by the length of the antenna, feedline impedance and length, transformation effect and the range of the Matchbox. The impedance of the antenna, at its feedpoint, varies greatly over a wide frequency range; from just a few ohms to several thousand ohms. It is the same whether the antenna is center fed, or end fed. This impedance is transformed by the feedline into a representative range at the Matchbox terminals to allow all band operation. Only if it falls within the range provided, (usually 25 ohms to 3000 ohms.) As we learned in elementary electronics, the impedance across a parallel tuned circuit is infinite, and we can tap down to any level we need within reason in order to match the feedline. The tuning controls tune the parallel tuned circuit to resonance and the matching controls provide a capacity divider across this tuned circuit in order that we may select a wide range of impedances. This is more convenient than the old antenna tuner method of tapping the turns on the coil. The limitations are controlled by the earlier mentioned factors of length and feedline impedance.

Arc-overs would indicate that the impedance is extremely high and that the antenna, or the frequency, is beyond reasonable limits. When the impedance is at the lower limit, the controls will run to the end of their range and the broad tuning characteristic outlined earlier will be experienced. The high impedance open wire feedline is important because of the lower losses. Too often, the temptation seems to arise to blame the s.w.r. on the transmitter, matchbox, or the feedline. Nothing could be more absurd, as the transmitter has no influence on the s.w.r. And it is more practical to adjust the antenna to better match the feedline, than to try to make compromises in the feedline to offset the improper adjustment of the antenna.

Often the question is asked, "How far should I be able to move my transmitter, frequency wise, on the 80 meter band?" Simple arithmetic shows us that the reactance of the antenna is going to determine how large a frequency excursion the antenna will allow us to make. Let's be realistic; moving 50 kc on the 80 meter band represents the same percentage of frequency change as moving 200 kc on the 20 meter band, or 800 kc on the 10 meter band. The reactive element makes it difficult to have an antenna that would be absolutely flat across any band of operation, more specifically across the 80 meter band. On 80 meters, a small change in frequency represents a greater percentage of the operating frequency than on the higher bands. A wide range pi-network output in the transmitter will give considerably more freedom, than is the case with a fixed output impedance in the transmitter.

Radiation Angle

The height of the antenna not only controls the impedance, but also the radiation angle. At the lower frequencies the antennas are usually placed closer to the ground to take advantage of the higher angle of radiation for local coverage. An 80 meter antenna can be as close to the ground as 12 or 15 feet if you really want local coverage. (That is within the immediate area up to 100 to 150 miles.) If you want to work DX, the antenna has to be raised to take advantage of a lower angle of radiation and the resultant skip that this will provide. The vertical antenna with a low angle of radiation in the order of 15 degrees, is usually poor for local area coverage, but excellent for "DX." The angle of radiation of a beam antenna is also controlled by height above ground as indicated in fig. 3. With the

[*Continued on page 90*]

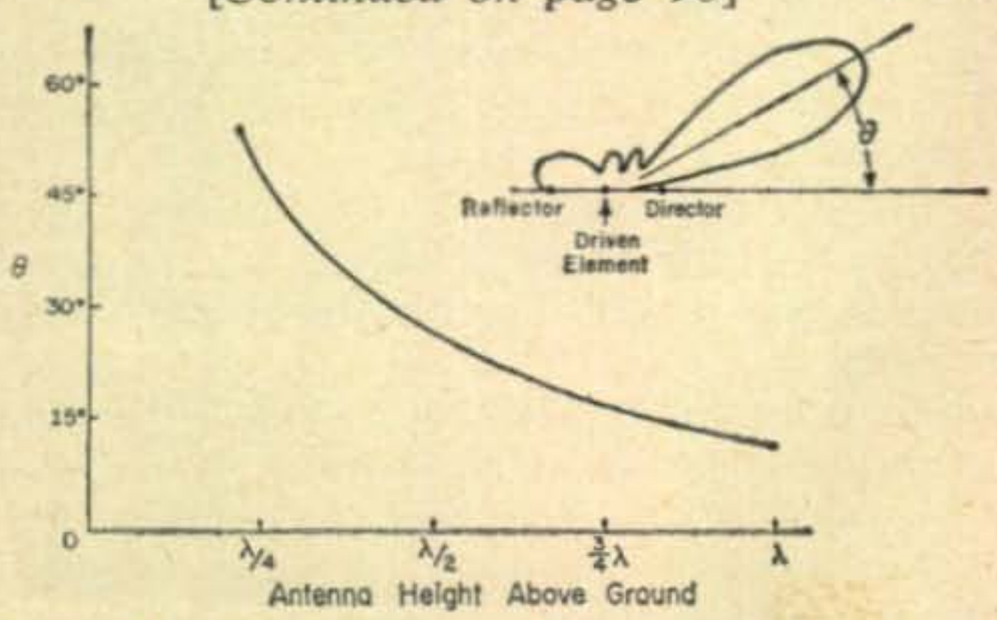


Fig. 3—Chart depicting angle of radiation versus antenna height above ground.

Transmitter—Receiver Control Circuits

BY CHARLES GREEN*, W3IKH

A problem often confronting the newly equipped amateur is how to control the transmit-receive function easily without accidentally pumping 50 or so watts of r.f. into the receiver antenna coil. W3IKH presents a helpful review of the principles and practices of transmitter-receiver control coordination for the beginner.

UNLESS a transmitter and receiver are purchased as a matched pair, that is built by the same manufacturer, the average ham usually has to do some work to synchronize the transmitter and receiver control circuits to operate with one switch.

Basic Requirements

Figure 1 shows the basic requirements for a transmitter control circuit. Two relays or switches are needed. "A" is utilized to switch the antenna from the receiver to the transmitter and "B" is used to turn the xmitter power on and also to disable the receiver and prevent its overloaded by the transmitter's r.f. output

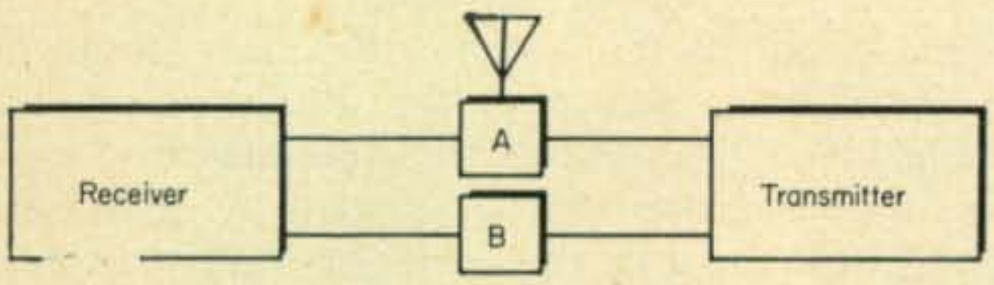


Fig. 1—Basic requirements for a transmitter control circuit. Block (A) switches the antenna from Rec. to Trans., and block (B) disables the receiver while simultaneously energizing the transmitter.

Each receiver manufacturer seems to have a different idea as to the best method of receiver disabling ("Standby"). These methods include:

1—Placing high bias on the r.f. and i.f. stages, thus making them inoperative by the tube grids being at cut off point.

2—Placing high bias on the audio stages, thus cutting them off.

3—A combination of r.f. and audio high bias, with the addition of receiver a.f. output disabling.

4—Receiver power supply disabling, opening the B– circuit by a switch in the center tap of the power transformer high voltage winding.

The transmitter disabling circuits either open up the primary or the center tap of the plate h.v. transformers. In some low power rigs, or for break-in operation, the h.v. supply is left on and the tube cathodes are keyed.

*17 Little Lane, Levittown, Pa.

Switching Low Powered Transmitters

Receivers and transmitters usually come equipped with a transmit-receive switch. Unless they can be wired into some sort of single switch arrangement, they must be thrown simultaneously, making operating more difficult.

There are various ways of synchronizing the transmitter and receiver, some simple and others more complicated, depending on what the power circuits are in the transmitter. The control circuit shown in fig. 2 is applicable to the

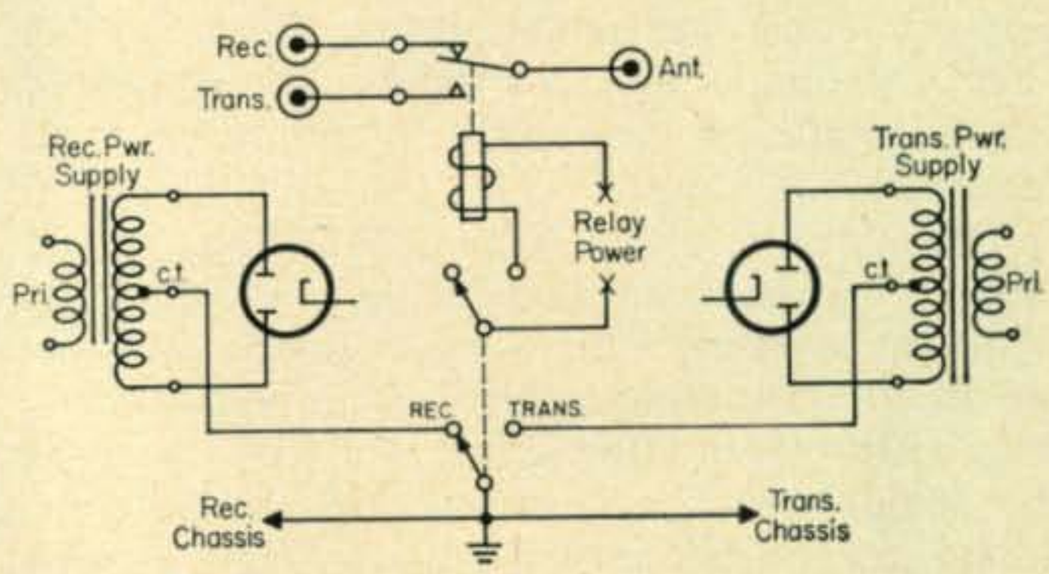


Fig. 2—A simple control circuit for a receiver and low powered transmitter.

lower power transmitters that utilize a single h.v. transformer for all stages, such as the DX-35,40 or the Globe Scout. A single d.p.d.t. toggle switch is used; one section switches the center taps of each power transformer to ground and the other section controls the antenna relay. The toggle switch may be mounted on either the transmitter or the receiver cabinet and the antenna relay, if of the coaxial type, can be mounted by means of commercial adapters directly on the transmitter antenna terminal, thus eliminating the necessity for a separate control box.

For very low power transmitters running 10 watts or less, a two section rotary wafer switch may be used instead of the toggle switch and antenna relay, as indicated in fig. 3. Low power transceivers such as the Two and Six meter Gonsets use essentially the same switching system and a single power supply is used for both transmitter and receiver.

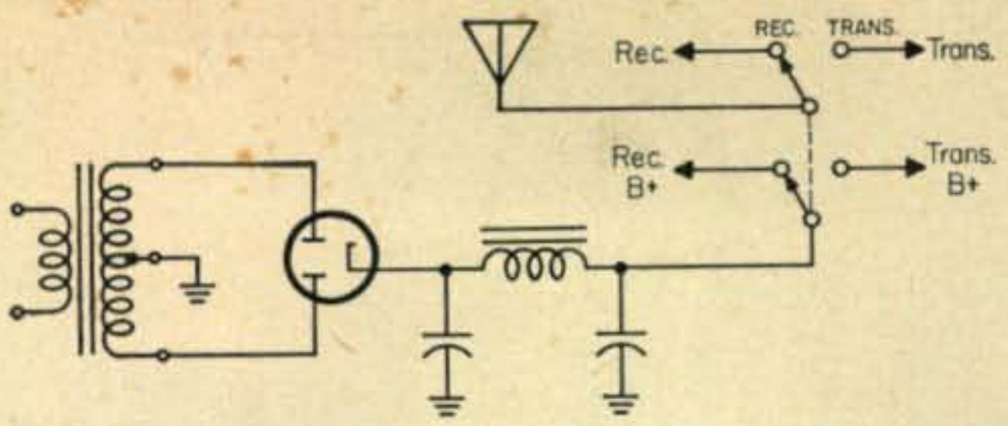


Fig. 3—A simple control circuit for a receiver and low powered transmitter that employ a common power supply.

Switching High Powered Transmitters

In higher power transmitters employing separate h.v. and l.v. power transformers, the circuit shown in fig. 4 is used. A s.p.s.t. toggle switch or push to talk switch, is used to control a 3 pole double throw relay, which in turn controls the h.v. primary and the l.v. secondary center tap connections. The center tap connection of the l.v. circuit is necessary because the l.v. power transformer usually has the filament windings on it, as in the DX-100. Point "A" on the fig. 4 diagram indicates the connection that can be made to a receiver that has a "Standby" terminal for internal disabling circuits such as the 75A-4 or HQ-170, instead of the center tap connection.

Tune-Operate Switch

Figure 5 shows how a transmitter may be modified to provide tuning up of the transmitter's Final Grid Current. This circuit can be used on transmitters such as the DX-35 and is a lot easier on the final amplifier tube. When the switch is moved to the TUNE position, the screen grid is connected to ground, thus cutting off the final amplifier tube. Tuning of the grid circuit for the proper current can now be accomplished. Then the screen is switched back to OPERATE position and the plate tuned.

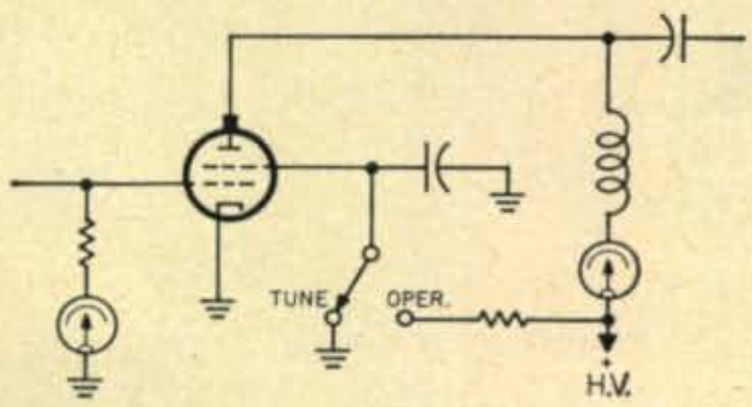


Fig. 5—Circuit of a Tune-Operate switch that protects the final when tuning

I have used these circuits in both commercial and home brewed rigs and have found them to work with the minimum of difficulties, and these were usually caused by a wrong connection. Therefore, check all wiring carefully before applying power, and make sure that a good common ground exists between the receiver and transmitter. ■

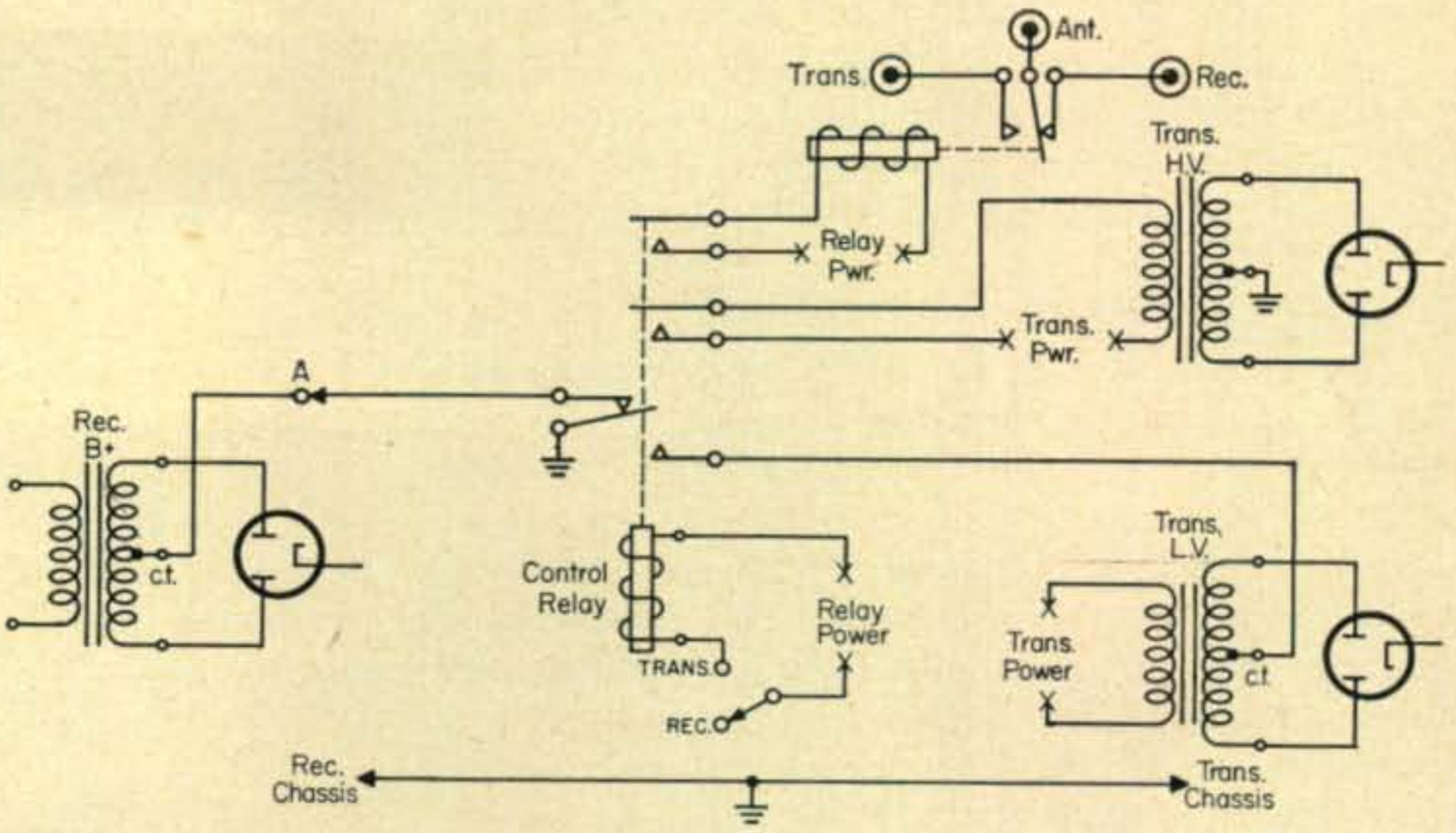


Fig. 4—A control circuit suitable for higher powered transmitters. Control of the h.v. transformer primary is permissable if there are no filament windings involved.

Mars Bulletins

Air Force MARS Eastern Technical Net

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Jan. 7th **New Electron Tubes For The Modern Era.** Dr. John E. Beggs, Research Associate, General Electric Research Laboratory.

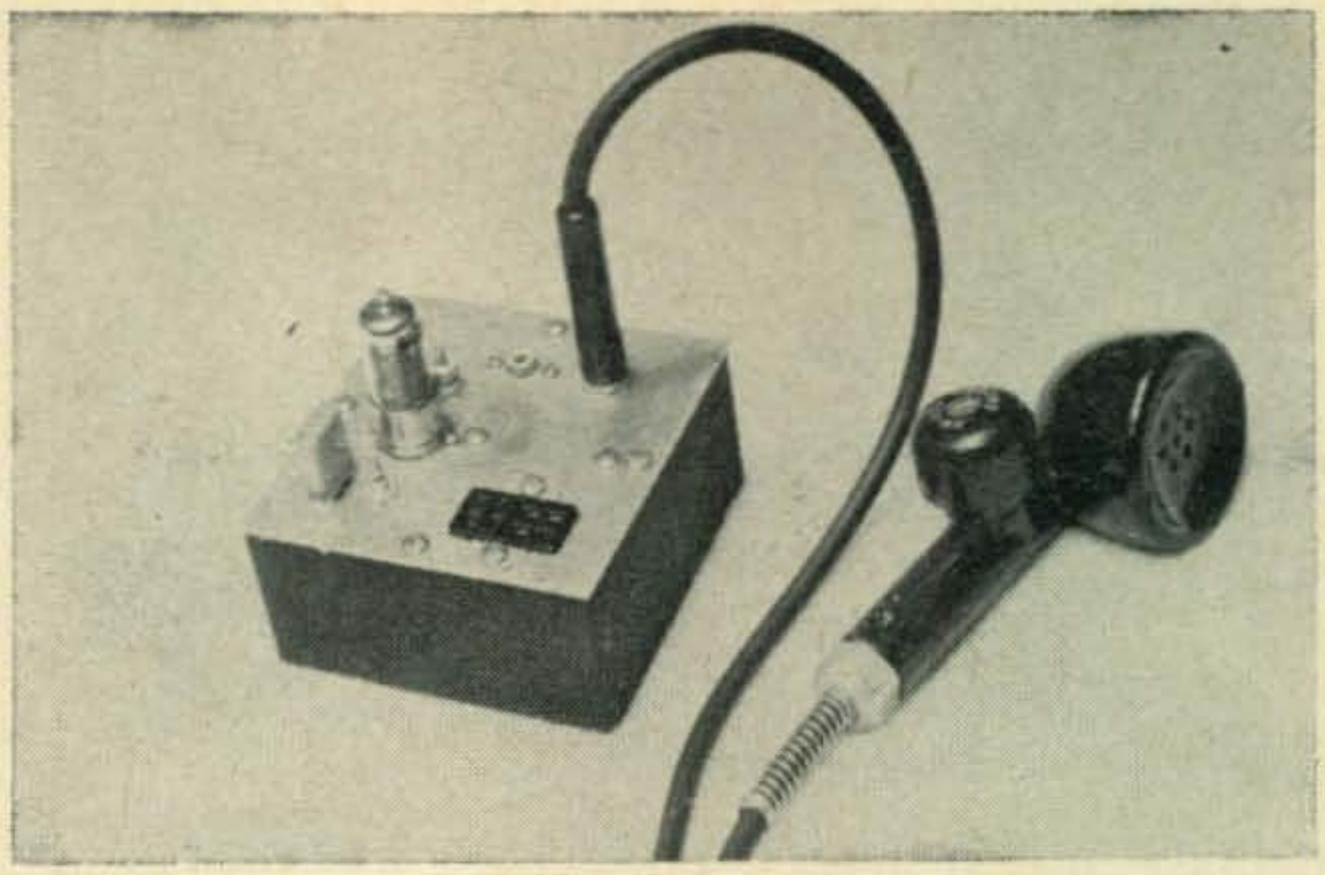
Jan. 14th **Thermionic Integrated Micro-Module Circuits For High Temperature Environments.** Allen P. Haase, Manager, Receiving Tube Department, General Electric Company.

Jan. 21st **Applications of Transistors.** Mr. F. B. Smith, RCA Laboratories.

Jan. 28th **General Discussion of Semiconductor Devices.** Mr. H. O. Johnson, Research Engineer, RCA Laboratories.

Feb. 4th **Advances in Broad Band Communications.** Mr. Kent Worthen, Communications Products Dept., General Electric Company.

One Tube On Six



BY C. J. FAUST JR.*, K2VRV

Here is a small transmitter for 6 meters with a one watt output. It is suppressor grid modulated by a carbon mike and can be either battery powered or operated from a small a.c. power supply.

IF you're a ham who likes to try something different now and then, without going to a lot of work, this may be just the project for you.

Here's a little rig that will really surprise you. This is a complete, crystal controlled, v.h.f. transmitter, including modulator and power supply, that uses but one tube, and a single pentode at that. It will work well with either 50 mc, third overtone, 25 mc, 16 mc, or 8 mc crystals of the plated type, treated for overtone operation. However, best output will be obtained when using 50 mc third overtone crystals.

Circuit Description

The circut, shown in fig. 1, is not new, but for those who are not familiar with it, I will attempt to explain how it works. It is basically a Tri-tet oscillator. The grid-cathode circuit of V_1, the crystal, L_1, C_1 and R_1 act as a conventional triode crystal oscillator. The screen, suppressor, and plate circuits of V_1, (C_5 and L_2) form a tetrode amplifier or frequency mutiplier, as the case may be. The screen and suppressor grids are by-passed for r.f. and serve to isolate the oscillator portion of the tube from the output circuits.

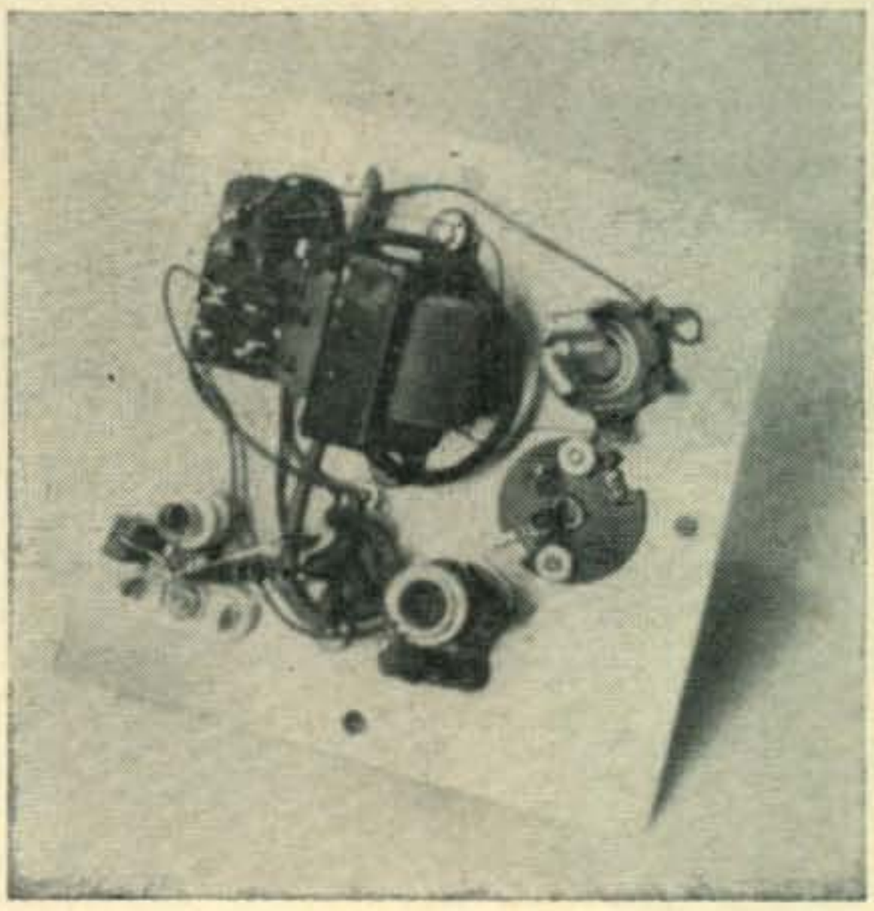
Suppressor grid modulation is used. Because the suppressor grid is operated with a negative bias, and draws no current, the modulator need not be capable of supplying any power. A voltage swing of approximately 20 to 30 volts is required to properly modulate V_1. This is easily supplied by a carbon microphone and a step-up transformer. Hence, there is no need for a modulator tube.

Several different transformers were tried before one was found that gave satisfactory results. The greater the impedance ratio between primary and secondary, the higher the voltage developed across the secondary will be, and consequently, the rig will be easier to modulate fully. The transformer specified in the parts list will give very good results, but a little experimenting at this point may prove worthwhile.

A number of different pentodes were tried in this circuit. Some gave slightly greater power output; however, none seemed to modulate quite as well as the 6BH6. Some other factors in its favor are low heater current drain, (150 ma), and good efficiency at low plate voltages, which will mean a lot should you decide to run the transmitter on batteries in an emergency.

Power Supply

The transmitter can be operated entirely from dry batteries, but you will find it more economical in the long run to build up the little power supply which will provide all the necessary voltages. It may be constructed on the same chassis as the transmitter, if desired,



Bottom view of the one tube crystal controlled transmitter for six meters. Above the crystal socket is cathode coil L_1 while L_2-L_3 is located at the lower right.

*Pemberton, New Jersey.

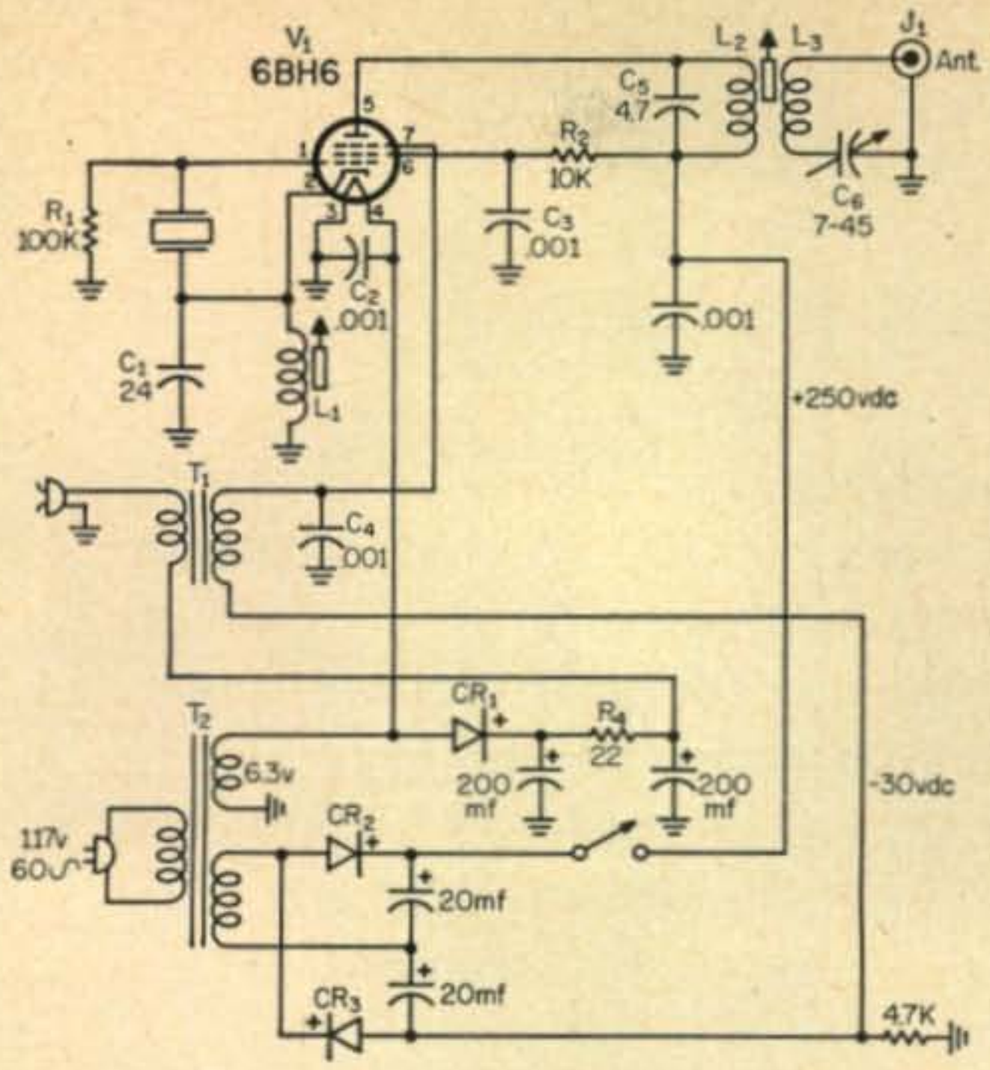


Fig: 1—Circuit of the one tube six meter transmitter. Adequate audio is obtained from the carbon mike and output transformer to modulate the 6BH6. All capacitor values greater than 1 are in mmf; less than 1, in mf unless otherwise noted. All resistors are ½ watt.

CR_1, CR_2, CR_3—Silicon diodes 500 ma, 400 p.i.v. Sarkes Tarzian M500.

L_1 — 5t #24 on ¼" diam. slug tuned form, close wound. J. W. Miller #4500 form.

L_2 — 8t #24 on ⅜" diam. tuned form, close wound. National XR91 form.

L_3—2t #18 wound over cold end of L_2.

T_1 — Output transformer, 10K to 3 ohms. Thordarson 24S84 or equiv.

T_2 — Power transformer 125 v.a.c. @ 25 ma, 6.3 v.a.c. @ 1 amp., Stancor PS8416 or equiv.

or separately. The author built both the transmitter and power supply on separate 4"×4"×2" steel utility boxes, and connected them with a multiple conductor cable. This way, it is a simple matter to disconnect the power supply, should you want to operate from batteries.

Construction

The layout of the transmitter may be seen in the photographs. You do not have to follow this layout if you don't want to. The main thing to remember in laying out the chassis is to keep all leads carrying r.f. as short and direct as possible, and bypass capacitors and grounds should go directly to the chassis. No two tuned circuits are resonant at the same frequency, so there is no danger of self oscillation due to poor layout.

Testing

When you've finished wiring the chassis and checked for possible errors, connect the batteries or power supply and mike, plug a crystal into the socket, and a dummy load into the antenna jack. A suitable dummy load for testing can be made from a #47 pilot lamp fitted into a coaxial connector. If you are using 50 mc crystals, start with L_1 at minimum inductance, (slug all the way out). Adjust L_2 until the lamp begins to glow. Next, adjust C_6 for maximum brilliance. Keep adjusting L_2 and C_6 alternately for maximum output, and trim up L_1. Speaking into the microphone should cause the lamp to flicker noticeably. When using 8, 16, or 25 mc crystals, the setting of L_1 before oscillation will take place, becomes a little more critical. Start with the slug of L_1 about halfway out, and then proceed as before. Inductor L_1 is always tuned slightly above the crystal frequency, and its setting is not critical. Once set, it need not be touched again.

When coupling to an antenna, either monitor the plate current or check output with a field strength meter or receiver "S" meter. The latter method is preferred. Settings for L_2 and C_6 will be slightly different than with a dummy load. Couple as tightly as possible to the antenna for best modulation. Loading can make a lot of difference in the way a grid modulated transmitter sounds and gets out.

Output, with the power supply shown, is approximately 1 watt. This may not seem like much, but distances of 10 miles and more have been covered with 5-9 reports. ■

Ham Hint

To help alleviate the mobile spares trunk storage problem, cardboard boxes may be used as shown in the photograph. A long band, double thickness, cut from an old inner tube, is attached to each side of the trunk to prevent the boxes from falling off the shelf.

If the car has an upright spare tire, still more storage space can be provided by using a "trunk organizer" (available at Sears and elsewhere, about $2). This fits over the spare and has numerous fabric loops and pockets, fine for storing spare tools, tubes, fuses, handbooks, etc.

If the car does not have an upright spare, roll-up tool pouches or work-apron pockets may be mounted on the sides of the trunk.

The "Miniceiver"

BY HELGE GRANBERG*, OH2ZE

A completely transistorized receiver, the Miniceiver uses 18 transistors and 8 diodes. It covers the 10, 15 and 20 meter bands but may also be expanded to operate on 40 and 80 meters. The receiver has the following features; double superheterodyne with i.f.'s at 3.5 mc and 455 kc, home brew ferrite filter, product detector, b.f.o., a.v.c., S meter, r.f. overload protection, 100 kc calibrator, zener regulation, and is a.c. or battery powered. The unit is an excellent example of the European construction.

AMATEUR equipment is being made smaller and smaller these days. The only problem is the transmitter which cannot be reduced proportionally to the receiver if the power is to be kept at a medium level. The new transmitting tubes are small indeed, but these small tubes require a blower to cool them that is much larger than the tube itself.

We hardly have these difficulties with the receiver now that transistors on the market. A high quality receiver can now be built in a few cubic inches of space, so small and light that it will be hard to handle, turn the switches and to check the dial calibration. That's what we can call miniaturization.

The transistors have a higher noise level than vacuum tubes, which is especially apparent when a transistor is used on its highest frequency. The amplification will drop rather sharply when the frequency rises too high. If a transistor with an alpha cut-off frequency of about 200 mc or more is used on the short wave bands, the noise will be quite low compared to the amplified signal. No difference will be noticed in the noise level between 3.5 and 30 mc without measuring equipment.

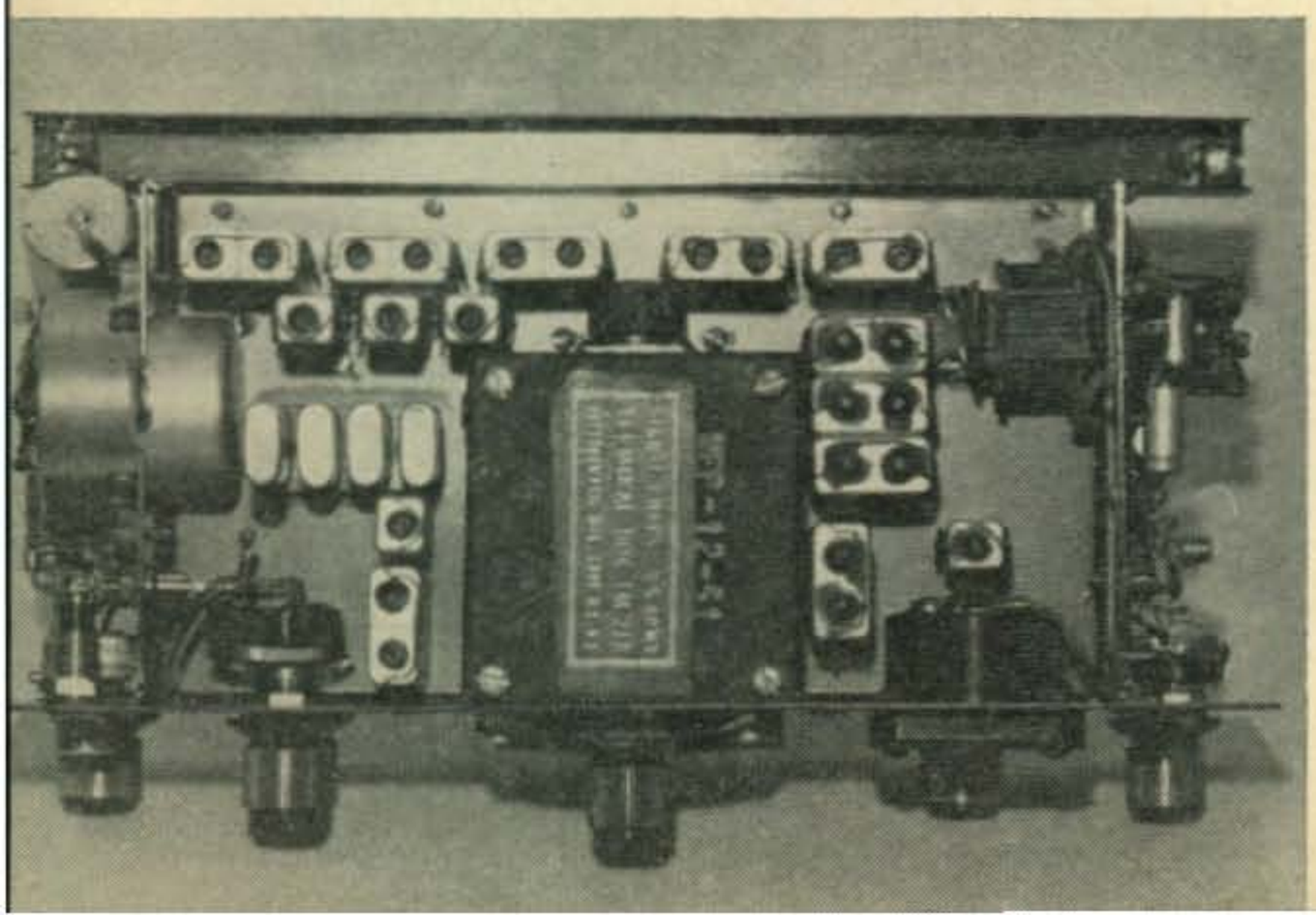
*Advanced Instrumentation, Electronics Laboratory, General Electric Co., Syracuse, N. Y.

Some circuit areas are more complicated in transistor receivers than those made with tubes. The a.v.c. is not one of the easiest problems to be solved since the impedances of a transistor change if base voltage varies. Changes in emitter voltage have the same effect. In addition this makes the r.f. gain control arrangement very difficult.

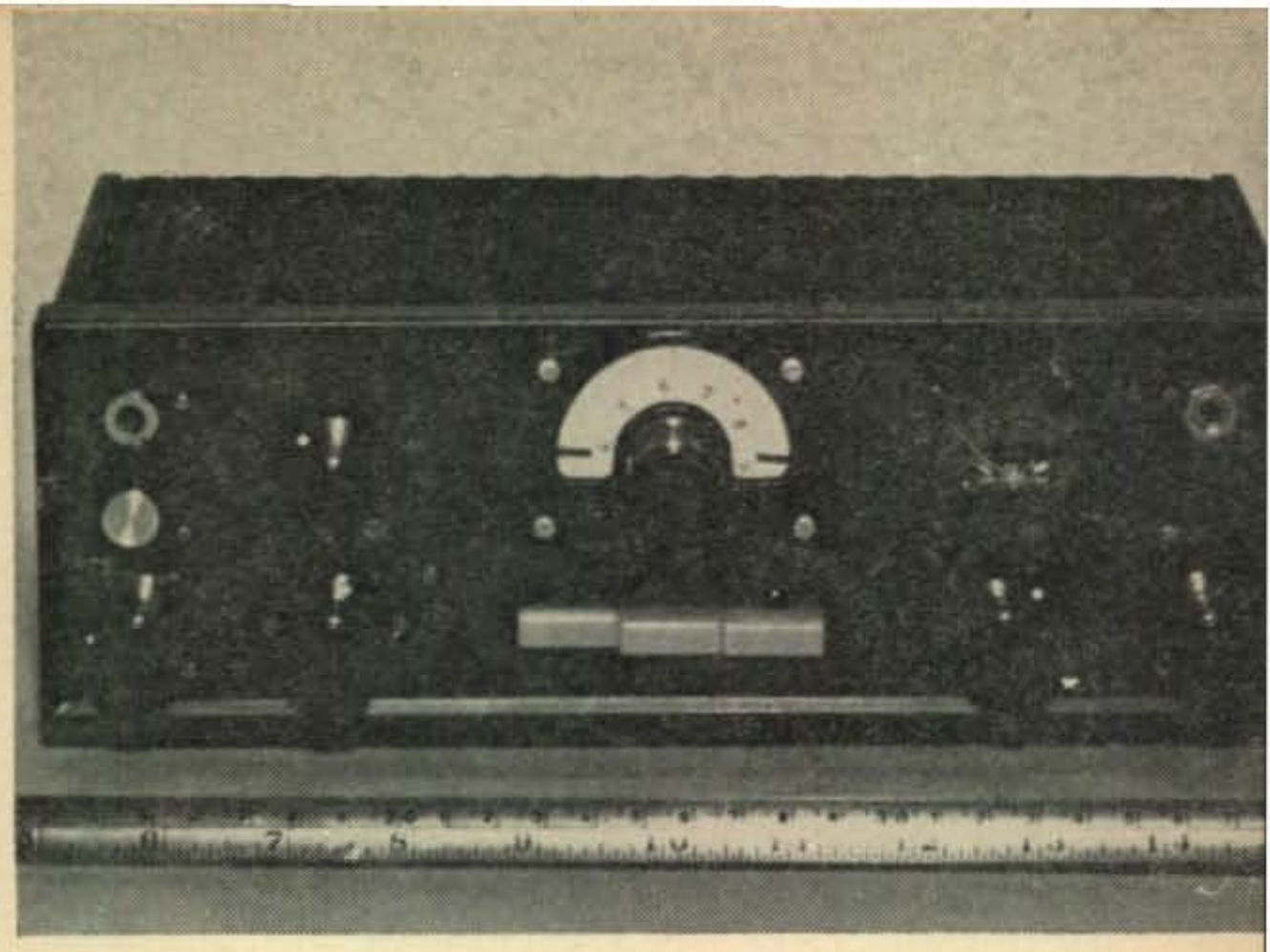
Another problem is the protection of the r.f. amplifier transistor when a high power transmitter is operating alongside. The r.f. field does not have to be too strong to burn out a small transistor. Several of them were blown in tests where the power was only 100 to 200 watts. Finally, a pair of silicon diodes were connected in parallel, as shown in fig. 1, across the input. Their forward resistance is low, (how low depends upon the diodes used) and they reduce the receiver's sensitivity. This can be corrected by the use of two r.f. stages instead of one.[1]

The "Miniceiver" was planned for fixed operation but can be used for mobile operation with the self contained batteries or an external

[1]To avoid any possible detection in the antenna circuit, a resistor can be connected across the diodes. It may not be needed with low impedance antennas.



Top view of the Miniceiver. The power supply is located on the left vertical plate with the power transformer in the circular shield car. The audio section is constructed on the right hand vertical plate. The three large and three small cans above the crystals are the r.f. coils with the 15 and 20 meter coils in common cans. The crystal oscillator coils are located below the crystals. The four 455 kc i.f. transformers are to the right of the v.f.o. compartment and the b.f.o. coil is directly behind the S meter. The two 3500 kc i.f. transformers are along the rear edge of the chassis to the right of the r.f. coils. The channel along the rear is to hold the battery pack.



Front view of the completely transistorized Miniceiver. The control functions are, bottom row, l to r; R.F. Gain, Function Switch, Push Button Band Switch, B.F.O. Tuning and Audio Gain. The Antenna Trimmer is located above the R.F. Gain control and 100 kc calibrator On-Off switch is to the right of it. The antenna input is in the upper left corner and the phone jack is in the upper right corner. The overall dimensions are 10×5×3½ inches.

car battery. In principle it is almost identical to a vacuum tube receiver but of course the transistorization has required different circuitry and mechanical construction. The 40 and 80 meter bands have been omitted merely because of the inactivity on these frequencies. They can be added by using a 3500 kc crystal on forty and operating the receiver as a single superhet on eighty as the input of the first i.f. is directly on that band. The r.f. coils for forty and two more positions in the band switch are also required.

Chassis Construction

The whole receiver, including the batteries and a.c. power supply, is housed in a 3.5″ × 5″ × 10″ cabinet. The chassis is made of 1/16″ aluminum. It consists of five different parts: Front panel, side mounting plates, battery container and the horizontal mounting plate. This set up allows a more compact construction of the equipment. The parts are pre-punched and black eloxidized before joining with self-tapping screws. The oxide layer does not cause trouble in grounding the components if star lockwashers are used. Only the a.c. cord is taken out from the back; the antenna connector and speaker jack are on the front panel.

Power Supply

The power transformer, T_9, has to deliver about 25 volts at 100 ma. The primary voltage is dropped by series resistors which effectively reduces the a.c. field the transformer radiates even when it is shielded. The transformer is also placed at the end of the chassis away from the a.f. stages which are very sensitive to a.c. Resistors R_2, R_3 and the relay coil act as filters and reduce the rectified voltage to the normal 12 volts. The relay, K_1, automatically disconnects the battery when the a.c. supply is powered. The relay coil is for 6 volts and has a resistance of 60 ohms. Sixteen penlight cells are used to form the 12 volt battery by two series banks of 8 cells connected in parallel. The total current drain varies between 25 and 90 ma depending on the strength of incoming signals. A zener diode, CR_4 regulates the voltage for the oscillator and other stages which may cause frequency shift.

I.F. Stages

The 3.5 mc i.f. transformer were made from 10.5 mc f.m. transformers by connecting 300 mmf capacitors in parallel with the coils except the one with the neutralizing capacitor (T_1). No attention was paid to matching the impedances since they are broad band tuned and do not have to be selective. The coils are each tuned 200 kc apart on the desired 3500-4500 kc range to provide a flat response. These i.f. transformers are quite selective since primary and secondary are both tuned and their Q is almost 150. However, a home brew mechanical filter is added to improve the selectivity on c.w.

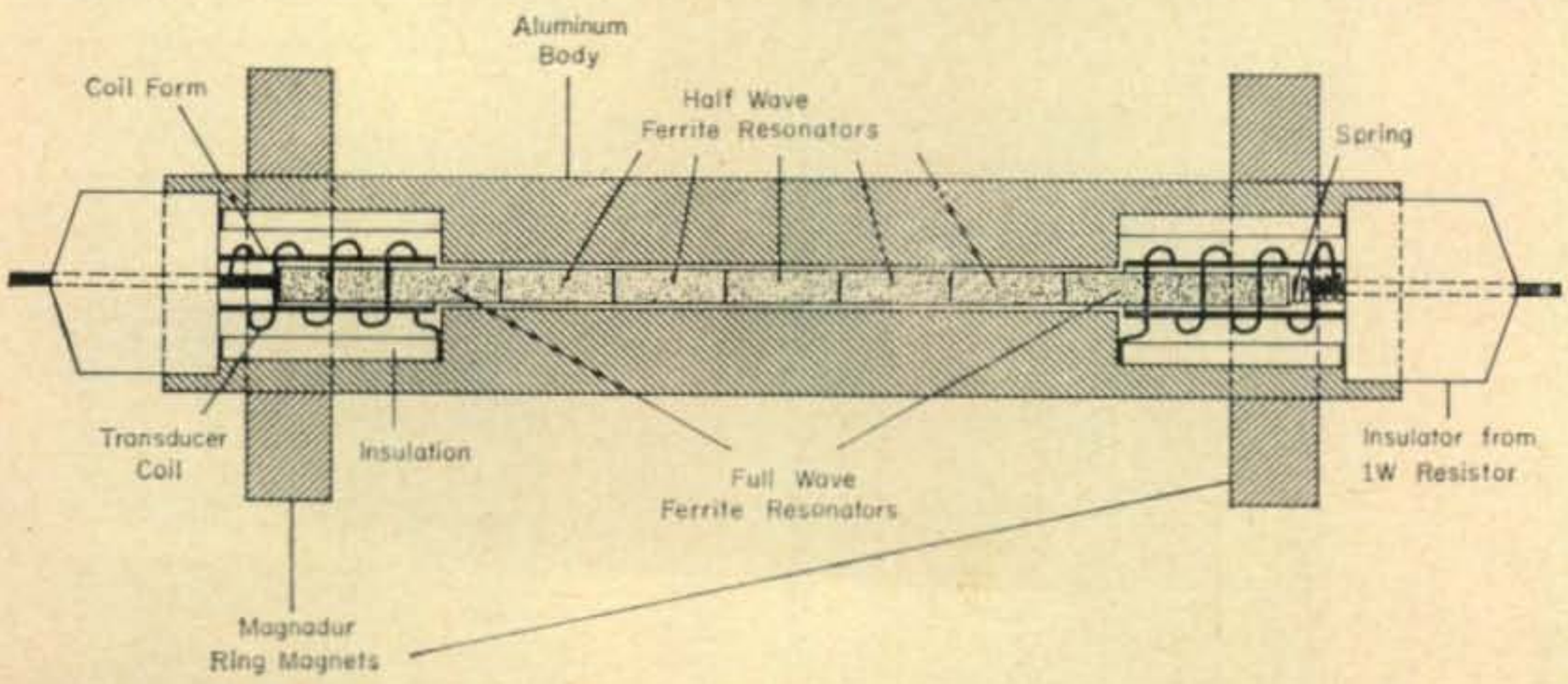
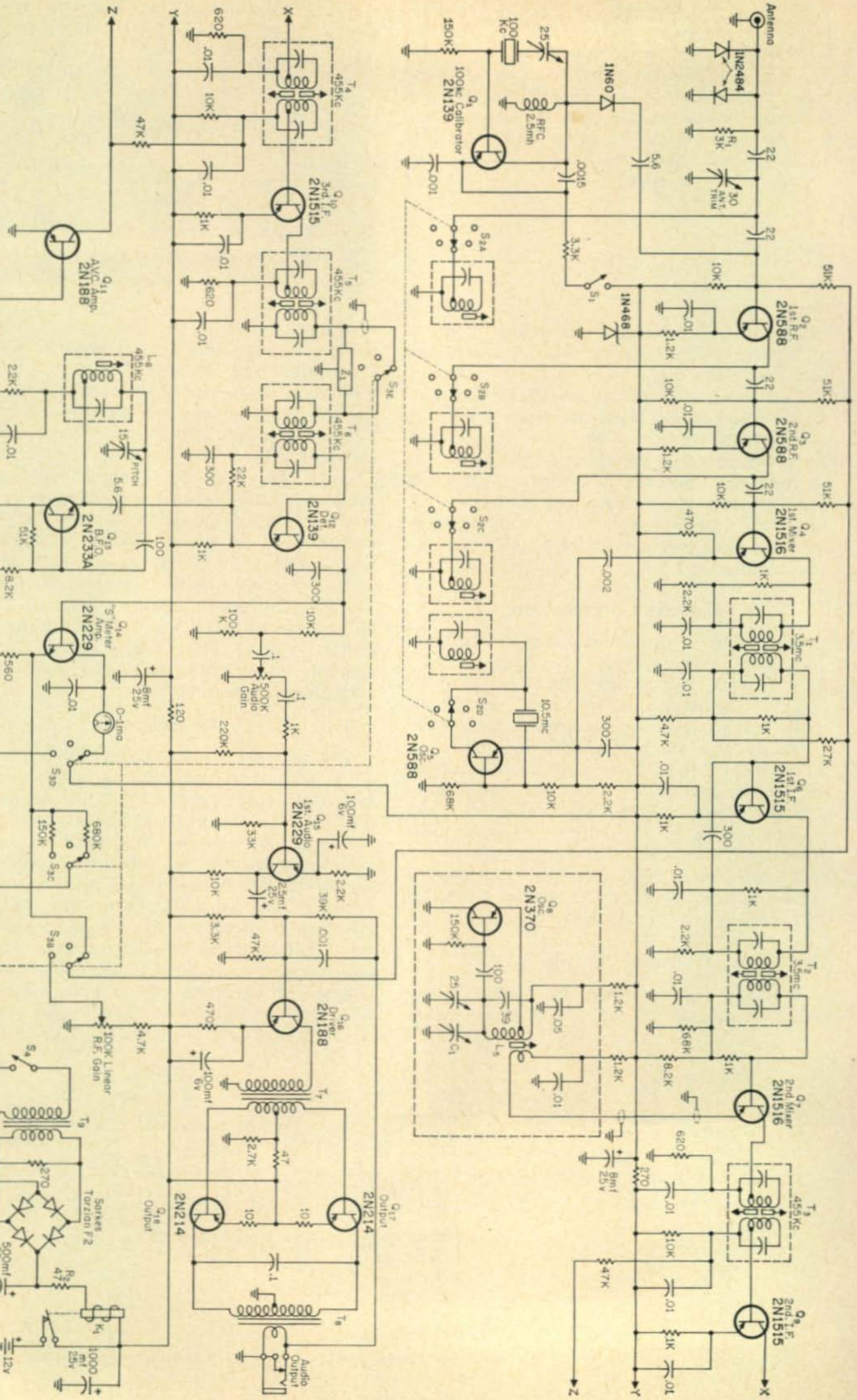


Fig. 2—Cross section view of the homebrew ferrite filter, Z_1. The two Magnadur ring magnets are for biasing and have a strong effect on the response curve. The transducer coils are taken from i.f. transformers with the same diameter cores as those used in the filter.


Antenna
1N2484
R1 3K
22
30 ANT. TRIM
5.6
.0015
1N60
RFC 2.5mh
100 Kc
25
150K
100Kc Calibrator Q1 2N139
.001
S24
3.3K
S1
1N468
10K
51K
Q2 1st R.F. 2N588
1.2K
.01
Q3 2nd R.F. 2N588
Q4 1st Mixer 2N1516
470
.002
1K
2.2K
T1 3.5mc
4.7K
27K
Q6 1st I.F. 2N1515
300
68K
Q5 Osc 2N588
10.5mc
S2D
S2C
S2B
S2A
Q8 Osc 2N370
150K
100
25
C1
39
L5
.05
Q7 2nd Mixer 2N1516
8.2K
T2 3.5mc
T3 455Kc
620
270
47K
Z
Y
X
Q9 2nd I.F. 2N1515
Q10 3rd I.F. 2N1515
T4 455Kc
620
.01
10K
47K
1K
Q11 AVC Amp. 2N188
Q12 Det. 2N139
22K
300
100
Q13 B.F.O. 2N233A
5.6
PITCH
15
8.2K
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T5 455Kc
T6 455Kc
Z1
L6 455Kc
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Q14 "S" Meter Amp. 2N229
560
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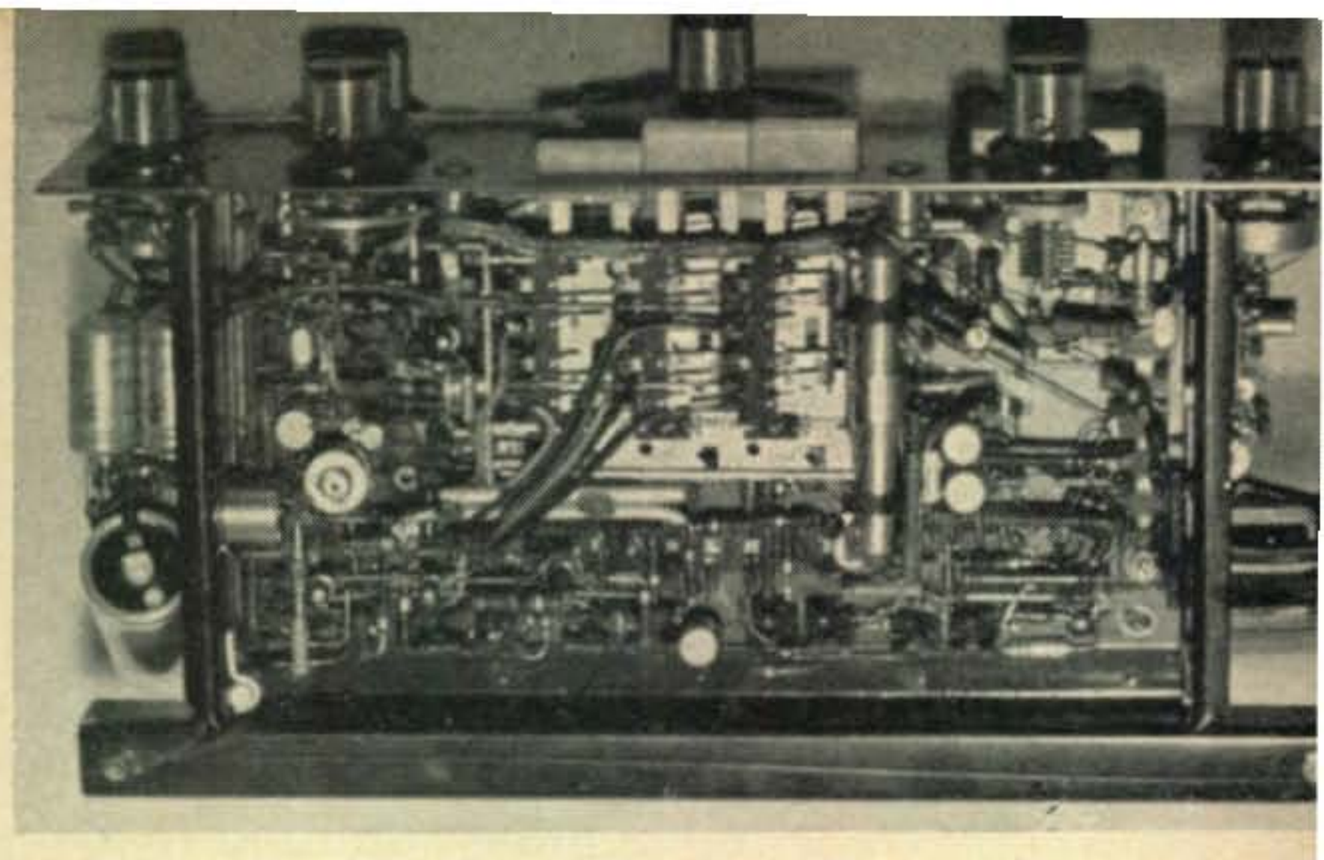
120
220K
100K
500K Audio Gain
Q15 1st. Audio 2N229
33K
100mf 6v
2.5mf 25v
39K
3.3K
680K
150K
S3A
S3B
S3C
S3D
100K Linear R.F. Gain
Q16 Driver 2N188
T7
2.7K
Q17 Output 2N214
Q18 Output 2N214
T8
T9
117V-60~
S4
62
Sarkes Tarzian F2
500mf 25v
R2 47
K1
S3A
AM
CW
SSB-CW
12v
1000 mf 25v
Audio Output



Bottom view of the Miniceiver. Power supply and audio components may be seen on the left and right vertical plates. The push button bandswitch is located in the center of the chassis with the ferrite filter just to the right of it.

and s.s.b. This filter is made of ferrite rods abous 3/16" long and 1/16" in diameter.[2] The exact length depends on the chemical consistence of the material. Strongest vibration was found with the ferrite used in pulse coils, etc.

The permeability of some types can be several thousands. The seven elements of the filter are place in a ⅜" aluminum tube as shown in fig. 2. The hole must be gauged so that the ferrite rodes slide through easily. The insulators in both ends are made from a one watt carbon resistor as the figure shows. They are press fitted after the filter is completed. Five of the ferrite elements are 3/16" long (half wave resonators) with the two driving elements being about 100% long (full wave) resonators. The resonators are lightly pushed against each other by a weak spring in one end of the filter. The transducer coils have been taken from a miniature i.f. transformer, which has similar ferrite rods for tuning.

Two "Magnadur" rings are threaded around the ends of the filter. The position of these bias magnets has a great effect on the bandpass curve. Also the coupling between the driving elements and transducer coils is critical. A signal generator and an inexpensive scope were used to check the vibration frequency of the resonators. The length of each resonator was ground as close to 455 kc as was possible. However, the bandwidth became almost 4 kc at 10 db attenuation. By moving the bias magnets the bandpass curve can be varied considerably. The transducer coils are tuned to 455 kc by fixed outside capacitors which are not shown in the diagram.

Tunable Oscillator

The tunable oscillator has circuits similar to the b.f.o. It operates from 3045 to 4045 kc on every band. The tuning capacitor plates have been filed to right shape to get the frequency linearity on that range with the *LC* ratio in the circuit. Capacitor C_1 was originally a 140 mmf variable and after filing, its capacity range was 10-95 mmf. Inductor L_5 is wound on a ¼" ceramic iron slug tuned form and consists of 50 turns #32 wire wound over ½" and tapped 18 turns up from the cold end.

An easier arrangement would be the slug tuned coil system in which the desired linearity is more easily obtainable.[3] The gear drive mechanism was taken from an old surplus transceiver. However, a G.W. Borg ten-turn microdial will be suitable especially if the slug tuning is adapted. The whole oscillator section was placed in a box 1½×2½×3 inches (Surplus terminal box TM218) which is made nearly air-tight with rubber paddings. The leads from the box are fed through the bottom with feedthrough insulators similar to National TPB. A half turn link on the oscillator coil is enough to feed the mixing voltage to the mixer emitter. The loose coupling eliminates the pulling between oscillator and the last 3.5 mc i.f. transformer.

Audio Stages

The maximum audio output is about 0.75 watts. Due to a large amount of negative feed back, the frequency response is as great as 150-12,000 c.p.s. The output and driver transformers, T_8 and T_7, are the ordinary type used in transistor portable receivers. The class B push-pull transistors are fastened to chassis which makes a good heat sink. This is necessary for most audio transistors of this size when operated with 12 volts. An NPN transistor is used in the first audio stage since the PNP type

[2]Roberts, W., "Magnetostrictive Devices and Mechanical Filters for Radio Frequencies," *QST*, June, p. 24; July, page 28, August, p. 32, 1953.

[3]Arnold T., "Transistorized V.F.O. with Linear Tuning," *QST*, March 1960, page 29.

[*Continued on page 98*]

Fig. 1—Circuit of the Miniceiver, a completely transistorized 3 band receiver employing 18 transistors and 8 diodes. All resistors are ½ watt, all capacitor values greater than 1 are in mmf, less than 1 in mf unless otherwise marked. Capacitor C_1 and inductor L_5 are explained in the text.

C_1—Main tuning capacitor, See Text.
K_1—Miniature relay—s.p.d.t., 6 volt coil.
L_1, L_2, L_3, L_4, L_5, L_6—See Text.
R_1—3K, See Text.
R_2—47 ohms, See Text.
S_1—S.p.d.t. rotary switch.
S_2—3 position 4 pole push button switch.
S_3—3 position 6 pole push button switch.
S_4—S.p.d.t. switch attached to r.f. gain control.
T_1, T_2—See Text.
T_3, T_4, T_5, T_6—455 kc transistor i.f. transformers (Philips).
T_7—Transistor driver transformer (Philips).
T_8—Transistor output transformer (Philips).
T_9—Miniature power transformer, 110/220 volts primary. Secondary 25 volts, 100 ma.

A Ten Meter Conversion of the BC-458

BY FREDERICK W. BROWN*, W6HPH

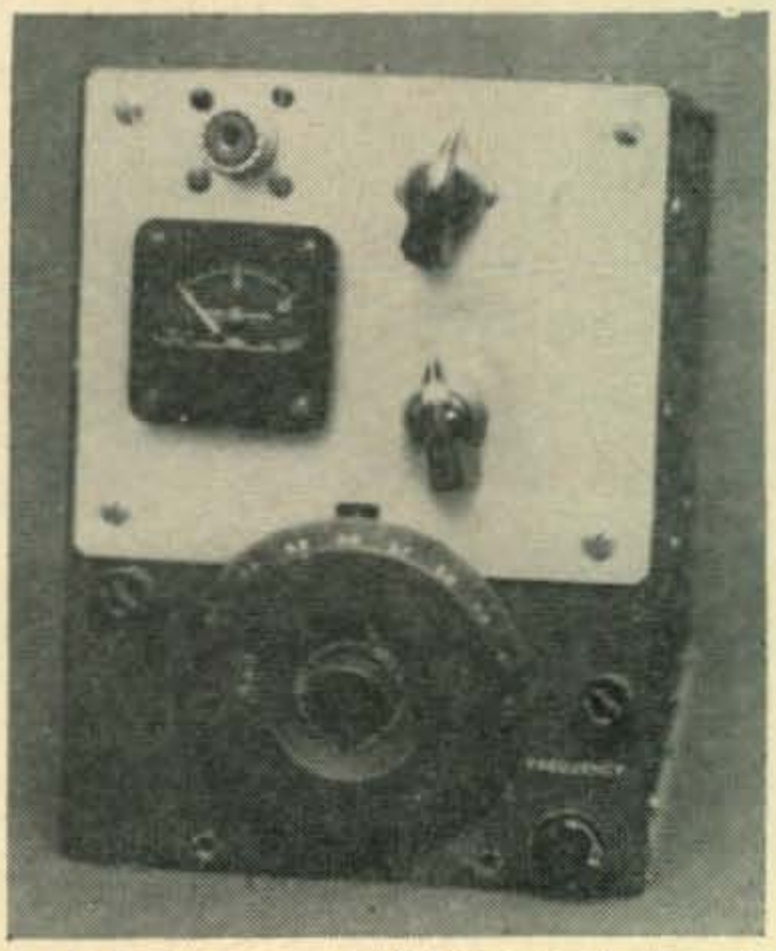
Yep—another Command set conversion! It's for ten phone, or c.w. but can be changed to suit your own requirements. Input is about 100 watts and you'll be hard pressed to find anything else that will beat its watts-per-dollar average these days.

COMMAND Set transmitters have been converted to just about everything from Novice rigs[1] to complete 500 watt s.s.b. layouts[2]. Although ten meter conversions have been described in the past[3,4], I consider this one to be just about the ultimate in simplicity and performance. Very little hole drilling is required and most of the original components are used. The result is a ten meter a.m. transmitter capable of handling 100 watts input, v.f.o. controlled, and featuring one knob tuning. All this from a piece of surplus that may still be purchased for less than $5.00.

Circuit

To retain the famous stability of the Command Set v.f.o., as little modification as possible is made on the oscillator circuit. Since the original oscillator range is 5.3 to 7 mc, there are two likely possibilities for setting the v.f.o. to cover ten meters. The frequency may be fudged up into the forty meter band and then doubled twice, or the oscillator may be moved down to cover 4.75-4.95 mc and the output doubled and tripled to obtain a frequency between 28.5 and 29.7 mc. The latter method was chosen since it requires less modification of the oscillator and also places the tuning capacitor at its high *C* setting, thereby improveing stability. The exciter circuits may be peaked up for 28.25 mc of course, if c.w. only between 28.0 and 28.5 is desired. Or, if the exciter is tuned up for 28.5 mc, tracking will be adequate between 28.0 and 29.0 mc, which will give you all of the c.w. band and the lower 500 kc of the phone band. As may be seen from fig. 1, the 1626 oscillator is used to drive a 12A6 doubler to about 9.7 mc. The following stage is another 12A6 which triples to 29 mc and drives the paralleled 1625's in the final. The plate coil of the doubler (L_1) resonates with the tube capacities, and because of its high *L* to *C* ratio this circuit is sufficiently broad band to require no tuning adjustment once it is peaked for the band center. Series tuning, consisting of L_3 and C_9, is used for the 12A6 tripler plate circuit. Capacitor C_9 is the original final plate tuning capacitor, and is ganged with the oscillator tuning. Tracking between the oscillator and the tripler plate circuit is not perfect but is good enough for covering the American phone band. The tracking can probably be improved by removing plates from C_9 and increasing L_3 to reestablish resonance. Ten meter output from the final is coupled through a conventional pi-network consisting of C_{12}, C_{13}, and L_7.

Conventional keying of the h.v. B-minus results in too much key arcing which is to be expected when breaking this much voltage and current. Keying the final screen grids gives too much back wave. Blocked-grid keying of the final was resorted to, and results in perfect c.w. that is absolutely free of chirps or clicks. At least −250 volts of bias is required to completely block the final stage. This voltage may be stolen from the low voltage power transformer as shown in fig. 2. A tube rectifier for



Front view of the converted BC-458. A panel of thin gauge sheet aluminum covers the many holes left on the original front panel. The meter reads final grid current. The upper control is Antenna Loading and just below it is Final Tuning

*Box 78 Star Route, Idyllwild, California.

[1]Smith and Bradley, "The Novice Conversion of a Command Transmitter", *QST*, Nov., 1951, page 22.

[2]Gutman, "Some Experiences With 'Cheap and Easy SSB'" *QST*, Jan., 1958, page 22.

[3]Brown, "Mobile with the SCR-274N, *CQ*, January, 1948, page 22.

[4]Rand, "War Surplus for Civil Defense", *CQ*, April, 1951, page 11.

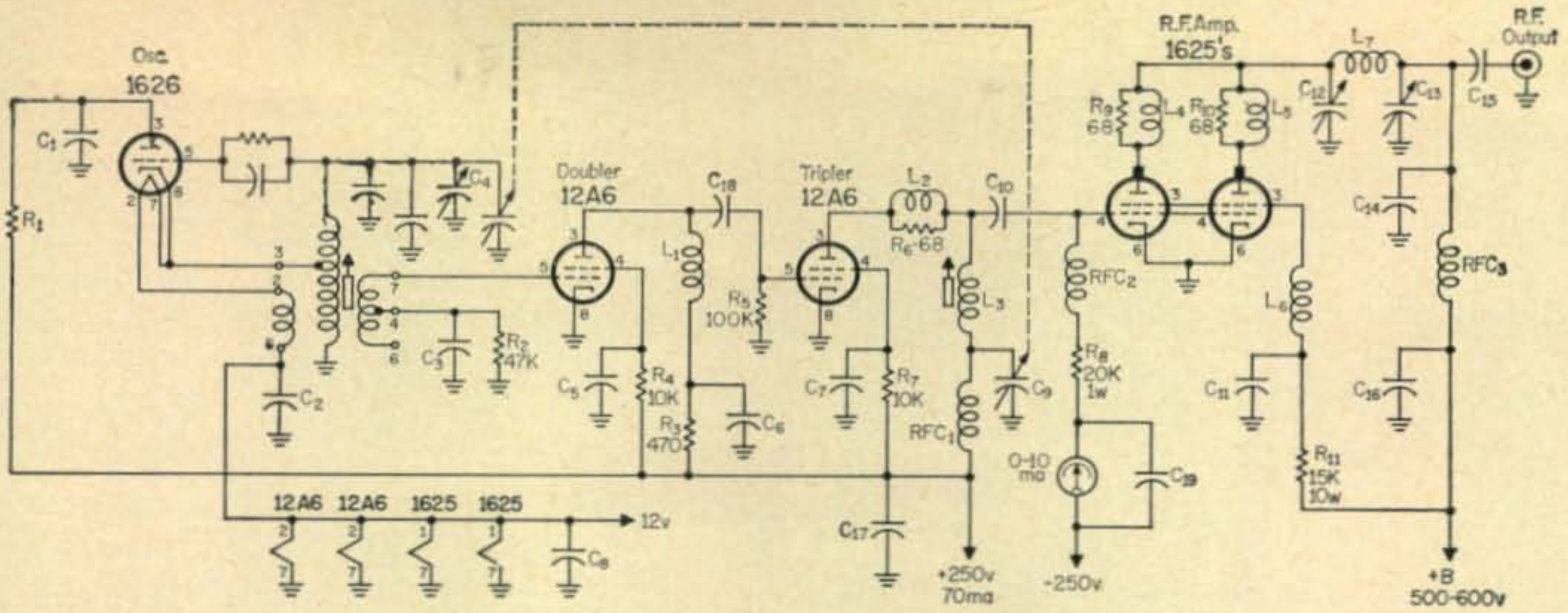


Fig. 1—Schematic of the converted BC-458 transmitter. Unlabeled components are unchanged from their original values. Resistors are ½ watt unless otherwise noted.

C_1, C_2, C_3, C_5, C_6, C_7, C_8, C_{17}, C_{19}—.005 mf disc ceramic.
C_4—Original oscillator padder.
C_9—Original amplifier plate padder.
C_{10}, C_{18}—250 mmf disc ceramic.
C_{11}—2400 mmf button by-pass.
C_{12}—26 mmf wide spaced variable.
C_{13}—140 mmf APC type variable.
C_{14}—150 mmf disc ceramic.
C_{15}—.002 mf mica.
C_{16}—500 mmf, 20 kv TV type.
L_1—About 14μh. See text.
L_2, L_4, L_5—6 turns #24 e., wound around R_6, R_9, R_{10}, respectively.
L_3—8 turns #18 d.c.c. close wound on a ½" dia. slug tuned form.
L_6—3½ turns #18 e. ½" dia., ½" long, air wound.
L_7—9 turns #14 e. 1" dia., 1¾" long, air wound.
R_1—Original 20 ohm plate resistor.
RFC_1—24 μh, Stancor RTC 8525.
RFC_2—550 μh, Stancor RTC 9173.
RFC_3—2.5 mh.

the bias supply is not recommended unless a separate heater winding is available for it. This is because of the heater to cathode voltage break down problem.

Conversion

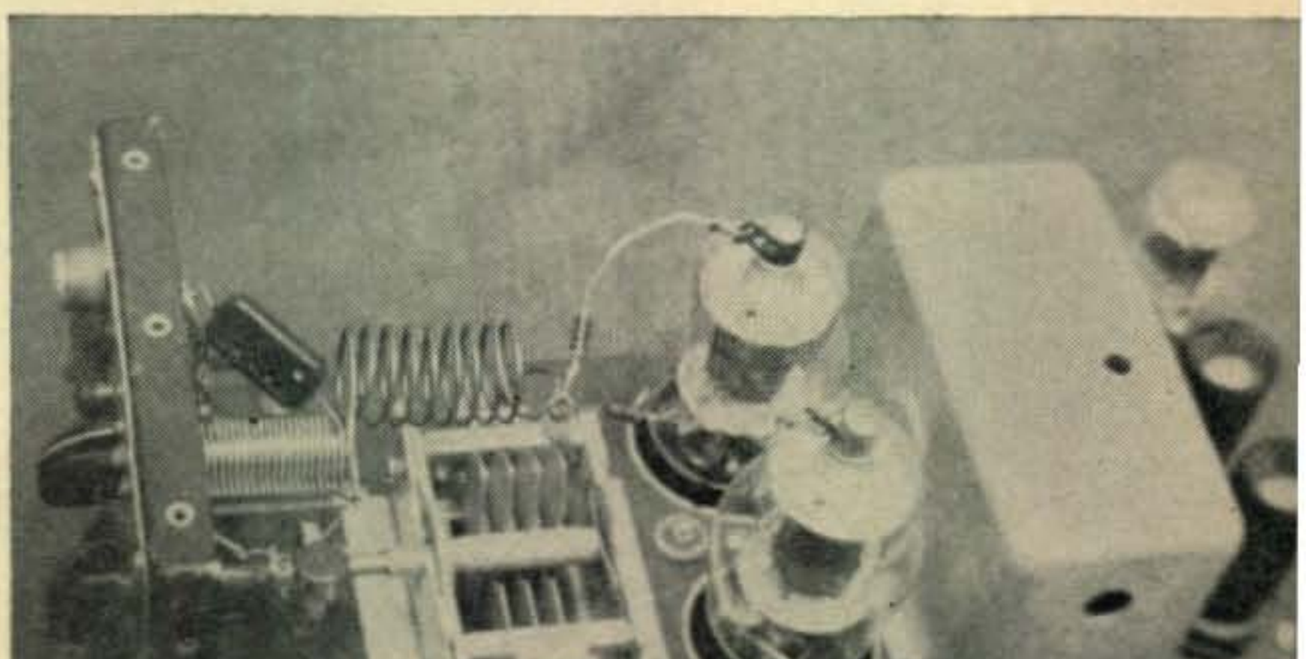
First step in conversion is to remove all superfluous components. This means just about everything beneath the chassis except the tube sockets, tuning capacitors, and some of the oscillator wiring. Also remove the amplifier plate tank padder capacitor. This is the variable that is *not* driven by a worm gear. Topside, remove the antenna change-over relay, the roller coil, and the amplifier plate tank coil. The bypass capacitors near the oscillator tube socket were all removed and replaced with .005 mf disc ceramics where necessary. This makes more room available for working below deck.

All heaters are wired in parallel for 12 volt operation which should make the rig ideal for mobile in one of those new-fangled 12 volt cars.

The oscillator frequency may be lowered simply by removing the shield-can and resetting the oscillator padder capacitor, C_4, to maximum capacity. This should put 4.75 mc at some spot well above 5.3 on the dial. If it doesn't quite make it, the frequency may be further lowered by screwing in the coil slug atop the shield can. Output from the oscillator is taken from the original secondary coil as shown in fig. 1. The coil terminals are numbered consecutively starting with number 1 nearest the oscillator tube socket.

The two 12A6 multiplier tubes go in the sockets formerly occupied by the calibrating crystal and 1629 tuning eye. Pin 6 on these sockets may be used as a convenient tie point. After wiring up the multiplier stages, L_1 may be adjusted to frequency with aid of a grid-dip meter. This coil can be made by scramble winding about 60 turns of #28 d.c.c. on a 1 meg, 1 watt resistor. With the tubes in their sockets, and with the coil soldered in place, gradually remove turns until it resonates to 9.75 mc.

A parasitic suppressor consisting of R_6 and L_2 was found necessary in the long lead that runs from the tripler to L_3. Inductor L_3 is wound on a National XR-50 slug-tuned form and is mounted on a bracket between the 1625



Top view of the converted BC-458 showing layout of the final tank circuit.

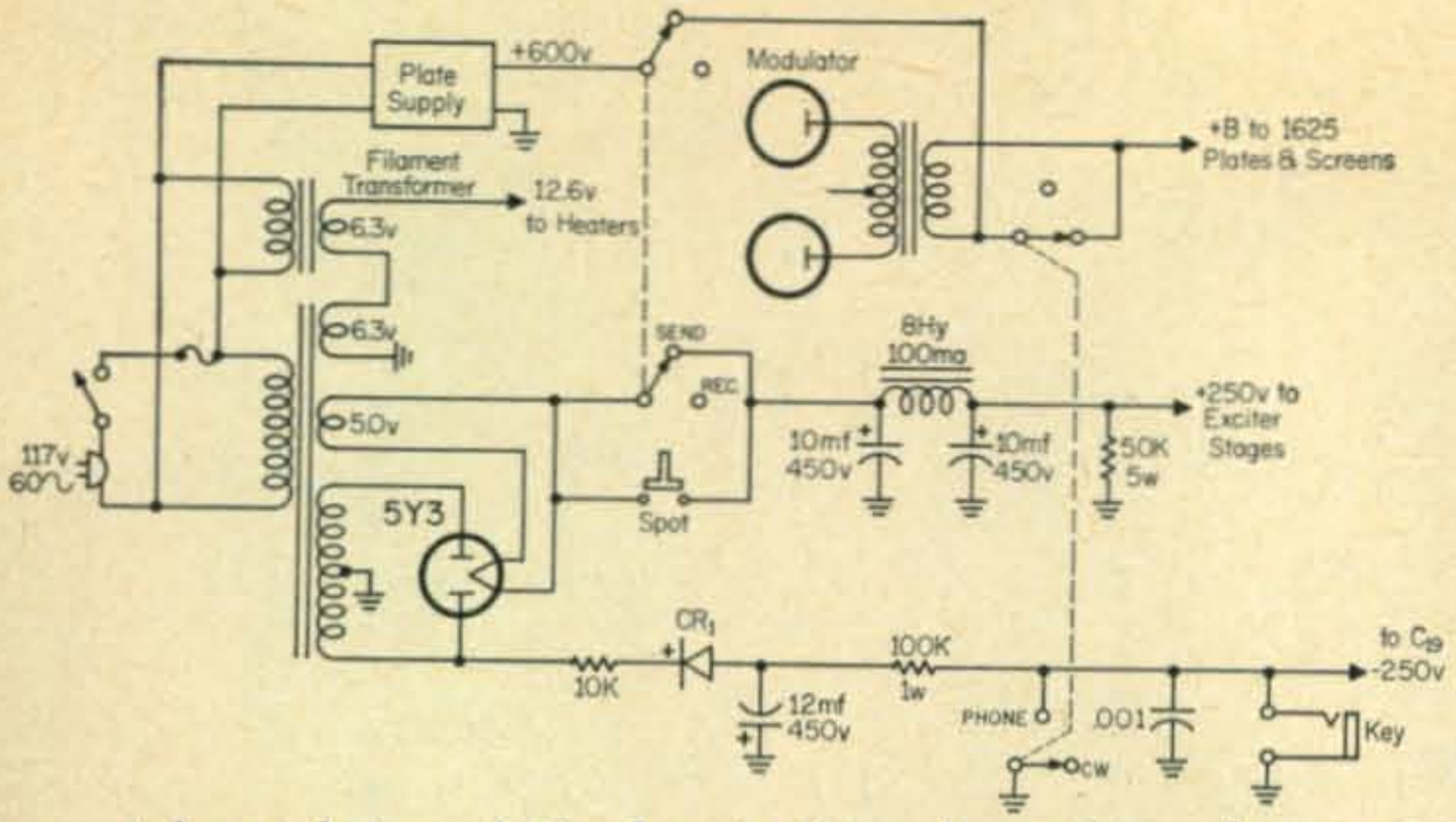


Fig. 2—Control and power supply circuit for the BC-458 transmitter using a b.c. receiver type power transformer. Rectifier CR_1 may be a Sarkes Tarzian 1N2484 or another silicon rectifier of suitable peak inverse voltage.

tube sockets and C_9. Locate the coil so that the slug may be adjusted through the access port which originally served for the amplifier plate padder capacitor adjustment.

The 1625 cathodes were grounded with sheet metal straps to provide as little lead inductance as possible. Inductor L_6 in the screen circuit is used for neutralization. The final tuning capacitor, C_{12}, came from a BC-375 tuning unit and is a readily available surplus item. The loading control, C_{13}, is an APC type. This capacitor will arc over if modulation is applied with the antenna disconnected. With a reasonably well matched antenna (50-75 ohms), you should have no trouble with inputs under 100 watts.

The plate meter (which measures final plate plus screen current) is mounted externally either on the modulator or high voltage power supply.

Tuning Up

It is best to run the 1626 and 12A6's from a separate plate supply. An old broadcast receiver power transformer will handle these stages nicely. It will also yield an extra 6.3 volt winding which may be series connected with some other 6.3 volt winding to provide the 12.6 volts for heaters. See fig. 2.

After applying low voltage to the exciter stages, tune the v.f.o. to 4.83 mc and check the d.c. voltage across R_2 and R_5 with a v.t.v.m. These voltages should be about −50 and −170 volts respectively. Next, adjust the slug of L_3 for maximum grid current to the final; about 5 ma should be obtainable.

The 1625's are best neutralized with the aid of some kind of r.f. voltmeter (fig. 3) connected to the coaxial output fitting. With drive to the final but no plate or screen voltage, peak C_{12} for maximum output. Now adjust L_6 by squeezing or spreading the turns for minimum meter reading. This will neutralize the final completely; but why or how it works is a complete mystery to me. If anyone has an explanation, I would like to hear it. I've used the same trick to neutralize a 6146 on six meters. L_6 is *not* series resonant with C_{11}. In my case the coil resonated with the tube capacities to about 65 mc.[5]

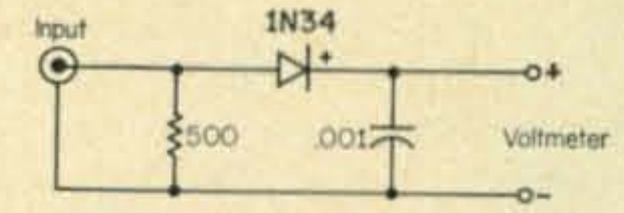


Fig. 3—Circuit of the neutralizing indicator referred to in the text.

With a 100 watt light bulb or other suitable dummy load connected to the output, apply about 500 volts to the final. Set C_{13} fully meshed and tune C_{12} for a plate current dip. Increase the loading with C_{13} to about 65 watts input and check the final screen voltage. It should be about 250 volts. If not, change the value of R_{11} accordingly.

[5]This method of neutralization was explained in *CQ* by W6SAI in the Dec. 1961 issue, pp. 32-37.

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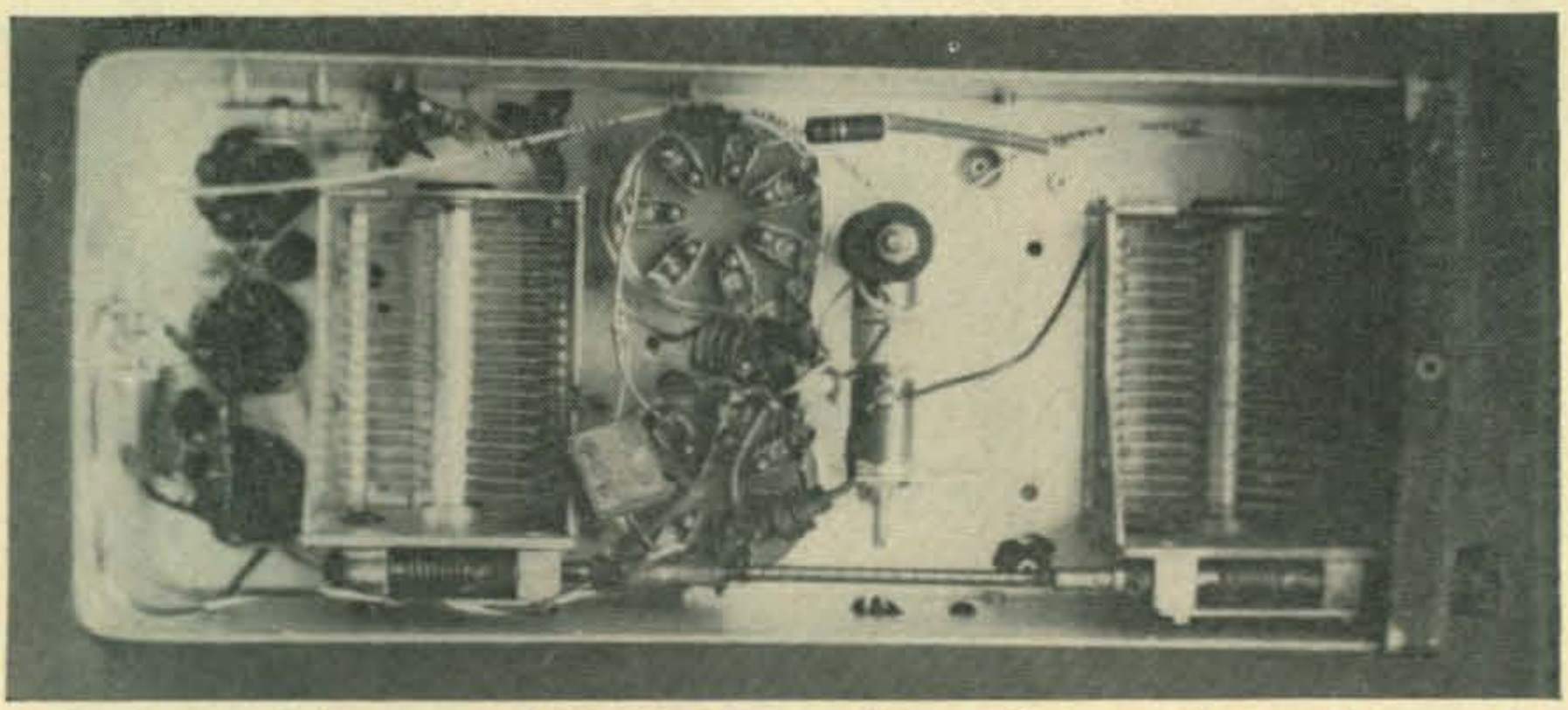


Under chassis view of the converted BC-458. The neutralizing coil, L_6, may be seen between the two 1625 sockets while L_3 is located to the right.

DXing is Different....In 6 Land*

JAMES W. CATES†, WA6GER

THROUGHOUT the DX world the most despised call on the bands is *W6*.

For the benefit of any non-DXer, 6 Land is California, USA. More than a State, a call area, it is a malignant mass of QRM that kills DX communications all over the world. It is the birthplace and home of the "California Kilowatt."

It is so horrible that even W6's hate it.

But there is something worse than having to put up with the W6 QRM, and that is having to live in it. DXing poses its own special problems here in 6 land, because the world recognizes that the least desirable contact possible is a W6. If you don't believe it, tune around the band and listen to the 4X4's calling "CQ DX—no W6."

But W6's are determined, and manage a few DX contacts in spite of world-wide animosity. And there are as many devious ways as there are devious 6ers.

One of the best known 6ers is the lid who sits on his fat bug sending "CQ DX" by the hour.

Five minutes on, five seconds off, until you wonder how he can stand to listen to all the QRM he's spawning. But only a W6 would ever think of it. He's never even turned the receiver on—so it doesn't bother him at all. The five second delay is just because the relay that resets the tape is a trifle slow. Mr. W6 is in the easy chair reading his favorite magazine. *CQ*? Nope. *Mad!*

He gets his DX though, because foreign stations who couldn't raise him send a QSL asking him to please shut up. These cards are fed into W6's Gonsort Computercator, which automatically totals up his DXCC standing.

Another successful DX 6er runs so much power that he has to use silver dollars for key contacts. This is the famous "California Kilowatt." He simply refers to it as "home brew," which it is, because it was made in the home of one of the best electronic engineers in the country. Its circuitry is specially designed for c.w. DXing. Instead of a v.f.o. it uses a "California Spreader," a device which spreads out the signal exactly the width of the band, thus decreasing QRM. (He's soon the only guy on the band.) A few purists maintain that this is not compatible with the state of the art, but it's more than harmonious. This is the state of the art perfected!

Such ingenuity is why, in spite of 6-land QRM and DX ill feeling, 6-land DXers have never appealed to the FCC for special power privileges. We want to compete on an equal level with everyone. A maximum of 1000 watts input to the final . . . . . of the exciter.

So the 6 boys get their DX because in California there is a gimmick. Money! Here every ham is a millionaire. As a friend of mine said the other day, "that 75A-4 is a dandy, best little c.w. monitor I've ever used."

You can guess that receivers get special attention here in 6 land, to pull that rare one (anything besides a W6 is a rare one here) through the local QRM. While many hams are satisfied to transmit their signals via a parabolic reflector and moon-bounce, we find this a lot of

[*Continued on page 92*]

*Or in 1, 2, 3, 4, 5, 7, 8, 9, or ø, depending entirely on which section of the country you're from.—Ed.

†3241 Eastwood Road, Sacramento 21, California

A Thyratron Operated Phone Patch

BY ERNEST S. TEUTSCHBEIN*, W4LAV

The use of a thyratron to control the relays in this phone patch precludes the possibility of feedback. This attractive unit has many deluxe features but may be trimmed for the sake of economy. It will make an excellent addition to the well equipped station.

MANY fine phone patch articles have appeared in *CQ* over the past 12 or 13 years. Several of them had already been printed[1,2] before the urge to patch got the better of me. I present it here as the possible answer to all the phone patch woes of those who have tried 'em all, and have thrown in the sponge.

Circuit Operation

Assume that the mode switch, S_1, is placed in the vox position (position 1). The 500 ohm audio output of the station receiver is fed in to a line to grid transformer. If the station receiver has only a 4 or 8 ohm audio output, the transformer specified will still be satisfactory. The station speaker can remain in use, as no deterioration of quality or decrease in level is noted. The SENSITIVITY control, R_1, determines the audio level applied to the 2D21. When you adjust your receiver audio for normal speaker level, you then adjust R_1 so that this same level of audio will trigger the 2D21. The audio is then rectified and the negative voltage is applied to the 2D21 grid, cutting off the tube. Components C_1 and R_2 form the time constant circuit to determine how long the tube will remain cut off after audio input is removed. As long as the 2D21 remains cut off (receiver audio coming through), K_1 is de-energized and K_2 is energized. Audio, taken off T_1 secondary is fed through K_2 to T_5 primary. Note that the bottom end of T_5 is grounded via one section of K_2. Control R_3 varies the audio gain to the telephone.

Now, your "receiver party" turns it over to your "telephone party." The audio quits (assuming you have a reasonably clear channel) and, after C_1 discharges through R_2 (about ¼ second or so), the 2D21 conducts, K_1 closes, K_2 opens, passing the telephone audio through T_5 (which now has its primary grounded at the top end via K_2) to the transmitter input.

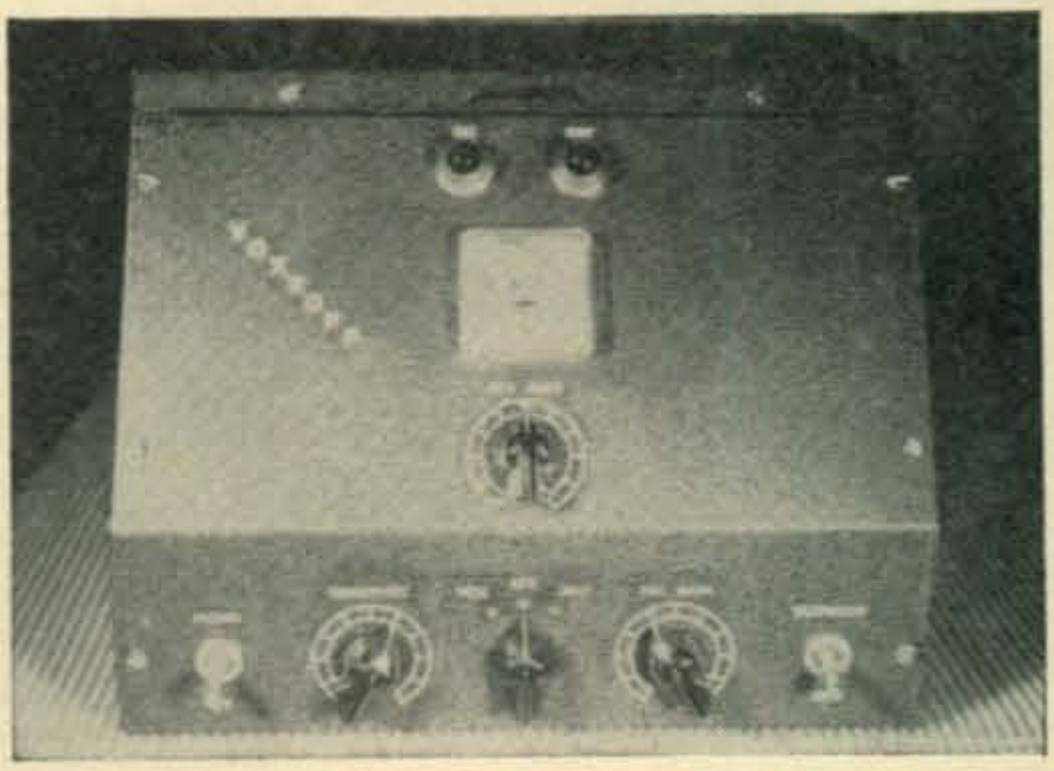
Your telephone party speaks, your transmitter vox is actuated, and your receiver should mute (in "Standby" position). Therefore, as long as your telephone party is talking, no receiver audio can block the 2D21. Conversely, no increase in receiver audio can feed into your transmitter vox circuit and start the dog "catching his tail" when you are receiving. Also, the "uh-huh's" and "yeses" your telephone party mumbles as he listens to your receiver party go totally ignored. You just can't transmit as long as you have a receiver signal strong enough to bias V_1 to cutoff.

In mode switch position 2, we defeat automatic operation, and can only receive. Capacitor C_2 is removed from the circuit in positions 2 and 3. In position 3, we can transmit only. The p.t.t. relay in the transmitter is actuated by connecting the p.t.t. lead to ground.

Construction

Not only can many of the frills be eliminated by the constructor, but he can undoubtedly substitute parts on hand for those specified. will work as well, or even better.

I built the unit on a 7×9×2″ aluminum chassis, and enclosed it in a Bud C-1588 cabinet. The rear view of the chassis shown in the photographs suggests a practical layout of major components. Some of you may want to use equivalent transformers, or may want to cut parts to a minimum. One relay and one



Front view of the voice controlled, relay-operated phone patch (VOXROPP). Bottom controls, l. to r. are, On-Off, Sensitivity, Function, Mic. Gain and telephone On-Off. Rcvr Gain is directly under the VU-meter. The pilot lights are explained in the text.

*4452 20th Road N., Arlington 7, Virginia.

[1]Hastings, E. H. "The Hum-Free Phone Patch", *CQ*, February, 1955, page 24.

[2]Lee, P. H. "The Electronic Phone Patch", *CQ*, October, 1960, page 48.

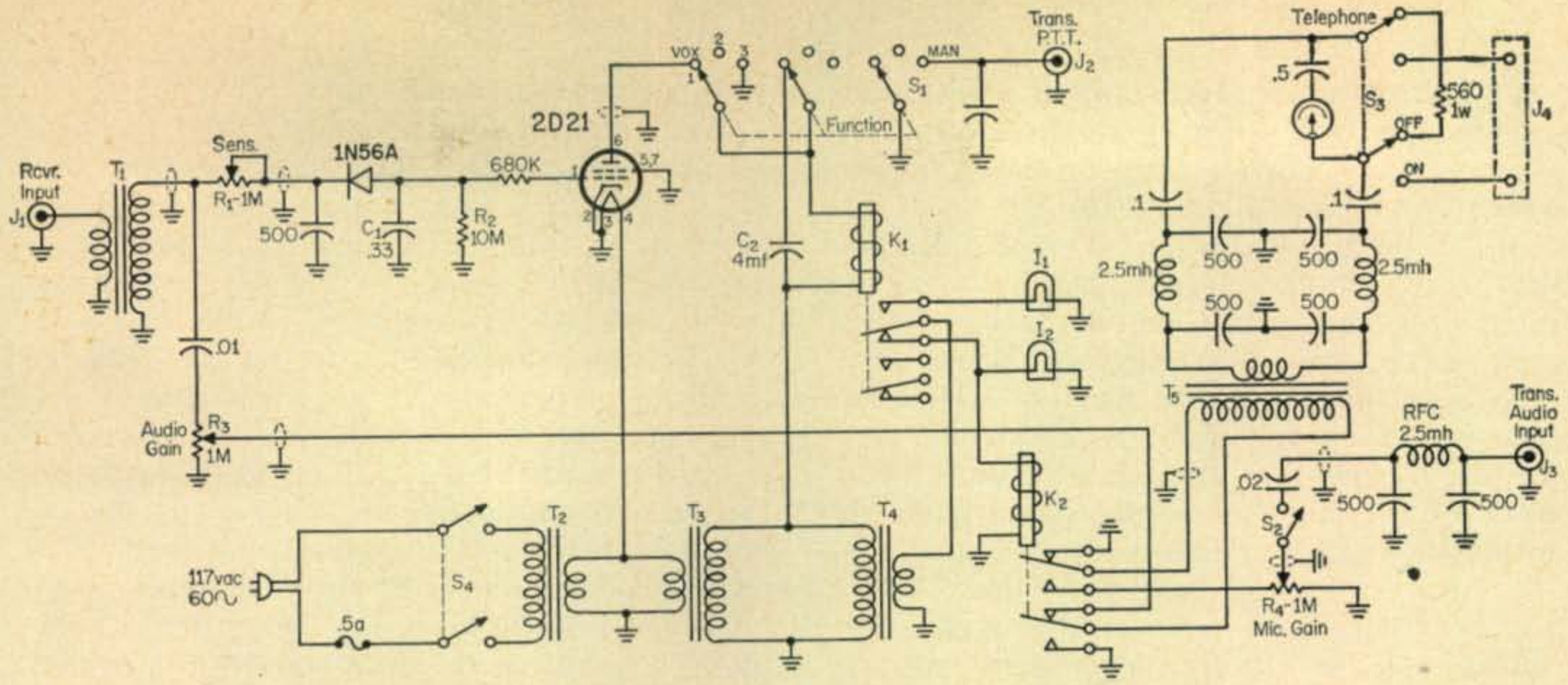


Fig. 1—Circuit of the thyratron operated phone patch. Resistors are ½ watt unless otherwise specified. Capacitors marked "500" are disc ceramic.

K_1—115 v.a.c., d.p.d.t. relay. Potter & Brumfield KA11AY or equivalent.

K_2—6 v.a.c., d.p.d.t. relay. Potter & Brumfield KA11AY or equivalent.

T_1—500 ohm line to grid. Stancor A4351 or equivalent.

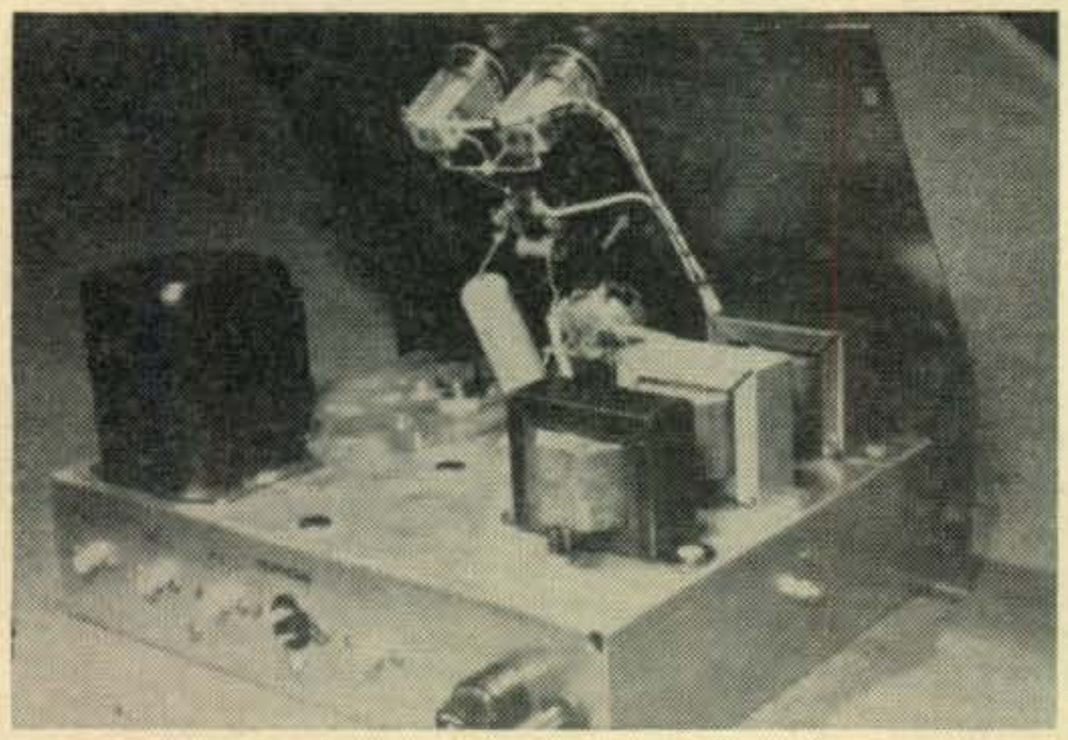
T_2, T_3, T_4—117 v.a.c. to 6.3 v.a.c. @ 1.2 a. Stancor P6143 or equivalent.

T_5—Line to grid, Thordarson 20A00 or equivalent.

power transformer could be eliminated, as well as pilot lamps and meter. I think these features are desireable, however, and well worth the slight extra cost. There is only one important consideration to be kept in mind. Hum *must* be minimized, and particular care must be taken to keep magnetic fields away from your audio transformers, particularly T_5. If you're lucky enough to have or to locate a surplus Mu-metal shielded equivalent of T_5, you have it made. Otherwise, some care should be exercised in wiring.

An aluminum chassis is preferred to steel because of decreased resistance to hum fields with consequent lower chassis hum voltage. Returning all grounds to a common point is a difficult task, and when shielded wiring is used where practical, as is the case here, the feasability of the idea disappears. Try to keep the high impedance leads of T_5 away from the a.c. fields, and *keep them short*.

Actually, with T_2, T_3, T_4 and K_1 located on one side of the chassis, and the other components on the other side, I had absolutely no trouble with hum. Transformers T_2, T_3 and T_4 are mounted on top of the chassis and K_1 is secured on the side, beneath T_3. The mounting ears on T_5 are bent vertically, and the transformer is mounted on its side, using one screw, to provide very short leads to K_2. Although rotating T_5 to a critical position cuts down hum induction, I did not even resort to this.



Rear view of the phone patch showing component layout. Transformers T_2, T_3 and T_4 are on the right. T_1 and the 2D21 are on the left. Relays and Transformer T_5 are underneath

Checking Out

Once you have constructed the unit, give it the acid test for hum. Turn your transmitter vox gain full on, turn R_4 wide open and switch S_1 back and forth between positions 1 and 2. Switching transients will momentarily activate the vox, or tap on your mike in position 1 (receiver audio cut back) to do so. If your vox relay does not stay closed, you are probably in business. Now put S_1 in position 3 (transmit manual) and advance your transmitter mike gain (R_4 still wide open). Note at what point you start seeing evidence of output, if at all. Compare this with your normal mike gain setting; it cannot be, and it probably won't be very close to that point, if you have taken the simple precautions outlined above.

The meter is optional, but the three dollar price tag on an imported, illuminated, VU is a bargain that is hard to pass up. Control R_2 can also be a 10 megohm pot to make the time constant variable.

Operation

Once you have a general idea of where your various controls will normally run, you may leave them there, and vary them only if necessary during a patch. Until you have made a few patches, however, the following procedure is recommended:

1. Turn POWER on.
2. Turn RCV GAIN down.

3. With speaker level normal, and mode switch in position 1 (vox), adjust SENSITIVITY to a level where your receiver party triggers your 2D21 (green light comes on), but that when he stops talking the weaker QRM or QRN will not hold you in receive position, and that the red light will come on. Naturally, the patch can't distinguish between the wanted audio and the QRM, or even a high noise level; so unless you have a reasonably clear channel, or there is at least 3 S units or so more level from the wanted than from the unwanted, manual operation is indicated.

4. Turn the mode switch S_3 to RCV.

5. Dial telephone number, give preliminary instructions and switch TELEPHONE on.

6. Switch patch to VOX operation, if conditions allow, or to XMT if manual operation is necessary.

7. Turn MIC GAIN up to a point where the telephone party triggers the transmitter vox circuit adequately.

8. When receiving, adjust RCV GAIN for normal audio into phone line. Ride gain on your receiver, if necessary, to prevent overloading the phone line or turning the red light on.

In any phone patch work, you must ride audio gain at all times anyway, so this produces no further hardships. Differing, however, this patch goes to a "no audio" condition if the signal drops into the noise level, thereby feeding only the intelligence to your telephone party.

To relate briefly, just how simple the operation of this patch can be, let me just add the following. When a relatively clear channel exists, operation is automatic, as in the Hybrid patch. If the QRM gets a little rough, operation can be semi-automatic. By this I mean that all you have to do to switch back and forth from receive to transmit is to turn the receiver r.f. or audio gain controls up and down, respectively, a few degrees. Since you are riding gain, anyway, this entails practically nothing. Of course, when horrible conditions prevail, and you still wish to patch, use the manual switching.

Conclusion

No comments on audio levels into the phone line, attachments to same, etc., will be discussed here, as these subjects have been well covered in past issues of *CQ*. ■

Transmitting Tube Rejuvenation

BY GEORGE F. DENNIS*, W1WML

OVER the past few years I have tried several methods of transmitting tube rejuvenation and have met with little success. One of the methods tried was to bake the tubes in an oven for a few hours. Another was to operate the filament a few volts above normal. This method helped only while the excessive filament voltage was applied and was not successful either.

The simple method to be described produced some remarkable results. A friend of mine supplied me with 6146s and 2E26s taken from two-way equipment after failing in service. These tubes were tried in a transmitter before rejuvenation and only drew 20 to 30 ma with no plate current dip discernable. The readings on a good quality tube tester showed the transconductance to range from 500 to 3000 micromhos. (A new 6146 transconductance reading is 7000 micromhos.) Emission readings were all very low also.

Rejuvenator Circuit

The circuit used to rejuvenate the tubes is shown in fig. 1. The circuit is very simple and all the necessary voltages could doubtlessly be taken from existing power supplies. The screen and plate are not connected and plus 250 to 400 volts is applied to the control grid for a second at a time. As this is done, it is possible to see the oxide that is coating the cathode evaporate. Eight to ten applications of the voltage is usually adequate to complete the vaporization.

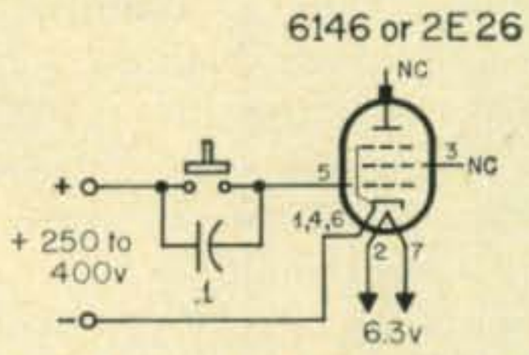


Fig. 1—Circuit of a simple transmitting tube rejuvenator. The push button must only be depressed momentarily or the tube may be destroyed. Best results seem to have been obtained when the tube pins were facing upward.

Results

Tests after the rejuvenation process showed the following results: Transconductance readings rose to 6200 to 7000. Emission readings all showed in the "Good" section of the scale. For tests in the transmitter, one tube was selected that read 500 micromhos before rejuvenation and 6200 after. The tube was run at 125 ma for a while and then at 140 ma. It held up fine for the tests. It has now been put in regular service and has operated satisfactorily for the last 3 months. What length of service these tubes will give has not been determined and is bound to vary from tube to tube. ■

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Audio Filters for C. W. Reception

BY CHARLES E. LANDAHL*, W5SOT

The effective use of audio filters for c.w. reception is often nullified by a combination of the filter notch frequency, earphone resonance and the hearing characteristics of the operator. W5SOT describes his investigation into these peculiarities and presents a filter designed to operate with the surplus ANB-H-1 headset.

HAVE you ever wondered about the audio response of your favorite pair of head-phones? Wondered why certain audio filter devices did not help you copy those weak signals?

Such thoughts can lead to some interesting information. My curiosity grew stronger while trying to use the surplus FL-5 and FL-8 radio range filters in between headset and receiver. With a rejection notch such as the FL-5-F exhibits (shown in fig. 1), it was not clear why adjacent interfering signals could still be heard.

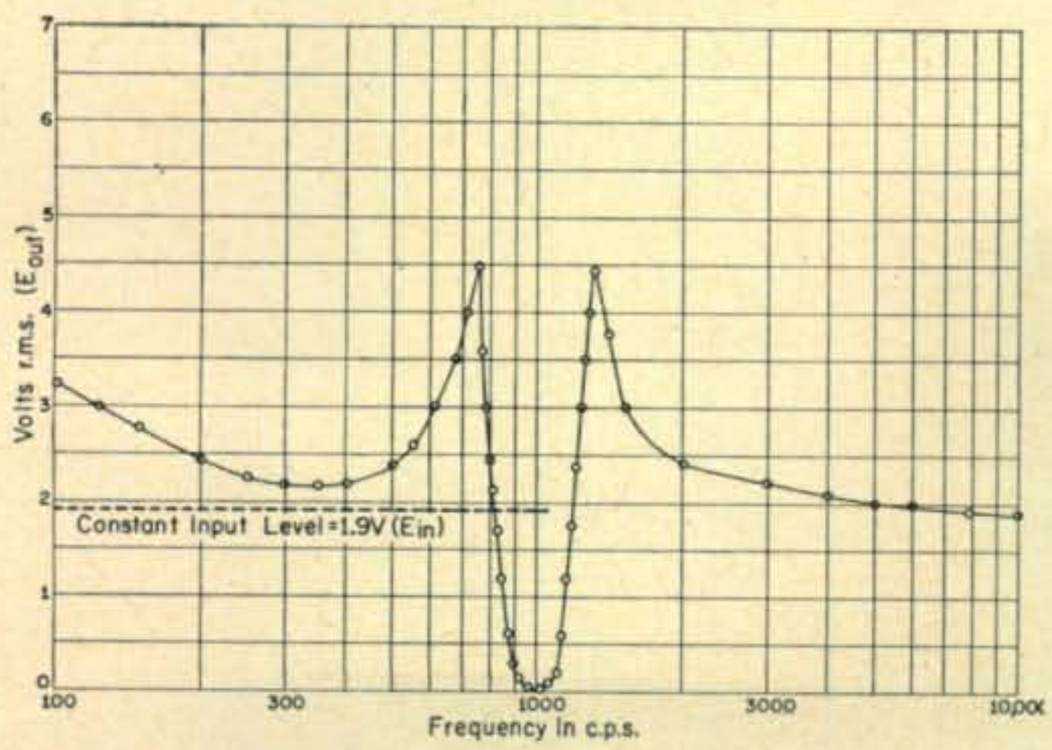

Fig. 1—Response curve of the FL-5-F filter with a constant signal input to terminals 1 and 5 and the output measured at terminals 4 and 5.

Additional tests with an audio oscillator, filters, head-phones, ears, and a good vacuum tube voltmeter, revealed several not too obvious facts. For example, 900-1500 cycle audio signals of a mere 0.05 volts input to the headset could be distinctly heard. This is about 4 millionths of a watt into nominal 600 ohm phones. This clearly indicated that the sensation of hearing is a sensitive mechanism. The curve of fig. 2 is an indication of how sensitive my own hearing is. At 1100 cycles per second, approximately 200 micro-volts across the headset was just detectable! Small wonder that the FL-5 filter rejection failed to help. In this case, it was possible to hear a signal 250 times lower than the 0.05 volt signal in the rejection notch.

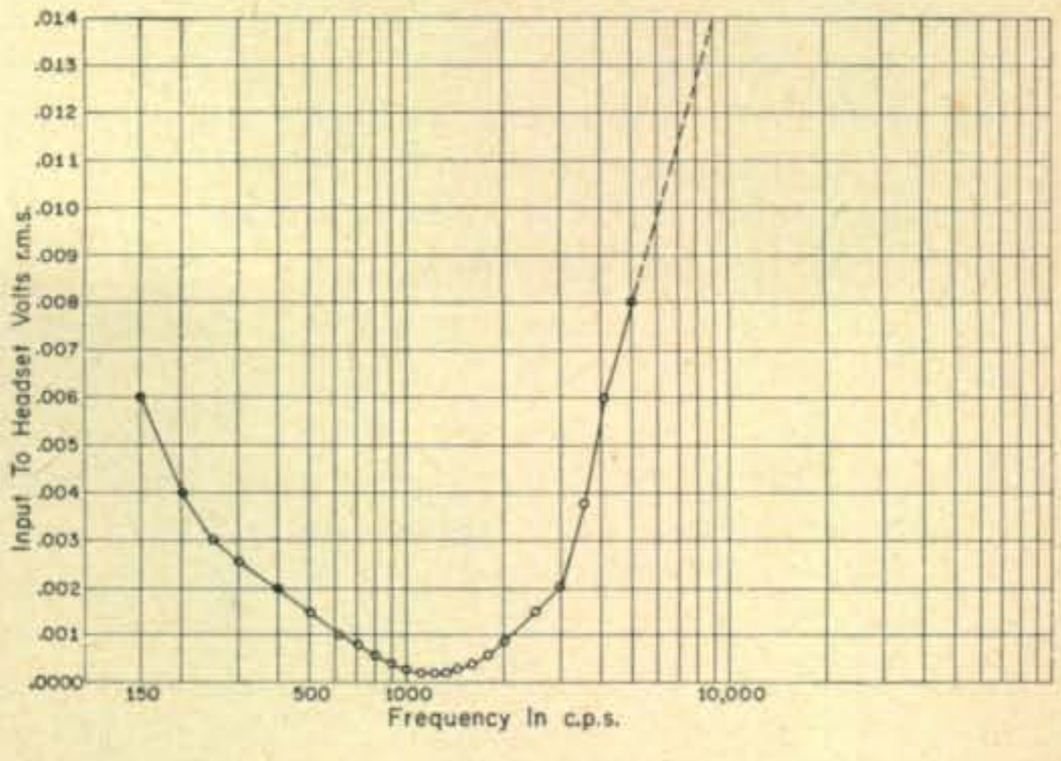

Fig. 2—Curve of W5SOT's hearing sensitivity. Each plot point represents the minimum input voltage at which that frequency could be detected. Note that the greatest sensitivity of hearing is from 1000 to 1100 cycles, the notch frequency (fig. 1) of the FL-5-F filter.

Having explored this far, textbook material[1] was consulted. It was learned that the threshhold energy required for human hearing is

*121 Barranca Rd., Los Alamos, New Mexico

[1]Langford, Smith, "Radiotron Designers Handbook, 4 Ed.", Reproduced by RCA, 1953

approximately 1×10^{-16} watts per square centimeter. This value is sometimes taken as the zero db point when constructing graphic presentation of the sensation of human hearing. As it turns out, the sensitivity of our ears to sound waves in the air around us, is roughly proportional to the logarithm of the energy of the sound wave, and, is not proportional to the energy itself. Since a person wearing headphones with rubber ear-cups can have a listening response like that of fig. 2, it becomes a bit more obvious why filtering systems can become complicated. It is appropriate to mention that the graphs are presented in terms of a.c. volts to avoid confusion that could result from defining different reference levels required for decibel values.

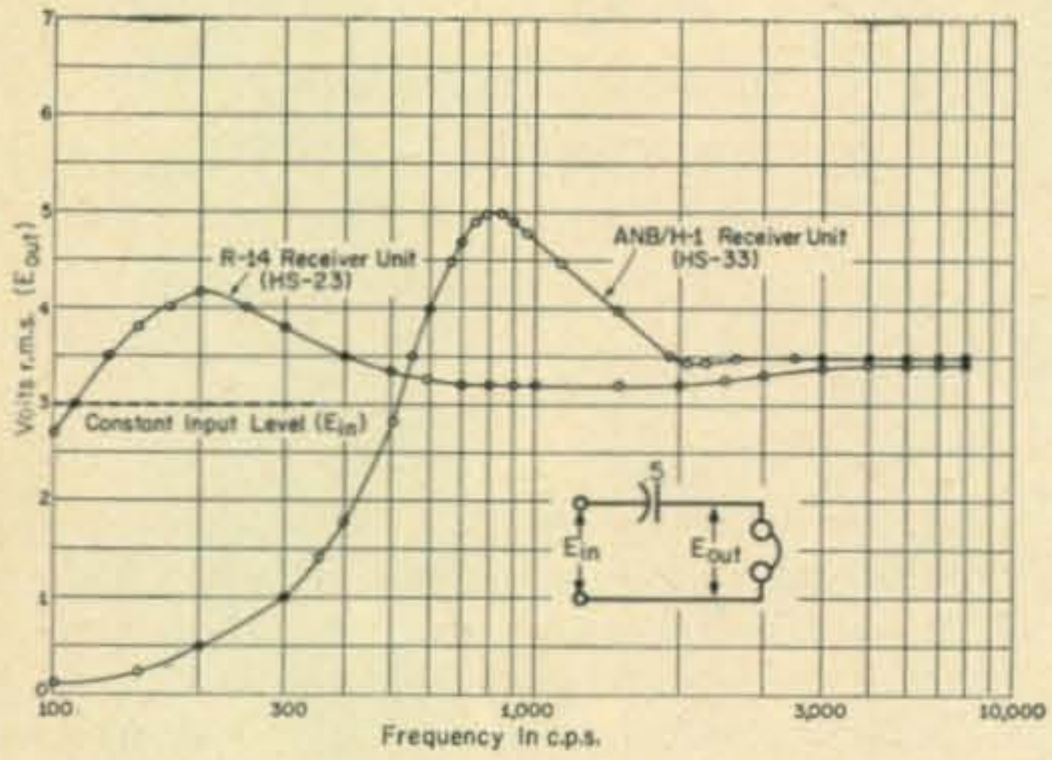

Fig. 3—Frequency response characteristics of two popular headsets, the HS-33 and HS-23.

Headset Response

The audio frequency response of two popular headsets is shown in the graphs of fig. 3. It should be recognized that these are series resonant curves involving the headset inductance and a 0.5 mf capacitor. Reason for this will be touched upon later. The HS-33 is a low impedance magnetic headset. It uses the ANB-H-1 units which are 300 ohms each. These units are a compensated magnetic system having a controlled damped diaphragm. They are recommended for speech work. (This is a personal thing and in my own use, find them equally good for code reception.) The HS-23 is a high impedance magnetic headset. It uses the R-14 units of 4000 ohms each. Both of these headsets will be recognized as the work horses of the U. S. Armed Forces. Some of them are still available in the surplus market.

Filter Circuits

This limited investigation reaches the conclusion that there is room for improvement among headsets. Especially for the reception of code. For instance, the inductance of the windings of the R-14 receiver is about 0.5 Henries. A series capacitor of 0.05 mf will help the headset to become resonant near 1000 cycles. The curves of fig. 4 illustrate the point. These

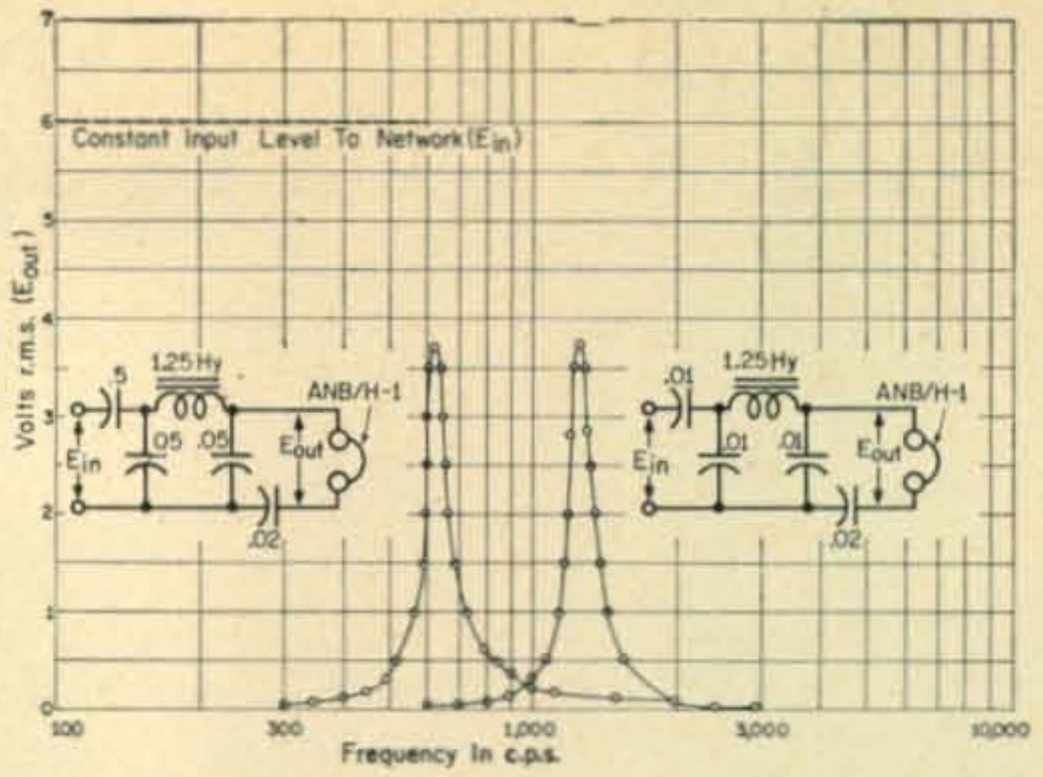

Fig. 4—Effective response of the ANB-H-1 (HS-33) headsets with networks to peak them at 620 cycles or 1,250 cycles.

graphs display the overall response of a network which includes the headset. Observe the loss of voltage across the headset (even at the peak frequencies) with reference to the input signal. This is of little consequence as long as there is plenty of signal voltage available. Most receivers are operated with the volume control turned well down from maximum. The important observation is that the network passes a narrow range of frequencies. Provided all signals are stable, such as b.f.o. and incoming signal, this type of filter can be of help with the weaker ones. Note well that word *weaker*. The 200 micro-volt, or, 6.6 milli-microwatt signals are still a problem.

The 0.5 (or .01) mf capacitor appearing in series with the headset network was used because my receiver does not have an output transformer. The capacitor is the coupling device to the plate of a 6V6 tube, which has a constant 7000 resistive load. ■

"... for the last time, I'm not making any skeds ..."

Before It's Too Late

EDWARD G. BRODERICK*, K2ZNH

WHAT ever happened to that piece of gear you were going to build? Well, don't feel bad, it probably wouldn't have worked as well as the 'kit' you bought instead. After all, you're no different than anyone else, unless . . . unless there's still hope for you. Let's see what's happening now.

A recent survey[1] of "CQ" readers shows that over 80% of those surveyed operated with commercially manufactured transmitters and 95% with factory made receivers. What does this mean? It simply means that the average amateur is losing interest in amateur radio as a complete hobby. Here's why.

The dictionary defines 'amateur' as "made or done by amateurs." Can your gear qualify in this sense? Amateur radio is a hobby, a good one, but if we continue to purchase gear across the counter in ever increasing amounts we may lose our hobby. It's simple, and absurd, for there's no need for it. We all know the trend is towards factory manufactured gear, so let's see why, and what this trend is doing to our hobby.

The average amateur purchased commercial gear for several reasons;

1. The equipment presents a neat appearance.
2. Trade in value is generally high, providing the equipment hasn't been greatly modified
3. Dependability and sturdiness.
4. Prestige.
5. Lack of time to construct home brew gear and the unwillingness to put forth the necessary effort.
6. Anxiety to get on the air with a minimum of trouble and snag that DX contact.

Now let's see what advantage stands to be gained by the homebrew amateur;

You get to keep the operating frequencies allocated to the radio *amateur*. Notice the accent on amateur. If we continue to forge ahead (?) towards becoming a mob of DX crazy, commercial gear radio operators, there will be no frequencies allocated for the purpose of amateur radio. . . . "To advance the science of radio communications and make for better international relationships for all concerned," or something to that effect. What contributions have you made lately . . . or at all? True, advancements are being made, but they are made primarily *for* the amateur and not *by* him. Thus, there is no great need for the amateur anymore. Once upon a time there was though, and a small need still remains, but it is slowly fading into the past what with the rapid advances in technology these days. Want proof?

Note the loss of frequencies for the amateur over the past few years, even though our hobby's ranks have swelled tremendously in that same period of time. This is exactly the inverse of what should be happening. Now don't go blameing the A.R.R.L. for not doing an efficient job; they are encouraging new amateurs all the while, and although this might not help the QRM problem it tends to create a formidable pressure group of, by, and for the League and what it stands for. However, they can't personally direct and supervise these new hams to build good home brew gear.

How?

But the question still remains: how *can* we correct and reverse the trend? Well, we know the why's and result of commercially purchased gear, so let's attack the problem from that angle; the arguments for commercial gear.

1. Neater appearance. Any gear is what you make it; if you can't drill a center punched hole, make a good solder-joint, and follow the authors' directions, you don't deserve the title of amateur—remember our definition?
2. Trade in. Advances are being made and the amateur's code says we must keep abreast of science. We all desire more selectivity and sensitivity, but why trade in un-modified gear to get a good trade in, to get the gear back in modified form? If you have your own neat homebrew gear you can modify and experiment as much as you please without ever worrying about loss of trade in value. You won't *have* to trade it in.
3. Dependability and sturdiness. It's just what you make it OM.
4. Prestige. Who gets the prestige, you or your gear? If the commercial piece of gear gets it then you don't, because any one can buy it on time and pass a simple (let's face it) test and go on the air. But if *you* build it *you* get the prestige, because that's something the neighbor or girl friend probably think they couldn't do. Also it tends to make you look like an electronic genius, when actually all you did was follow directions. Or can't you do that?
5. Time and effort. If you don't have time to build gear, you don't have time for your hobby. If you aren't willing to put forth

[*Continued on page 96*]

*9 Backus Street, Rochester 6, New York

[1] *"CQ's* Survey," *CQ*, Dec. 1957, p. 34.

DX DX DX DX DX DX DX DX

URBAN LE JEUNE, JR., W2DEC
BOX 35, HAZLET, NEW JERSEY

The following certificates were issued between the period from October 12th, 1961 to and including November 11th, 1961:

CW/PHONE WAZ

1608	SM7AIA	Alle Lofgren
1609	W2OCL	Ed Ricca
1610	W9YHE	Thomas B. Stogdill, M.D.
1611	DL1FK	Richard Auerback
1612	W8RQ	Roger F. Hathaway

ALL-PHONE WAZ

98	DJ2YI	Hermann Meffert
99	G3NUG	E. N. Cheadle

SSB WAZ

14	VE7ZM	W. D. Wadsworth
15	UR2AR	Enn Lohk
16	G3NUG	E. N. Cheadle
17	DL1IN	Hansheinrich Heider

CW WPX

216	OE3WB	Willy Blaschek
217	W2HQL	Joseph H. Reisert, Jr.
218	W6MDK	Robert G. Mintle
219	EA5BD	Eduardo Bigne Bartle
220	ZS1RM	Margery Snyman
221	W1IJO	Edward F. Van Gasbeck
222	VE4OX	D. E. McVittie
223	UR2CU	Karl Kallemaa
224	W6JNX	Norman D. Nash
225	W3DKT	Charles A. Earp

PHONE WPX

42	VK6RU	J. E. Rumble
43	G3NUG	E. N. Cheadle

SSB WPX

81	UR2AR	Enn Lohk
82	W2HQL	Joseph H. Reisert, Jr.
83	G3NUG	E. N. Cheadle
84	KØRDP	George Goodwin

AC3 SIKKIM: The VU2NRM boys are at
AC5 BHUTAN: it again. They will operate as AC3NRM and AC5NRM during Janu- and February. This promises to be one of the biggest DXpeditions ever.

DL Germany: Pete Jenks, ex-DL5CR, dropped a note to tell what it is like at the other end. "It was quite a challenge operating over in Germany. The maximum power was 500 watts and on 40 meters it was like a rush to a bargain sale when you managed to hear a rare DX station on the band. 40 only runs to 7.1 mc over there. With every mode of operation on the same band. 20 meters was better than 40, while 15 meters was fair at times and that was for about three hours in the middle of the afternoon. Once in awhile I managed to hear a few in the late evenings but not too many. 10 meters had nothing on it at all. We're not allowed any 6 meter operation at all due to the ruling by the local governments. I did work WAE several times though. I used to take leave and lock myself in the room and just operate until I was operating by sheer instinct alone. I enjoyed it very much. But, there were times that it was impossible to get much done. Then you had to put up with the various broadcast stations at the early evening hours. I believe one of the stations was Radio Cairo on about 7016 kc. I met several fellows from the various countries that were in Germany going to Heidelberg University. SUIMS was one from Egypt, YU1WJ was from Belgrade, Yugoslavia. I met DL3JJ (Hans Plisch) who had an assembly plant in Viernheim/Hessen. "All of them were fine people." Pete's present address is as follows: SP-5 R. L. Jenks, HQS BTRY 2nd Arty GP (Ad), Lockport, N.Y.

FB8WW Crozet Island: The recent operation of FZ8PF is a pirate. This, from FB8XX and 5R8BC (FB8BC) who should certainly know. FB8XX will operate as FB8WW on Crozet sometime in January. This should definitely be a new country. (Tnx ZS1RM)

HE9 Liechtenstein: HE9LAA is now on 14.296 mc s.s.b. daily. He has a new HT-37. (Tnx *DXer*).

PY7 Fernando de Noronha: PY7LJ has closed down and may be reached at his home QTH, PY1BLT.

TR8 Gabon: Look for TR8AB on 14,060 mc. TR8AA should be returning from a Paris vacation about the time you read this.

TY2 Dahomey: Angus, 5N2AMS, has been operating weekends as TY2AA. Most operation on 21 mc a.m. and 14 mc s.s.b. His ticket is for a 2 month duration which may be renewed. QSL via 5N2AMS.

UAØ Tana Tuva: The Tuva Area on the Siberia-Mongolia border has been proclaimed an autonomous Soviet Republic, the Soviet News Agency Tass reports. This may mean that Tana Tuva will again become a separate country. Look for UAØKYA, UAØYA, YB and YC. (Tnx WGDXC)

UAØ Zone 19: I would like to say well-done for the swell job that UAØBP/UAØ and UA3AT/UAØ did on their s.s.b. DXpedition to Zone 19. That was operating at its finest. When conditions permitted the fellows were working

Silent s.s.b. Microphone. Teodoro, HC1KA (at right), and his bride Chela, with Monte, HC1JU, at their wedding festival in Quito, Ecuador, September 30, 1961. Teddy, HC1KA, will be silent as he and Chela are moving to Washington, D. C. and we don't have "Reciprocal Privileges." Note: Have you written to your Senator to encourage passage of Bill S-2361 which would allow reciprocal privileges? (*Tnx HC1JV*)

them at about 3 per minute.

VQ8B St. Brandon: VQ8AP will operate from this spot for three weeks starting December 15th. He will use the call VQ8APB with 14 mc c.w. preferred. (Tnx OVARC)

VU2 India: VU2AJ is looking for Wyoming, Utah, Arkansas, and Vermont to complete his WAS. If any of you fellows hear Dut, give him a call. (Tnx KØKKU)

XT2 Upper Volta: XT2A has returned to France with his XYL and 4 "harmonics." Maurice worked 53 countries between Sept. 5 and Oct. 15. (Tnx CE3AG)

YVØ Aves Island: YV5GO says he and a YV gang will make another trip to Aves Island between January 5 and 15. Call will be YVØAA. All modes will be used. (Tnx WGDXC)

Carribean S.S.B. Operation: A transmitter furnished by HB9TL (the same one used at F9QV/FC) has started making the rounds of VP3, FY7, FM7, FG7, all VP2's, PJ2M, FS7, etc. VP3YG was the first to start using this rig. PJ2AA is organizing the affair and QSL managers are W4OPM for W/K's and G8KS for non W/K's. They will operate for about 3 weeks from each spot. The frequencies are 14.281, 14.294, and 14.304 mc.

This good looking couple is none other than Ken, EL4A, and Traute, EL4YL, Bale. They operate all bands 160 through 6 on c.w., a.m. and s.s.b.

Operating

Lately, much has been said about bad operating habits and, as usual, the story has two sides. The following is the views taken by KZ5SW concerning contest activities: "I would like to comment on the fine display of skill and manners displayed by the vast majority of the stateside gang. I operate a barefoot KWM-2 to a Quad, which gives me a good-enough signal so that during good-skip conditions there was always a pile-up on either band. As a result bedlam could have been expected. It did **not** occur. I asked the gang to follow these few simple instructions:

1. Accurately Zero beat the frequency.
2. Call me **only** when I asked for QRZ?
3. Refrain entirely from 'tail-ending.'
4. Please to be patient while I worked down through the pile and got to everyone.
5. Use my call only once, followed by their call with no 'cute' phonetics.

What amazed me was that these suggestions were followed to the letter by 99.8% of the group. This allowed me to use both hands on the log and mike. It seems to be a good system

Kamio, JA7AD, who has one of the best signals from Asia into the States, and his neat station. (*Tnx K8RBW*)

for a tranceive 'target' station. Of course, the 'big signals' get answered first. The only thorn, is the guys who can't accurately zero-in. They cause some problems with being unreadable and the resultant 'garbage.' However, they seem to learn reasonably soon that they won't get answered. I didn't have to touch the dial most of the time. During the worst pile-ups I was working stations at a rate of about 2½ stations a minute."

Certificates

20K Award

Mac, W1AGS, ex K2QXG, is now issuing a larger and nicer looking 20K certificate. Anyone who has the old one and would like one of the new certificates, send Mac $.40 in stamps. His new QTH is Lauren L. McMaster, W1AGS, Box 1145, Weston, Conn.

WAZ and WPX certificates

Since there has been some modifications of certificate rules, it might be a good idea to review the rules, WAZ zone boundries and WPX rules, application procedure, and prefix definition.

The wallpaper in ON4IF's shack belies that George is only using a DX-35. (*Tnx K8RBW*)

DL8CA and his hide-away station. Franz was previously 9S4CA. (*Tnx K8RBW*)

WAZ Rules

The following are rules for the Worked All Zones Award which will be issued to any licensed amateur station presenting proof of contact with the forty zones of the world. Any type of emission may be used providing communication was established after November 15, 1945.

1. The official *CQ* WAZ Zone map will be used in determining zone boundries.

2. Confirmations must be accompanied by a list of claimed zones.

3. All contacts must be made with licensed amateur stations working in authorized amateur bands. In addition, all stations must be land based stations.

4. All contacts submitted by the applicant must be made within a 250 mile radius of the original location.

5. Any altered or forged confirmations will result in permanent disqualification of the applicant.

6. Continued use of poor operating ethics will result in disqualification of applicant.

7. In addition to the conventional certificate, in which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and signal sideband operation. The Phone certificate requires that all contacts be two-way phone and the s.s.b. certificate requires that all confirmations state that they are two-way s.s.b. In addition, special band endorsements will be issued when all zones have been contacted on a single band.

8. If, at the time of the *original* application a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application.

9. Sufficient postage for the return of the confirmations should, if possible, be included with the application. Inability of a foreign station to include return postage will not disqualify the application.

10. Decisions of the DX committee on any matter pertaining to the administration of this award shall be final.

11. All applications should be sent to the DX Editor, address shown at head of column or *CQ*, 300 West 43rd Street, New York 36, N. Y. Attention: WAZ Dept.

12. Zone Maps and/or WAZ applications are available from either of the above for a stamped, self-addressed envelope or 1 IRC.

The following list of zones is presented as a guide. Any questions will be decided by the zone map.

Zone 1. Northwestern Zone of North America; KL7, Yukon (part) VE8, Northwest Territories (part) VE8 Dist. of Mackensie VE8, Dist. of Franklin VE8, Islands of 102 degrees West including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northeastern Zone of North America; Labrador, VO2 Canada that portion of Quebec (part of VE2) north of the 50th parallel. Canadian NW territories, part of VE8 including Dist. of Franklin east of Long. 102 degrees west, including the Islands of King William, Prince of Wales, Somerset, Bathurst, Devon, Ellesmere, Baffin and the Melville and Boothia Peninsulas.

Zone 3. Western Zone of North America; VE7, W6 and the States of Arizona, Idaho, Nevada, Oregon, Utah and Washington.

Zone 4. Central Zone of North America; FP8, VE1, that portion of VE2 south of the 50th parallel, Newfoundland VO1, VP9, W1, W2, W3, and the following states; North Carolina, South Carolina, Florida, Georgia and West Virginia.

Zone 5. FP8, VE1, VE2, VP9, W1, W2, W3, W4 (Fla., Ga., S.C., N.C., Va.), W8 (W. Va.).

Zone 6. Southern Zone of North America; XE/XF.

Zone 7. Central American Zone; Clipperton FO8, HP, HR, KS4, KZ5, TI, TI9, VP1, TG, YN and YS.

Fritz, DJ1WT, who is a printer by trade, operates this neat station on all bands, phone and c.w. from Hamburg. (*Tnx W2AMS*)

Zone 8. West Indies Zone; CM/CO, FG7, FM7, HH, HI, KG4, VP2, VP5, VP6, VP7, Navassa KC4, PJ2M/FS7, PJ2E, PJ2S and Aves Island YVØ.
Zone 9. FY7, HK, PJ2, PZ, VP3, PV4, YV.
Zone 10. Western Zone of South America; CP, HC, HC8 and OA.
Zone 11. Central Zone of South America; PY and ZP.
Zone 12. South West Zone of South America; CE (all).
Zone 13. South East Zone of South America; CX, LU, VP8 (all), Antartica (CE9, FB8YY, 8J1, KC4U, LA/G, LU-Z, OR4, UA1, VKØ, VP8K and ZL5).
Zone 14. Western Zone of Europe; CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HE, HB, LA, LX, ON4, OY, OZ, PA/PI, PX, SM/SL, ZB2 and 3A2.
Zone 15. Central European Zone; FC, HA, HV, I, IT, IS, MI, OE, OH, OK, SP, UA2, UP, UQ, UR, YU, ZA and ZB1.
Zone 16. Eastern Zone of Europe; UA1, UA3, UA4, UA6, UA9 (Bashkir and Chkalov) UB5, UC2, UN1, UO5.
Zone 17. Western Zone of Siberia; Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotov, Omsk, Tyumen, UA9, UH8, UI8, UJ8, UL7 and UM8.
Zone 18. Central Siberian Zone; Novosibirsk, Tonsk, Kamerovo, Altai, UA9, Keasnoyarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island UAØ.
Zone 19. Eastern Siberian Zone; Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island North of the 50th parallel and Wrangel Island UAØ.
Zone 20. Balkan Zone; JY, LZ, OD5, SV, TA, YK, YO, ZC4, and 4X4.
Zone 21. Southwestern Zone of Asia; EP, HZ, MP4, 9K, VS9 (except Maldives and Socotra) YA, YI, 4W1, UD6, UF6, UG6, and AP (West Pakistan).
Zone 22. Southern Zone of Asia; AC3, AC5, CR8, 4S7, VU (except Andaman and Nicobar) 9N1, and AP (East Pakistan).
Zone 23. Central Zone of Asia; AC4, Tanna Tuva, UAØ, JT1 and the following Provinces of China; Sinkiang, Kansu, and Hinghai C8.
Zone 24. Western Zone of Asia; China (except as noted in Zone 23) C/BY, C9, BV, CR9, and VS6.
Zone 25. Japanese Zone; HL, JA/KA, KR6, and Sakhalin Island south of the 50th parallel.
Zone 26. Southeastern Zone of Asia; HS, XV, XW, XZ, 3W8 and Andaman and Nicobar Islands VU2.
Zone 27. Philippine Zone; DU, KC6 and KG6.
Zone 28. Indonesion Zone; PK, CR1Ø, JZØ, VR4, VK9 (except as noted in Zone 31 and 32) VS1, 9M2, VS4, VS5 and ZC5.
Zone 29. Western Zone of Australia; VK6, VK8, and ZC3.
Zone 30. Eastern Zone of Australia; VK1, VK2, VK3, VK4, VK5, VK7 and VKØ (Macquarrie Island only).
Zone 31. Central Pacific Zone; KB6, KH6, KJ6, KM6, KP6, KW6, KX6, Nauru VK9, VR1, VR3 and ZM7.
Zone 32. New Zealand Zone; FK8, FO8 (except Clipperton), FU8/YJ, KS6, Norfolk Island VK9, VR2, VR5, VR6, ZK1, ZK2, ZL and ZM6.
Zone 33. Northwestern Zone of Africa; CN2, CN8, CT3, EA8, EA9, FA and 3V8.
Zone 34. Eastern Zone of Africa; ST, SU and 5A.
Zone 35. Central African Zone; CR4, Guinea CR5, EL, FD, all previous FF8's, ZD1, ZD2, ZD3, and 9G1.
Zone 36. Equatorial Zone of Africa; Sao Thome CR5, CR6, EAØ, FE8, all previous FQ8's, 9Q5, 9U5, VQ2, ZD7 and ZD8.
Zone 37. Eastern Zone of Africa; CR7, ET2, ET3, FL8, 6O1, 6O2, VQ1, VQ3, VQ4, VQ5, Socotra VS9 and ZD6.
Zone 38. South African Zone; ZD9, ZE and ZS.
Zone 39. Madagascar Zone; FB8, 5R8, FR7, VQ8, VQ7, VQ9 and Heard Island VKØ.
Zone 40. North Atlantic Zone; Spitzbergen, Jan Mayen, OX/KG1, TF, and Franz Joseph Land UA1.

The UAØ Zones are, perhaps, the hardest to determine. If you are in doubt, send several cards. Some of the most active stations are: Zone 18: UA9's OI, OE, VB, KOU, UAØ's, BP, OM, KSA, KAR, Zone 19: UAØ's KKB, KJA, LA, KKC, RQ, LC.
One other point . . . Sakhalin Island is divided into two Zones, 19 and 25; south of the 50th parallel is Zone 25 and north of the 50th parallel is Zone 19. Most stations located on Sakhalin are in Zone 25. For some reason quite a few put Zone 19 on their card, although they are in Zone 25. They include UAO's, EH, EF, KGH, KFA and EC. Any of these are not acceptable for Zone 19 credit.

WPX Rules

The same general rules apply as listed under WAZ rules with the addition of the following: A special form, which is available free of charge, must be used for WPX applications. It must contain the following:

1. All call letters must be in strict alphabetical order.
2. All entries must be clearly legible.
3. Use separate application for each endorsement.
4. For additional WPX credit, list only additional calls.
5. Include with application $1.00 (or equivalent) for certificate. A stamped, self-addressed envelope, or 1-IRC will be appreciated for endorsement stickers.

Certificates are issued for the following:

Mixed: 400	CW: 300
Phone: 300	SSB: 200

Rafael Estevez, CO2ZQ, is now living in Miami because of the political situation in Cuba. He would like to hear from his old stateside buddies. See his QTH in listing.

Endorsements are issued for each 50 additional prefixes plus band endorsements which require the following number of prefixes be worked on each band.

1.8 Mc	35	14 Mc	300
3.5 Mc	150	21 Mc	300
7 Mc	250	28 Mc	250

Continental endorsements are issued for the following number of prefixes worked:

North America	126	Africa	80
South America	88	Asia	68
Europe	146	Oceania	51

Cards need not be sent but must be in possession of the applicant. Any or all cards may be requested by the Certificate Committee.

The definition of prefixes will be as follows:

1. The two or three letter/numeral combination which form the first part of any amateur call will be considered the prefix.
2. Any difference in the numbering, lettering or order of same shall constitute separate prefix. The following would be considered different: W2, WN2, WA2, WV2, K2, KN2.
3. In a prefix, only the first three (or two) letter/numeral combination will be counted, CR1ØAA would count as CR1.
4. Any prefix will be considered as legitimate if its use was licensed or permitted by the governing authority.
5. A suffix would designate portable operation in another area and would count only if it is the normal prefix used in that area. Example: W2XXX/KP4 would count as KP4. HB1AA/FL would count only as HB1 because the /FL designates only portable activity. FF8AC/GN would count only as FF8 because /GN is a suffix not a legitimate prefix.
6. Calls without numbers will be considered as Ø plus the first two letters. Example: RAEM would count as RAØ.
7. Stations operating portable and using a portable prefix without a numerical designation will assume the numeral form and his own call.
8. In order to keep WPX on a competitive basis, when a prefix changes for the same geographical area or becomes obsolete either the old or the new prefix may be counted, but *not* both. Example: ZD4 *or* 9G1, not both; 9Q5 *or* OQ5, not both.

The very popular 4X4DK, Ami, has given many a new country on s.s.b. (*Tnx WA2KNC*)

I hope this clears some of the misunderstanding we have had in the past. If you have any further questions, drop me a line and I will be glad to help, if possible.

160 Meters

The following 160 meter news and views, thanks to W1BB.

Summer Openings: G/SWL/Norman Smith reported hearing K3MBF 1820 kc at 0320 GMT May 31st, 1961 in QSO with a K1. (Norm missed the K1 call purposely to concentrate on and identify the K3) K3MBF peaked once at S7-the K1 inaudible. Both using fast c.w. made copy difficult in QSB/Noise QRN—He also heard K3MBF QSOing K2TMG same date S7 at times, v.f.b. K1KSH, Gary, on June 5th logged marker station DHJ54/1 1831 kc S2-5 on his new HRO and made v.f.b. tape recording of the same. He reports: "The facts are that the critical frequencies are falling off rapidly and 160 meter conditions are getting better day by day. Thanks Gary . . . . W2UKS, Bill, wrote that W8, 9, Ø's coming thru summer evenings 579 and often heard West Coast on 2 mc, 569 during June. Thanks Bill! K1KSH reports that VE1ZZ QSO'd G3NVO June 17th at 0250Z giving VE1ZZ 349, said G was not audible in W-land. Numerous other miscellaneous reports of calls heard were passed around.

[*Continued on page 88*]

PROPAGATION

George Jacobs, W3ASK
11307 Clara St., Silver Spring, Md.

LAST MINUTE FORECAST

The following is a forecast of day-to-day propagation conditions expected during January, 1962. This forecast attempts to predict the *specific* days upon which openings shown in the Propagation Charts in this column are most likely to occur, and the expected quality of the openings. For example, the following forecast shows that circuits rated (2) in the Charts are most likely to open with "good" quality; (B) when conditions are "above normal" (January 8, 9, 23 and 24) and with "fair to poor" quality (C-D) on days when conditions are expected to be normal. Circuits rated (2) are not expected to open on those days forecast to be "below normal" or "disturbed", etc.

PROPAGATION CONDITIONS and CIRCUIT QUALITY

Prop. Chart Forecast Rating	*Above Normal* Jan. 8-9, 23-24	*Normal* Jan. 2-7, 10, 13-15, 21-22, 25-26, 29-31	*Below Normal* Jan. 1, 11-12, 16, 20, 27-28	*Disturbed* Jan. 17-19
(1)	C	D-E	E	E
(2)	B	C-D	E	E
(3)	A	B-C	D-E	E
(4)	A	A-B	C	D-E

Where:

A—Excellent opening with strong steady signals.
B—Good opening, moderately strong signals, with some fading and noise.
C—Fair opening, signals fluctuating between moderately strong and weak, with moderate fading and noise.
D—Poor opening, signals generally weak, with considerable fading and high noise level.
E—Very poor opening, or none at all.

THE following is an overall picture of h.f. band conditions forecast for January, 1962. For specific times of DX openings refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for January and February, as well as Charts centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for circuits varying in length between distances of 50 and 2300 miles.

6 Meters

The frequent DX openings which took place on this band during the winter months of high solar activity are now just memories; no DX openings are forecast for 6 meters for at least the next five years. Some meteor-type short-skip openings are likely to occur during the *Quadrantids* metor shower expected between January 1-4. Sporadic-*E* and auroral—reflection short-skip openings may also occur during periods of disturbed propagation conditions. (Check the Last Minute Forecast).

10 Meters

Although somewhat fewer openings are forecast than during November and December, some DX openings, especially on circuits into southern areas, are expected during the daylight hours. Some short-skip openings, between distances of approximately 1300 and 2300 miles, are also forecast during the late morning and early afternoon hours.

15 Meters

Some fairly good 15 meter DX openings to most areas of the world are forecast for the daylight hours. Some circuits to southern areas may remain open through the early evening hours during period of good propagation conditions. Fairly consistent short-skip openings are predicted for the daylight hours over distances ranging between approximately 1000 and 2300 miles.

20 Meters

Fairly good DX openings to most areas of the world are forecast for 20 meters sometime between sunrise and the early evening hours. Signal levels may be exceptionally high shortly after sunrise and during the late afternoon hours, when conditions on this band peak. Good short-skip openings, over distances ranging between 750 and 2300 miles, should take place during the daylight hours. Shorter distance openings should be possible during the afternoon hours, when the skip distance may be as short as several hundred miles.

40 Meters

DX openings are expected to begin during the late afternoon hours, with conditions peaking the hours of darkness. The band is expected to remain open to some DX areas until shortly after sunrise. Static levels should remain at low seasonal levels during the month, and signals may be exceptionally strong during many openings. During the daytime hours good short-skip openings should be possible between distances of approximately 150 and 750 miles, while during the hours of darkness the short-skip range should increase to between 1000 and 2300 miles.

80 Meters

Ionospheric absorption and static levels are expected to remain at low seasonal values during January, resulting in fairly good DX openings to many areas of the world during the

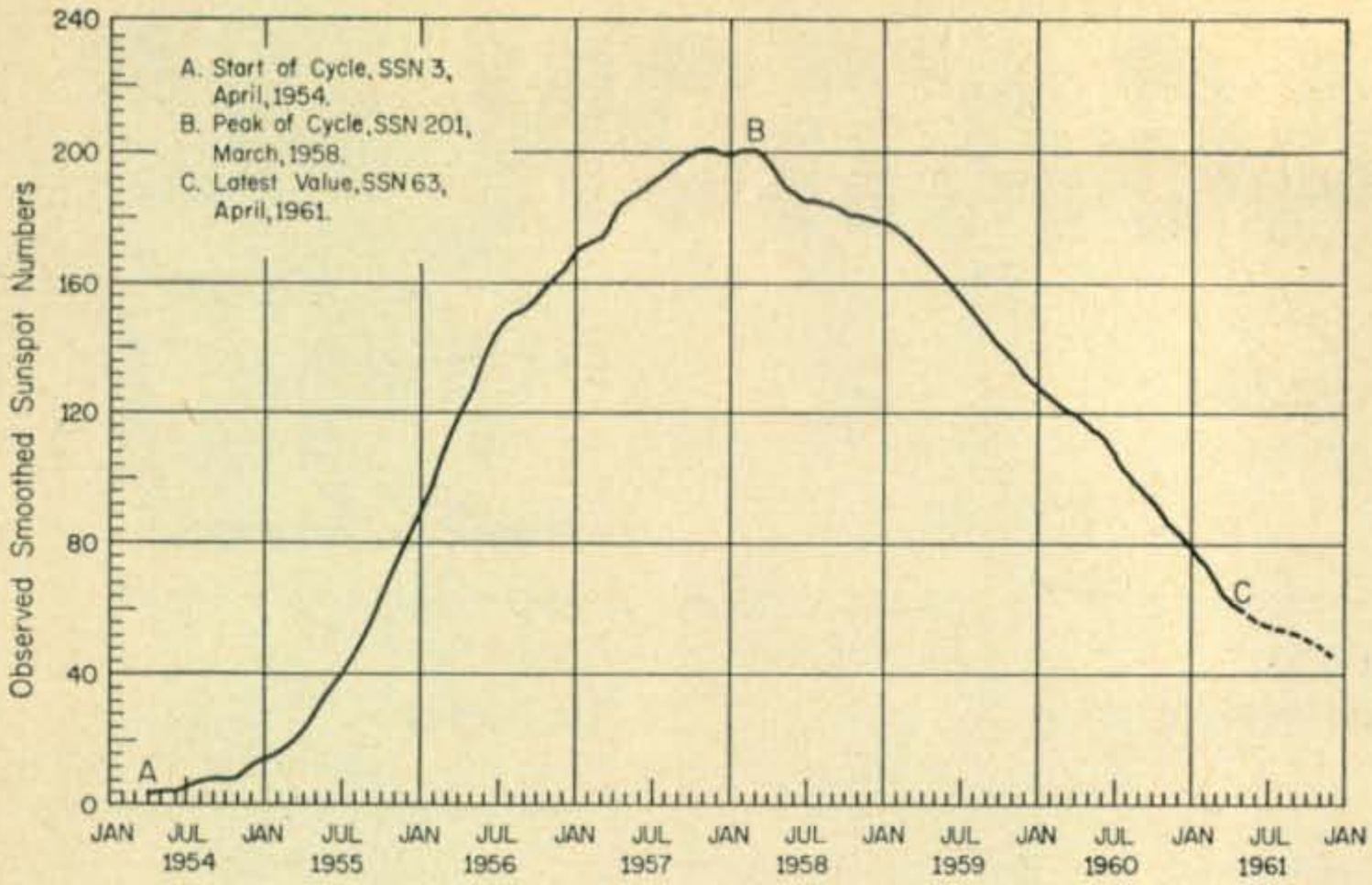

Fig. 1—Graph illustrating the progress of Sunspot Cycle 19 from April 1954 to April 1961. The dotted portion of the curve represents predicted smoothed sunspot numbers for the remainder of 1961.

hours of darkness. During the daytime hours short-skip openings should be possible between distances of approximately 50 and 350 miles; during the hours of darkness, short-skip openings should be possible between distances of approximately 250 and 2300 miles.

160 Meters

On evenings when static levels are exceptionally low, fair DX openings should occur to some areas of the world from a few hours after sunset to shortly before sunrise. Short-skip openings up to 2300 miles should be possible during the hours of darkness. Because of extremely high solar absorption in this frequency range, ionospheric propagation is generally not possible during the daylight hours. Trans-Atlantic propagation tests are scheduled for 160 meters between Midnight and 2:30 A.M. EST on January 7 and 21. See last month's column for more details.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a monthly sunspot number of 36 for October 1961. This results in a 12 month smoothed sunspot number of 63 centered on April 1961. This month's *CQ* propagation forecasts are based upon a predicted smoothed sunspot number of 43.

1961 In Review

During 1961, the sunspot cycle declined more rapidly than expected. The year began with solar activity at a smoothed sunspot number level of 79, but by December it had declined to an estimated level of 46. The following table contains the values of smoothed sunspot numbers recorded since the present sunspot cycle (cycle 19) began in April 1954. The values shown after April 1961 are based upon estimates. The progress of cycle 19, from April 1954 to April 1961, is shown graphically in figure 1.

Due to the relationship that exists between the smoothed sunspot number, ultraviolet radiation, and the ionization of the earth's upper atmosphere[1], the ionosphere was in a weaker state during 1961 than during any year since 1955.

Values of smoothed sunspot numbers observed during Cycle 19. Italic figures indicate estimated values for the remainder of 1961.

Year 1954	1955	1956	1957	1958	1959	1960	1961
Month							
Jan	14	89	170	199	179	129	79
Feb	16	98	172	201	177	125	74
Mar	19	109	174	201	174	122	68
Apr .. 3	23	119	181	197	169	120	63
May . 4	29	127	186	191	165	117	*60*
Jun .. 4	35	137	188	187	161	114	*57*
Jul ... 5	40	146	191	185	156	107	*55*
Aug .. 7	46	150	194	185	151	102	*54*
Sep . 8	55	151	197	184	146	97	*53*
Oct .. 8	64	156	200	182	141	93	*51*
Nov ... 9	73	160	201	181	137	87	*49*
Dec ... 12	81	164	200	180	132	83	*46*

The bands most affected by reduced sunspot activity during the past year were 6 and 10 meters. While 6 meters opened quite regularly for DX to many areas of the world during the fall, winter and spring months of 1957-1960, there were practically no DX openings at all on this band during 1961. Ten meter openings also fell off sharply during the past year, and the band remained open for much shorter periods of time.

The 15 and 20 meter bands were also adversely affected by poorer propagation conditions during 1961, but to a lesser degree. Fifteen meter openings, especially during the late spring, summer and early fall months, were noticeably fewer than during the previous years of more intense solar activity, and when the band did open, it was usually for shorter periods of time and to fewer areas of the world. The most noticeable change in 20 meter propagation conditions during the past year was the large reduction in nighttime openings. During recent years of high solar activity, DX

[1]See, The Sunspot Story, Cycle 19; The Declining Years, G. Jacobs and S. Leinwoll, Part I (*CQ* Apr. 1961), Part II (*CQ* May 1961), Part III (*CQ* Jun. 1961). Reprints of the entire article, in booklet form, are available for $1 each postpaid directly from *CQ*'s Circulation Dept., Box 55, 300 West 43rd Street, New York 36, N.Y.

CQ SHORT-SKIP PROPAGATION CHART

JANUARY AND FEBRUARY, 1962

LOCAL STANDARD TIME AT PATH MID-POINT

BAND METERS	50-250 Miles	250-750 Miles	750-1300 Miles	1300-2300 Miles
10	NIL	NIL	10A - 3 P (0-1)	8 A - 10A (0-1) 10A - 3 P (1-2) 3 P - 5 P (0-1)
15	NIL	10A - 4 P (0-1)	8 A - 9 A (0-1) 9 A - 10A (0-2) 10A - 3 P (1-3) 3 P - 4 P (1-2) 4 P - 5 P (0-2) 5 P - 6 P (0-1)	6 A - 7 A (0-1) 7 A - 8 A (0-2) 8 A - 9 A (1-3) 9 A - 10A (2-3) 10A - 3 P (3-4) 3 P - 5 P (2-3) 5 P - 6 P (1) 6 P - 7 P (0-1)
20	NIL	8 A - 10A (0-1) 10A - 2 P (0-3) 2 P - 4 P (0-2) 4 P - 6 P (0-1)	6 A - 7 A (0-1) 7 A - 8 A (0-2) 8 A - 10A (1-4) 10A - 2 P (3-4) 2 P - 4 P (2-4) 4 P - 6 P (1-3) 6 P - 7 P (0-2) 7 P - 9 P (0-1)	6 A - 7 A (1) 7 A - 8 A (2) 8 A - 10A (4) 10A - 2 P (4-3) 2 P - 4 P (4) 4 P - 5 P (3-4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)
40	7 A - 8 A (0-1) 8 A - 9 A (1-2) 9 A - 10A (2-4) 10A - 4 P (4) 4 P - 5 P (3-4) 5 P - 7 P (2-3) 7 P - 8 P (1-2) 8 P - 9 P (0-1)	7 A - 8 A (1-2) 8 A - 9 A (2-3) 9 A - 11A (4) 11A - 3 P (4-3) 3 P - 5 P (4) 5 P - 7 P (3-4) 7 P - 8 P (2-3) 8 P - 9 P (1-2) 9 P - 2 A (0-2) 2 A - 7 A (0-1)	7 A - 8 A (2) 8 A - 9 A (3-1) 9 A - 11A (4-1) 11A - 3 P (3-1) 3 P - 5 P (4-2) 5 P - 7 P (4) 7 P - 8 P (3-4) 8 P - 11P (2-4) 11P - 2 A (2-3) 2 A - 4 A (1-3) 4 A - 7 A (1-2)	7 A - 8 A (2-1) 8 A - 3 P (1-0) 3 P - 5 P (2) 5 P - 7 P (4-3) 7 P - 11P (4) 11P - 2 A (3-4) 2 A - 4 A (3) 4 A - 7 A (2)
80	7 A - 8 A (1-2) 8 A - 9 A (3-4) 9 A - 8 P (4) 8 P - 10P (3-4) 10P - 3 A (2-3) 3 A - 7 A (1)	7 A - 8 A (2) 8 A - 9 A (4-2) 9 A - 4 P (4-1) 4 P - 6 P (4-2) 6 P - 10P (4) 10P - 3 A (3-4) 3 A - 7 A (1-3)	7 A - 8 A (2-1) 8 A - 9 A (2-0) 9 A - 4 P (1-0) 4 P - 6 P (2-1) 6 P - 8 P (4-3) 8 P - 3 A (4) 3 A - 5 A (3) 5 A - 7 A (3-2)	7 A - 8 A (1-0) 8 A - 4 P (0) 4 P - 6 P (1-0) 6 P - 8 P (3-2) 8 P - 2 A (4) 2 A - 3 A (4-3) 3 A - 5 A (3-2) 5 A - 7 A (2-1)
160	9 A - 5 P (1-0) 5 P - 7 P (3-2) 7 P - 5 A (4) 5 A - 9 A (3-2)	5 P - 7 P (2-1) 7 P - 9 P (4-2) 9 P - 4 A (4) 4 A - 5 A (4-3) 5 A - 7 A (2-1) 7 A - 9 A (2-0)	5 P - 6 P (1-0) 6 P - 7 P (1) 7 P - 9 P (2-1) 9 P - 3 A (4) 3 A - 4 A (4-3) 4 A - 5 A (3-2) 5 A - 6 A (1) 6 A - 7 A (1-0)	6 P - 8 P (1-0) 8 P - 9 P (1) 9 P - 1 A (4-3) 1 A - 3 A (4-2) 3 A - 4 A (3-2) 4 A - 5 A (2-1) 5 A - 6 A (1-0)

ALASKA

Openings given in Alaskan Standard Time **

TO:	10 Meters	15 Meters	20 Meters	40/80* Meters
Eastern USA	11A - 2 P (1)	8 A - 10A (1) 10A - 11A (2) 11A - 1 P (3) 1 P - 2 P (2) 2 P - 4 P (1)	7 A - 1 P (1) 1 P - 4 P (2) 4 P - 6 P (1)	9 P - 4 A (1)
Central USA	12N - 3 P (1)	9 A - 12N (1) 12N - 3 P (2) 3 P - 5 P (1)	8 A - 3 P (1) 3 P - 5 P (2) 5 P - 6 P (1)	10P - 4 A (1)
Western USA	12N - 4 P (1)	10A - 12N (1) 12N - 1 P (2) 1 P - 3 P (3) 3 P - 4 P (2) 4 P - 5 P (1)	9 A - 11A (2) 11A - 4 P (3) 4 P - 5 P (2) 5 P - 7 P (1)	11P - 6 A (2) 6 A - 7 A (1) 1 A - 6 A (1)*

** There are four different time zones in Alaska. This Chart is based on standard time in the zone from Skagway to 141 degrees west longitude. To convert from standard time in this area (AST) to:

Eastern Standard Time, ADD four hours (12 Noon AST is 4 PM EST);
Central Standard Time, ADD three hours (12 Noon AST is 3 PM CST);
Mountain Standard Time, ADD two hours (12 Noon AST is 2 PM MST);
Pacific Standard Time, ADD one hour (12 Noon AST is 1 PM PST).

HAWAII

Openings given in Hawaiian Standard Time***

TO:	10 Meters	15 Meters	20 Meters	40/80* Meters
Eastern USA	7 A - 8 A (1) 8 A - 12N (2) 12N - 2 P (1)	6 A - 7 A (1) 7 A - 8 A (2) 8 A - 12N (3) 12N - 2 P (4) 2 P - 3 P (3) 3 P - 4 P (2) 4 P - 5 P (1)	6 A - 8 A (2) 8 A - 12N (1) 12N - 3 P (2) 3 P - 5 P (3) 5 P - 7 P (2) 7 P - 9 P (1)	4 P - 6 P (1) 6 P - 8 P (2) 8 P - 12M(3) 12M - 3 A (2) 3 A - 4 A (1) 6 P - 8 P (1)* 8 P - 1 A (2)* 1 A - 3 A (1)*
Central USA	7 A - 8 A (1) 8 A - 9 A (2) 9 A - 12N (3) 12N - 2 P (2) 2 P - 4 P (1)	6 A - 7 A (1) 7 A - 8 A (2) 8 A - 1 P (3) 1 P - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 6 P (1)	6 A - 8 A (3) 8 A - 1 P (2) 1 P - 2 P (3) 2 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	4 P - 6 P (1) 6 P - 8 P (3) 8 P - 1 A (4) 1 A - 3 A (3) 3 A - 4 A (2) 4 A - 6 A (1) 5 P - 8 P (1)* 8 P - 10P (2)* 10P - 1 A (3)* 1 A - 3 A (2)* 3 A - 5 A (1)*
Western USA	7 A - 9 A (1) 9 A - 1 P (2) 1 P - 3 P (1)	6 A - 7 A (1) 7 A - 8 A (2) 8 A - 2 P (4) 2 P - 3 P (3) 3 P - 4 P (2) 4 P - 6 P (1)	6 A - 7 A (2) 7 A - 10A (4) 10A - 2 P (3) 2 P - 4 P (4) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 8 P (1)	4 P - 5 P (1) 5 P - 6 P (2) 6 P - 2 A (4) 2 A - 4 A (3) 4 A - 7 A (2) 7 A - 9 A (1) 5 P - 6 P (1)* 6 P - 8 P (2)* 8 P - 4 A (3)* 4 A - 5 A (2)* 5 A - 7 A (1)*

* Indicates predicted 80 meter openings. The 160 meter band is likely to open during those times when 80 meter openings are rated (2) or better.

*** To convert from Hawaiian Standard Time to:

Eastern Standard Time, ADD five hours (12 Noon HST is 5 PM EST);
Central Standard Time, ADD four hours (12 Noon HST is 4 PM CST);
Mountain Standard Time, ADD three hours (12 Noon HST is 3 PM MST);
Pacific Standard Time, ADD two hours (12 Noon HST is 2 PM PST).

FORECAST RATINGS

The following ratings indicate the total number of days during each month of the forecast period on which a particular opening appearing in the Propagation Charts is expected to occur:

(1) Less than 7 days
(2) Between 8 and 13 days
(3) Between 14 and 22 days
(4) More than 22 days

For the specific days of each month on which a particular opening is most likely to occur, as well as a day-by-day forecast of reception quality (signal, noise and fading levels), see the "Last Minute Forecast" appearing elsewhere in the text.

On the Short-Skip Propagation Chart, where two forecast ratings are shown within a single set of parenthesis, the first rating applies to the shorter distance, and the second to the forecast for the longer distance.

A - A. M. P - P. M. N - Noon M - Midnight

The CQ Short-Skip Propagation Charts are based upon a CW effective radiated power of 75 watts from a half-wave dipole antenna, a half-wave or higher above ground. The Charts are valid through February 28, 1962. These forecasts are based upon basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

conditions on 20 meters usually peaked during the evening hours, with the band often remaining open to one area of the world or another around-the-clock. During 1961, however, 20 meters was primarily a daytime DX band with conditions peaking shortly after sunrise and again during the afternoon hours. Except for circuits to some southern areas, there were very few good DX openings on this band during the evening hours.

While a weaker ionosphere adversely affected propagation conditions in the 6, 10, 15 and 20 meter bands during 1961, conditions on 40, 80 and 160 meters *improved*. This improvement resulted from the decrease in ionospheric absorption associated with a weaker ionosphere. Signals were noticeably stronger on 40 meters, and the band opened more frequently for DX, and to more areas of the world than during recent years. In fact, during 1961, 40 meters was the best band for DX during the hours of darkness. The improvement in propagation conditions on 80 and 160 meters, although not as outstanding as on 40 meters, also resulted in a greater number of DX openings during the hours of darkness, and generally stronger signals.

Outlook 1962

The sunspot cycle is expected to continue its

[*Continued on page 88*]

Space Communications

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SILVER SPRING, MARYLAND

U.S. Announces OSCAR Launch Date

On November 15, 1961 the U.S. Government announced officially that it plans to launch Project OSCAR, the radio amateur's satellite, sometime during early December. According to the announcement, OSCAR will be sent aloft piggyback with a DISCOVERER satellite from Vandenberg Air Force Base, California by the Space Systems Division of the U.S. Air Force.

The DISCOVERER satellite, selected as OSCAR's parent vehicle, is part of America's most extensive satellite program. To date, thirty-four satellites in the DISCOVERER series have been fired, with 23 of them, or 68%, placed successfully in orbit. The two-stage DISCOVERER space vehicle consists of an Air Force liquid-propellant Thor booster (150,000 pound thrust) as the first stage, and a liquid propellant Agena B rocket (15,000 pound thrust) as a unique second stage. The Agena B, besides providing second stage thrust, also serves as the satellite's payload, to which is attached a recoverable nose capsule. Standing on the pad, the Thor-Agena B combination has a height of 81 feet and a base diameter of 8 feet.

The OSCAR program, conceived, organized and conducted by radio amateurs, is a serious, non-government, civilian, non-commercial effort to obtain technical and scientific information from outer space, and to introduce radio amateurs and lay scientists throughout the world to new concepts in space communications. The DISCOVERER's association with Project OSCAR is merely for the purpose of providing a launch vehicle. Once in orbit, the Air Force vehicle will "kick away" the piggyback amateur radio satellite, leaving it to follow its own course around the earth independent of the parent DISCOVERER satellite.

During late November as this column is being written, the 10 pound OSCAR payload, containing a two meter amateur radio beacon transmitter, is being installed in the aft portion of the Agena B booster-satellite. Sometime after the Agena has attained orbit, the OSCAR satellite will separate from the parent vehicle, its antenna will extend and its beacon transmitter will commence sending a continuous series of HI's in Morse Code on a frequency of 145 megacycles. Once OSCAR goes into orbit (over the north and south poles, in a typical DISCOVERER pattern) its signal should be detected in all areas of the world at least once a day.

The government's assignment of a parent vehicle to carry OSCAR piggyback into orbit represents the final step, short of a successful launch, for transforming the year-old project from a dream into a reality. Because of deadlines, this column is being written a few days before OSCAR's expected launch date. If the launch is successful, OSCAR's beacon transmitter should be on the air when this appears in print, since the self-contained mercury cells are expected to have a life of approximately four weeks.

Once in orbit, tracking and other technical data concerning the OSCAR satellite will be transmitted on the Voice Of America's SPACEWARN broadcasts (Monday through Saturday, 10:30-10:35 P.M. EST on 15290, 11830, 11790 and 9765 kc), and over ARRL's station, W1AW, according to the following schedule:

C.W.: Sunday through Friday, 8 P.M. EST; Monday through Saturday, 12 Midnight EST (with hourly bulletins if warranted) 1820, 3555, 7080, 14100, 21075, 28080, 50700 kc, and 145.80 mc.

Voice: Sunday through Friday, 9 P.M. EST· Monday through Saturday, 11:30 P.M. EST (with hourly bulletins if warranted) 1820, 3945, 7255, 14280 (s.s.b.), 21330, 29000, 50700 kc, and 145.80 mc.

OSCAR's Challenge

OSCAR's ultimate success depends not so much upon what has already been done by a relatively small group of devoted radio amateurs who helped get the satellite off the ground, but upon what is yet to be done by radio amateurs throughout the world once OSCAR is in orbit. Project OSCAR has a serious and extremely important mission to fulfill: to prove that today's radio amateur is capable of producing results of a useful scientific nature. This challenge to amateur radio can be successfully

met only if radio amateurs in all corners of the globe participate in collecting data from the satellite's two meter transmissions.

Observations of OSCAR's signal need not be difficult to perform, nor do they require elaborate equipment. Observations as simple as recording the exact time reception of the signal reaches a peak on each pass will help determine OSCAR's orbit; observations of the time taken for OSCAR to beep out HI ten times will determine the internal temperature of the satellite; observations of signal to noise levels with a calibrated S-meter will help determine the atmosphere's influence on v.h.f. propagation from space.

Complete information concerning participation in the OSCAR program, as well as a sample of the official report form that must be used, appears on pages 77-79 in October's *CQ*, with the correction that *all* observations must be reported with a time accuracy of plus or minus *one second*. All Project OSCAR reports should be sent directly to the Project OSCAR Association, P.O. Box 183, Sunnyvale, California for analysis and evaluation.

Just to repeat a word of caution: OSCAR's beacon will operate on 145 megacycles. Its power is low (one-tenth of a watt), and its weak signal will have to travel long distances. PLEASE KEEP THE CHANNEL CLEAR. Don't be guilty of rag-chewing on a frequency that will make amateur communication history if left in the clear.

Space Frequency Allocations

The U.S. Senate recently ratified into law the 1959 Geneva Radio Regulations. This document replaces the Atlantic City Radio Regulations of 1947 which were in force previously.

The Geneva Radio Regulations have an important bearing on space communications. They allocate, for the first time, frequency bands to be used for *research* in connection with space communications. The details of the allocations are contained in the following table. The Regulations also recognize that research and development in space communications are moving rapidly toward the development of operational systems, and they recommend that a special international radio conference be held (in principle during the latter part of 1963), to allocate frequency bands for *operational* space communication purposes.

Allocation of radio spectrum for space research. All bands allocated are shared with other services. Note that a "gigacycle (gc)" is equivalent to 1,000 megacycles.

10,003-10,005	kc	1700 - 1710	mc
19,990-20,010	kc	2290 - 2300	mc
39,986-40,002	kc	5250 - 5255	mc
136 -137	mc	8400 - 8500	mc
183.1-184.1	mc	15.15-15.25	gc
400 -401	mc	31.5 -31.8	gc
1427 -1429	mc		

Note that there is no allocation for space communications research on 108 megacycles. It is understood that all future U.S. satellites will use a frequency in the 137-137 mc band instead of 108 mc.

Project West Ford Fails

As reported in last month's column, a MIDAS IV satellite containing a canister of 350 million microwave dipole antennas was successfully placed in orbit on October 21. The mechanism which was to eject the dipoles into a radio reflecting belt 2100 miles above the earth's surface, however, apparently failed to operate properly. Radar and optical searches have failed to locate either the belt, or the container in which the dipoles were packaged. No announcement has yet been made concerning the possibility of another Project West Ford attempt.

American Shortwave Listeners Club

James J. Howard, in a recent letter to the Editor of this column, states that there is an important role to be played in space communications by the radio amateur's "listening brother"—the s.w.l. (The Editor heartily agrees with Mr. Howard. For example, s.w.l.s listening on 145 megacycles can contribute much valuable information on Project OSCAR.) Mr. Howard points out that an organization has been formed, called the American Shortwave Listeners Club, expressly for s.w.l.s who are interested in space communications. The ASWLC already has a membership of more than 200, and publishes an interesting and informative monthly bulletin. The ASWLC would like to hear from s.w.l.s interested in space communications, especially from individuals and clubs that now have, or are planning, satellite listening posts. Additional information and a sample copy of the ASWLC bulletin can be obtained from James J. Howard, 3510 Garfield Ave., Kansas City 9, Missouri.

Transit IV-B/TRAAC

Here are the frequencies being used by the Transit IV-B/TRAAC dual satellite which was launched successfully by NASA on November 15, 1961:

Transit IV-B 54, 136.8, 150, 324 and 400 mc.
TRAAC 54, 136.65 and 324 mc.

The orbital period of both satellites is approximately 106 minutes.

OSCAR Special

Don Stoner, W6TNS, the originator of the OSCAR concept, and a longtime member of *CQ*'s Editorial staff, will be standing by at Vandenberg AFB, California to report Project OSCAR's launching. If all goes according to plan, next month's issue of *CQ* will be devoted to a special launching report, as well as to background stories concerning the project and some of the individuals to whom Project OSCAR owes its success.

73, George, W3ASK

sideband
sideband
sideband

SIDEBAND

IRV and DOROTHY STRAUBER,
K2HEA/K2MGE
12 ELM STREET, LYNBROOK, NEW YORK

SSB DX HONOR ROLL

TI2HP	258	G3AWZ	201
VQ4ERR	252	K6ZXW	201
W8EAP	246	W3MAC	201
W6UOU	243	W5KFT	201
W8PQQ	242	W1OOS	200
PY4TK	234	WØCVU	200
W2ZX	233	W1LLF	200
HB9TL	227	W3LMA	193
W3NKM	226	K2JFV	185
WØQVZ	225	WØUIJV	185
W2FXN	225	W3KT	179
K9EAB	225	DL1IN	178
K2MGE	223	K1IXG	178
W6PXH	222	W2YBO	177
W2JXH	221	W3VSU	177
VK3AHO	220	W2VCZ	175
W6RKP	219	WA6EYP	175
W6BAF	215	W2HXG	175
W6WNE	215	G2BVN	175
K4TJL	212	W2NUT	175
K5AFX	211	W5RHW	174
MP4BBW	208	K6MLS	165
K8RTW	206	W6YMV	165
ON4DM	205	W6EKZ	165
W5IYU	204	K2HEA	165

CQ SSB STICKERS AND CERTIFICATES

Worked 50
UB5WF W4UF
UA3CG GM3BCL

Worked 75
KP4GN SM5BPJ
WA2IWH WA6MAZ

Worked 100
VK4RQ W2FGZ
K9MGF K6EXO
W6NJU

Worked 125
G3CCN OD5CT
XE1CV DL4NQ
DL1IN W4OM

Worked 150
W2MAF DL1IN
DJ3CP

Worked 175
G2BVN W3VSU
DL1IN W2NUT
K1IXG

Worked 200
W1LLF

Worked 225
W2FXN K9EAB

Sixth Annual CQ World-Wide S.S.B. Contest

1200 GMT, Saturday, March 24, 1962 to
1800 GMT, Sunday, March 25, 1962

The Sixth Annual *CQ* World-Wide S.S.B. Contest will take place the last weekend in March, 1962 from 1200 GMT, Saturday, March 24, to 1800 GMT, Sunday, March 25, *with only 24 hours of operating permitted.*

There are several changes of rules in this year's Contest so please read the following carefully.

As usual, the object of the contest is to work as many stations and as many different prefixes on s.s.b. in the world as possible. (A "prefix" is considered the two or three letter/numeral combinations which form the first part of any amateur call. The following would all be considered *different* prefixes: W2, K2, WA2, WA6, 5A1, 5A2, DJ1, DJ2, etc.) A prefix may only be worked once during the contest! (See this month's DX column for full particulars).

The contest is open to all sidebanders in all parts of the world and all authorized amateur frequencies may be used.

Here is a major change. To return this Contest to the status of a strictly DX contest, contacts between stations in the same country will not count, except for the prefix multiplier. In other words, U.S.A. stations *cannot* count other W/K/WA stations for points but they may work W/K/WA stations for the 23 different prefixes in use in this country ("W" calls in 10 districts; "K" calls in 10 districts; WA2, WA4, and WA6 calls, making 23 prefixes in all at the time of this writing. As other WA calls are added in other districts, they, of course, count as separate prefixes.) For purposes of this Contest, Alaska, KL7, and Hawaii, KH6, count as separate countries. See the Rule on Scoring for additional information on points.

Another change in the rules this year is that the *same* station may be worked *once* on each band for purposes of accumulating points and therefore you must submit separate log sheets for each band worked. For example, if you work HB9TL on 20 meters, you may also work him again on 10, 15, 40, and 80 meters, adding

It's a toss-up as to who deserves the title of "Mr. DX". Is it Don Chesser, W4KVX, left whose weekly news bulletin is so eagerly awaited throughout the world, or Buck Joyner, W4TO, right, who, quietly, courteously, and effortlessly, has worked more DX than most of the DX brass? Both men set operating examples that we would all do well to follow.

the proper points each time. As mentioned before, however, once you have worked the HB9 prefix on any band, you cannot count it again.

Only one transmitter may be in operation from any station at any one time and *only the licensee of the station may operate* (except at a club station where one duly-designated club member may operate at any one time).

You will note that the time span of the Contest has been changed this year and for a very good reason. Due to changing propagation conditions the Contest time has been changed to give U.S. stations two full early morning DX periods for the higher bands and one full night of operating for the lower bands. This will give everyone a chance to work more DX at the best openings under today's conditions. The time indicated covers 30 hours but, as usual, a participant must not operate for more than 24 hours. The six hours of non-operation *must be consecutive*—at the beginning, end, or any six hours during the middle of the contest—and must be *clearly designated* in the Contest log. Contestants may, of course, operate less than 24 hours if desired. Logs not indicating a 6 hour silence period will be disqualified!

Scoring

The Contest exchange shall consist of the usual Q and S-report, followed by the serial number of the contact. For example, the first contact might be 59001; the 67th contact would be 58067, etc. *All times must be entered in GMT!*

The following points shall be used for this Contest:

	Points 10, 15, & 20	Points 40 & 80
Contacts Within Own Country (KH6, KL7 count as separate country)	0	0
Contacts With Different Country on own continent	1	2
Contacts with Different Country on Different Continent	2	4

Final scores are determined by multiplying the *total* number of points achieved on all bands worked by the total number of different prefixes worked.

The operator's name, address, call, rig, power input, total number of points, total number of prefixes worked, and the final score *must* be indicated on a *separate sheet* attached to the front of your log.

Awards: The K2HEA-K2MGE Trophy will be awarded to the highest scoring operator in the Contest.

The W2SKE Trophy will be awarded to the highest scoring W/K operator in the Contest.

The W8YIN Memorial Trophy will be awarded to the highest scoring W/K operator *using less than 175 watts.*

International good will was solidified during this get-to-gether at the Long Island, N.Y. home of Fan, WA2GZP, and Jim, K2AKK. Seated, left, Clyde, XE1IG; Dick, XE1GGA. Standing l. to r., Dave, XE1RE; Fan, WA2GZP; Henni, WA2DLK; Jim, K2AKK; and Raoul, K2AOS.

Certificates will be awarded to the highest scoring contestants in each of the U.S., Canadian, and Australian call areas as well as in other countries from which log returns indicate a minimum of three participating stations.

Log forms are available upon receipt of a large self-addressed envelope, with double postage for either air or surface mail, sent to *CQ* SIDEBAND Editors, 12 Elm Street, Lynbrook, New York.

To be eligible for mention, logs must be returned *directly* to the *CQ* SIDEBAND Editors at the above address no later than May 30, 1962.

The CQ World Wide S.S.B. Contest and You!

Lest we be guilty of a misleading impression, let us hasten to tell you that Bill Leonard, W2SKE, Contest Operator Extraordinaire, mulled over last year's Contest rules and last year's results and came up with the foregoing changes in the rules. We have not the slightest doubt that Bill's suggestions will improve the contest many times over. Further down in the column, you will have the unique opportunity of reading Bill's thoughts on 40 and 80 meter DX operations; words which will open a whole new world to you. Most sidebanders who are interested in DX confine themselves to the lower frequencies—the tried and true 10, 15, and 20 meter bands—mostly because they don't know how or where to work DX on 40 and 80. We prevailed upon Bill to share the fruits of his contest experiences with you and are very grateful for the thorough explanation which he sent along.

When the Sixth Annual S.S.B. Contest comes along in March, it will be interesting to see how deteriorating conditions affect the scores. Last year, Olliver, ZS5JY, stole a march on everyone by bringing the championship to South Africa. Through superb operating, Olliver amassed a total of 80,456 points, truly an astounding feat in view of the poor conditions that prevailed. Close on his heels was Bob.

Never mind about the chap on the left of the above photo; look at the doll on the right! She's Charlene, KØBJK of St. Louis, Missouri, who, in the past few months, has become internationally famous on sideband. The OM? Why, He's Chester, WØNFA who certainly needs no introduction. What a signal comes out of their station!

W2VCZ, who came within a stone's throw of copping the winner's crown for the U.S.A.—the first time any W station was that close to the winner's circle. Well, we know now that conditions won't be any better; they may be worse! That doesn't mean, though, that you should give up too easily. There will be many more DX stations on the bands; it's up to each one of you to dig for them. And now's as good a time as any to start preparing those who prefer ragchewing and phone patching to contest operation. It is our suggestion that a little common sense be employed by everyone. Contestants should try to restrict their activities to the frequencies between 14.300 and 14.350 for the period of the contest while those not interested in the contest should hie themselves below 14.300. In this way, the age old bitterness of contestants unwittingly landing on top of a ragchew or phone patch or of a ragchewer opening up with a loud "CQ" right on the frequency of a much sought after DX station will be avoided. Yes, we know that the frequencies are open to all and, no, we're not trying to dictate who should operate where. But doesn't it make sense that "to each his own" and that some order should arise out of the chaos?

DX contests under poor conditions provide everyone with a challenge to get the most out of their power and antennas. They are not, as some people would like to think, a fruitless way to spend a weekend. Serious operators are able to evaluate changing conditions on the basis of the contacts made with various areas throughout the world. For newcomers, contests afford a great amount of excitement, activity, and competition—good, healthy competition that encourages them to improve their stations and their operating procedure. So this is a plea to non-contest operators; move down out of the active contest area; you'll enjoy your operating more and the DXers can have their day!

80 and 40 Meter S.S.B. DX

BY BILL LEONARD, W2SKE

The number of stations using s.s.b., inside and outside the U.S. is increasing just about as fast as the number of sunspots are declining. In both cases there is literally no immediate end in sight. And so amateurs who switched to s.s.b. because, among other things, it made DX easier to work, are finding DX *harder* to work. The fault is with the sunspot cycle. No system of modulation on earth is going to open up ten meters when it retires for a four year nap a year or two from now (its pretty sleepy already). Three years from now, and for a couple of years after that, fifteen will be behaving like ten does today, like a pouting child. And good old reliable twenty, once a wonderful 24 hour-a-day treasure trove will be strictly, very strictly a daylight DX band.

But all is not lost.

As every good c.w. DX man knows, 40 meters is open for DX to one part of the world or another on the average of *15 hours* a day. And on s.s.b. in spite of all the obstacles of broadcast interference and jammers which make the 7200-7300 segment a cacophony of screeches during the evening hours, DX can be, and indeed *is* being worked.

Eighty meters in many respects is even better for s.s.b. DX. For the next half a decade it will open for intercontinental DX for long periods virtually every winter evening. Hundreds of trans-Atlantic and trans-Pacific QSOs take place every evening.

To give some idea of what s.s.b. can accomplish on these bands, during the *CQ* WW DX contest K2GL worked some 30 countries on 40, including SU, UA, VK, ZL and literally dozens of Europeans. On 80, W1BU worked WAC on s.s.b. in *3 hours* last winter and worked more than a score of countries during the recent contest. VE stations just below 3800 kc take part in nightly roundtables with British and Western Europe hams. Signal strengths are sometimes above S9 on both ends.

It is true that working DX on 40 and 80 is more difficult than on the higher bands, but the satisfactions are greater, too, and above all, they may be the *only* open bands for days on end in the years to come. And in the upcoming s.s.b. contest the premiums for low frequency DX make it essential for serious contestants to get the most out of 40 and 80.

Here's how.

40 Meters

If hams had an exclusive world wide band in the 40 meter region, phone DX contacts would be as common as they are on c.w. But even fighting the broadcasters and the jammers it can be done. Best frequency for U.S. sidebanders is 7296 upper side band. European stations generally operated between 7050 and 7100, upper or lower sideband. Toward dawn (U.S.) many of the broadcast stations and their jammers have shut down.

Then the normal s.s.b. channels toward the 7200 end of the band are best. Pacific stations (VK, ZL, JA), work W's on lower sideband and they operate in the 7100-7200 region.

Forty meter signals tend to peak when it is dawn or dusk at one end of the path and darkness over all or most of the path (same for 80, for that matter). A couple of hours either side of 0000 GMT is frequently the peak time on 40 for U.S.-Europe contacts. 1000 to 1200 GMT is usually optimum on the transpacific path from the Eastern U.S.A.

Power isn't so important (it still helps) on 40 but a good low angle radiator is. Most can't afford a two or three element beam on 40, ideal as it may be, but some who can afford one lose a lot of effectiveness by lack of height. A forty meter beam (or dipole) up 30 feet is like a twenty meter antenna up 15 feet.

Best all round practical DX antenna for is probably a ground plane. Radials can run every which way as long as there are at *least* three of them and they resonate at a frequency somewhat lower than the operating frequency (35' feet of wire for each radial works out pretty well.) Anyone with a 35 foot (or higher) tower can use it to support a fine 40 meter groundplane by suspending the vertical from a short wooden boom extended out from near the top of the mast.

If a groundplane is out of the question, a slanting dipole supported at one end by the tower is usually better for DX than a horizontal dipole of the same height as the highest end. The dipole should be as close to the vertical as possible, with the bottom end far enough off the ground to remove the danger of it being touched by curious children. The bottom end should be pointed in the most favored DX direction.

On forty meters, except at contest time, there are a few DX stations regularly listening for U.S. s.s.b. stations. Europeans tend to be very discouraged at the thought of listening through all that 'crud' on the high end. Best way to test out your station for DX on 40 is by scheduling a European via an original contact on 20, or by 'checking in' on 7296 where the most DX minded sidebanders hang out during the evening. It is not unusual for DX stations who are legally able to operate above 7200 to call in on 7296.

80 Meters

Fred, W1FRR, Sam, W1FZJ and a couple of other New Englanders are currently the leading practitioners of DX black magic on 80 meters. 3805 plus or minus a couple of kc, lower sideband, is the accepted hangout for these stations and DX stations listen there. Every night a dozen or more European stations are available in the region just below 3800 (down to about 3750). African stations operate on about 3695.

A good receiver, preferably with *Q* multiplier, is a must on 80. Getting across isn't the problem for most U.S. stations. *Hearing* the DX is! Spend a couple of evenings after supper listening carefully in the region just below 3800. Chances are you'll hear VE's working G's. If you can hear the DX you can work it. Period.

Beams and groundplanes are impractical for most hams on 80. Long wires and extended double Zepps work well if they are high enough (most of them aren't). Sam Harris, whos as expert at l.f. DX as he is at u.h.f. swears that a dipole suspended 30 degrees from the vertical with the bottom end pointed in the desired direction gives the best angle of radiation for DX on 80. This requires quite a tower. But by using your existing tower its possible to keep the major radiating portion of the dipole at the desired angle. Vertical and semi-vertical dipoles with one end near the ground tend to resonate at the desired frequency when cut somewhat shorter. (3-5%) than formula.

Another practical method of stringing an 80 meter dipole keeps the current portion of the antenna, which does the radiating, up as high as possible. This is the familiar inverted V. Some hams have had success with a variation of the inverted V that keeps a small section at the center of the antenna high and horizontal. A wooden boom is secured crosswise to the tower as high as possible extending perhaps 8 feet either side of the tower. The antenna is hung from insulator on either end of the boom.

But don't be scared away from trying 40 or 80 meter DX with whatever hunk of wire you now have hanging or can put up in a weekend morning. When conditions are good, and they're getting better all the time, low frequency DX is really no trick at all.

Sideband Around the World

The latest count of Bryan Bisley's ham calls is twenty-one (21)! Anyone know of a more-licensed ham? . . . Northern Rhodesia now boasts another sideband—Art, VQ2AT, who's using an HT-32 to drive a KW-500 watt linear. Art's QSL manager is Jim, WA6HOH, and we bet that Buggy, VQ2AB, is happy to have the pressure off himself for VQ2 sideband contacts . . . Phil, VS9APH, gave a happy moment to Reg, W3HQO, when he identified himself as the same chap who had met Reg personally at their local radio club meeting when both lived in England. They had lost contact with each other over the years so you can imagine what a nice reunion they had over the air from two widely separated locations . . . Dennis, EI6F, is a new EI6 now on sideband . . . Carlos, XE1CV, did a wonderful job while on his DXpedition to Socorro Island in November. Using the call XE1CV/XF4, Carlos made many a sidebander happy by the smoothness of his operation. With many standbys for non-W stations and by listening district by district for the U.S.A. boys, Carlos covered many log sheets in apple-pie order . . . Bill, DL4NQ, has his own special brand of TVI. One evening, Gene, DL5CY, and family were watching TV when they not only heard Bill's

The Three Musketeers of Sideband, Leon, W7EH; Henry, W9AK; and Merv, K9SFU, ex-9BJA, who as long ago as ?, used to play cylinder recordings over the air to each other. Still enthusiastic about amateur radio, these three gentlemen are now active on sideband and wonderful contacts all.

You'd never believe that this lovely gal is the mother of six children and an active sideband as well. She's Hilda, CT1YE, who, with OM Tony, CT1EY, has been dispensing sideband contacts from Portugal with great charm. Hilda is one contact worth getting into a pile-up for! *(Photo courtesy of W6WNE)*

audio but actually saw him on their TV set! Bill and his family were shown on a local Frankfort TV show during which Bill demonstrated sideband!

Ed, HK3LX, has asked us to pass along the information that he has answered all the requests for the HKØTU QSLs received in his shack. Ed sent out about 80% of the 4,200 possible QSLs but had to return a number of cards because he could not find them in the log at the time indicated. (We thought everyone knew by now that GMT is the only time that should appear on your QSLs!) Ed confirms what a hard task it is to be a QSL manager, especially for a very active DXpedition like the HKØTU operation, and mentions that he will appreciate everyone's cooperation. So if you have not received your card, either the time you indicated was wrong (your local time means nothing to a QSL manager!) or you failed to send a request, preferably with a self-addressed envelope and IRCs to HK3LX do so immediately . . . Pete, DL5HI, has been keeping us up-to-date on European sidebanders whose numbers are increasing daily. Pete reports that Bert, GI4RY, and Frank, GI6TK, seem to be the most active sidebanders from Northern Ireland while Sim, EI9Y, after many years on c.w., has also joined the *vox populi* . . . Leo, UA3CR, is planning to send the portable transmitter to UA1KED in Franz Joseph land in January. We can hear the pile-ups already! . . .

Congratulations to Alex, ZS6ARL, and his XYL, who became the very proud grandparents of a beautiful little girl during the summer months . . . Rumor has it that Ian, ZL4JF, is back on Campbell Island; this time with an s.s.b. rig and a 75S-1. Up to now, no one has mentioned working him and you can't keep that kind of news quiet if Ian were active . . . Finn, LA6VC, makes all too rare appearances on sideband because c.w. is still his favorite mode. Guess that must apply to many DX stations formerly active on sideband—the QRM must be too much for them . . . We heard Raju, VU2NR, confirm that he has the licenses for AC3NRM and AC5NRM but the band changed before we could learn when his DXpedition would take place. Keep your ears open—this is too hot to miss . . . Angus, 5N2AMS, took on all comers when he opened up from Dahomey as TY2AA in November. The din must have been terrific as the fellows spread out for about thirty kc to try to snag this new one. There seems to be an increasing tendency to use an unwarranted number of frequencies for new DXpeditions. A spread of ten kc would be more in keeping with good operating practices . . . Attie, ZS6AMV, wants the news spread around that he is keen to work WAS-YL and would appreciate YLs looking for him. From what we've heard on 21.440, Attie has a head start toward this award!

We hear tell that the Ontario Sideband Dinner in November was a huge success. About 112 sidebanders attended the affair, including W2ZYD, W2RXM, W2UZL, K2JOI, and W2QLK. At this writing, no details from the Chairman of the Dinner but we hope to learn more . . . We're still trying to help Walt, K6GMA, locate Jim, VS4JT, who seems to have dropped completely out of sight. Jim's cards had been efficiently handled by Walt in years past but no log, no QSLs. It is believed that Jim might have gone to Malaya from England so if any of the 9M2 boys are in touch with Jim, please drop a line to K6GMA . . . Another QSL manager who has lost contact is Harold, W6BAF, who would appreciate word of the whereabouts of VS1JV.

Everyone is wondering what Hallicrafters and W2B1B have been planning in the way of a rare DXpedition. An announcement was to be forthcoming so we'll be just as interested as you are to learn what's up! . . . Looks like amateur radio activity is increasing all over the world. Now it's Belgium which has run out of ON4 calls and issuing ON5 calls to new licensees . . . Listen again for Louis, 9G1DP, as XT2Z. He's due back in Upper Volta in December. Hal, K4TWF, is handling Louis' cards . . . The hoped-for DXpedition to Navassa Island was postponed until January or March due to a change in ship's schedules . . . We wish you all good DXing!

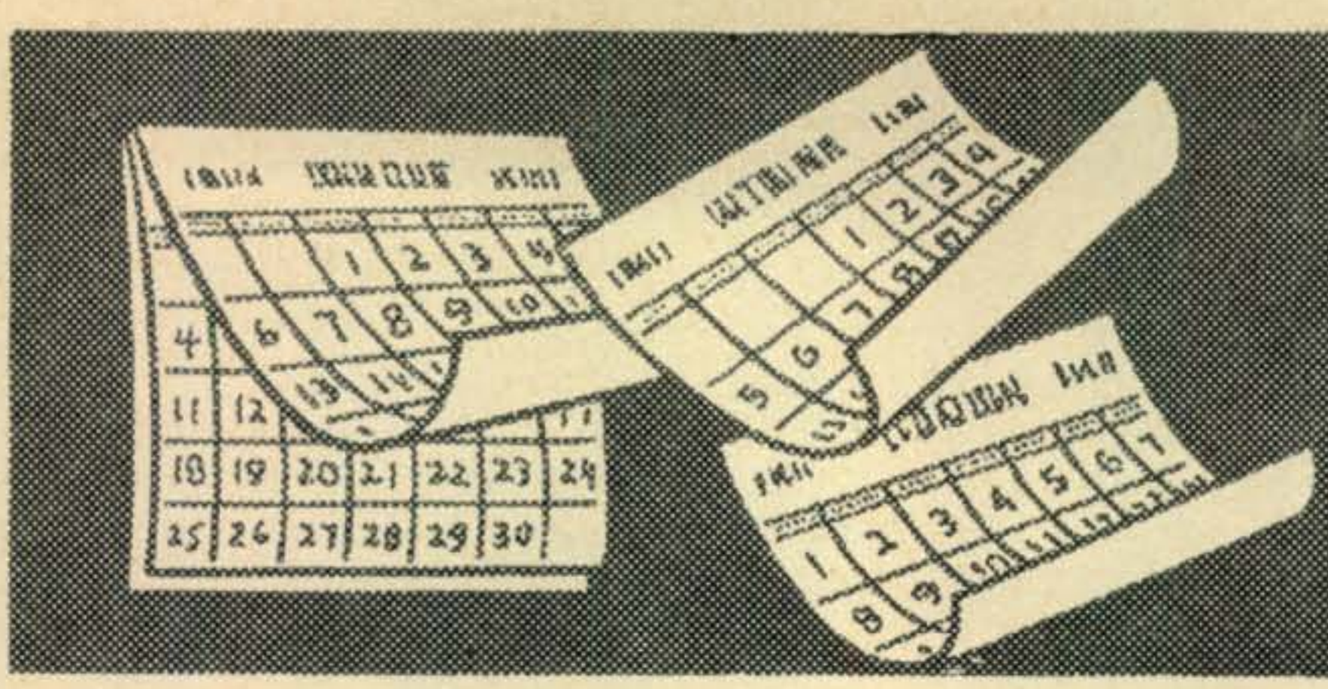
Band Hopping

Nighttime conditions have given many of us a chance to get better acquainted with the locals on 20 or explore the possibilities of 40 and 75. We finally got our rig to work okay on 75, got up a dipole, and it sure is nice to work the old gang again. Steve, W2CWB; Herb, K3LNA; Bernie; W9HTF; Vern, K4BG, (in a surprise appearance from 40 meters); Frances, W4KYI, and Jack, W4SIB, whom we last enjoyed on a.m. five years ago; and a host of others made it feel like "Old Home Week"! To add to the enjoyment, Hal, HR3HH, added his bit of DX magic to 75 and he mentioned that probably more of the Central and South American regulars would soon be on the band. . . . If you hear W2WSP/VP9, that's Dino, late of EA8BA. How does he manage to pick all these tropical paradises from which to operate? . . . Les, W5LYT, of Los Alamos, has finally decided to accept that Fellowship at the University of London and will be going abroad early in the New Year.

All hams were shocked to learn of the great number of their brethren who were burned out in the tragic California fire in November. The famous Henry's—Ted, W6UOU, and the Meredith, W6WNE—were among those who lost their homes but we have no doubt that they will rise above this catastrophe in short

[*Continued on page 88*]

"Take it easy; the longer you live"—that's the theme of Dr. Ben, PAØXZZ, of Amsterdam, who delighted Harriet, K9WUR by sending her this honest photo of his "not cleaned" shack. Dr. Ben was hospitalized during the Fall but we hope that the new linear built up for him by Albert, PAØPRF, speeded up his convalescense. *(Photo courtesy of K9WUR)*



CONTEST CALENDAR

FRANK ANZALONE, W1WY
14 Sherwood Road, Stamford, Conn.

Calendar of Events

January	13-15	ARRL CD C.W.
January	13-14	DARC WAE
January	20-21	New Mexico Party
January	20-22	ARRL CD Phone
February	2- 4	ARRL DX Phone
February	9-11	QCWA QSO Party
February	16-18	ARRL DX C.W.
February	24-25	*CQ* 160 C.W.
*February	24-25	REF C.W.
February	24-25	YL-OM Phone
March	2- 4	ARRL DX Phone
March	10-11	B E R U
March	10-11	YL-OM C.W.
March	16-18	ARRL DX C.W.
March	24-25	*CQ* WW DX SSB
*April	14-15	REF Phone
*April	14-15	Helvetia 22
April	21-22	*CQ* W.W. V.H.F.
April	28-29	PACC C.W.
May	5- 6	PACC Phone
*May	5- 6	USSR DX

(*) denotes events that have *not* been officially announced.

DARC WAE

Starts: 0600 GMT Saturday, January 13th
Ends: 2400 GMT Sunday, January 14th

This is the seventh European WAE Contest and this year the dates have been a source of confusion. Originally it has been booked as the 3rd week-end in January. That would make it the 20/21st and this was confirmed by information released in the DARC magazine. However a belated rules sheet just received has the dates indicated above, the 2nd week-end of the month. Confusing? Wait until you try to work Europeans thru the ARRL CD chatter scheduled for the same week-end.

There are no indications of any changes in the rules from last year. It's still a c.w. contest only and the object is for non-European stations to contact as many European stations as possible.

Rules:

1. All bands, 3.5 thru 28 mc c.w.
2. The usual six digit serial number, RST plus a progressive three figure QSO number starting with 001.
3. One point per QSO, except on 3.5 mc where it will count two points. (Same as the WAE certificate rules.)
4. The same station can be worked once on each band.
5. The multiplier for non-European stations is determined by the number of European countries worked on each band. (Using the WAE country list.)
6. European stations will use the ARRL country list. In addition, each call area in the following countries will also count one point; CE, JA, PY, VE/VO, VK, W/K, ZL and ZS. Also UA9 and UAØ count separately.
7. The final score will be the QSO points, plus the QTC points, multiplied by the sum of the country points on all bands.

QTC Traffic:

A QTC can be sent only from a non-European station to a European station. The general idea being, that after a number of European stations have been worked, a list of these stations can be sent back during a later QSO with another station. An additional credit of one point can be claimed for each station reported.

1. A QTC contains the time, call and QSO

Here are a few claimed scores from our Phone World Wide DX Contest. Remember, these are only a *few* of the early returns and are *not* final scores. We have to check them all.

Single Operator

All Band

5A3TY	189,826
YV5AGD	167,824
W1ONK	153,837
K5MDX	153,833
W2VCZ	144,540

28 Mc

VP6AM	12,064
W2QKJ	4,462
K5SBN	4,407

21 Mc

W2WZ	31,980
I1ZLW	27,405
DJ1ZG	14,490
SM3VE	11,515
I1CMA	9,145

14 Mc

DL5HI	114,121
KH6DLD	102,179
KX6BU	84,150
MP4BBW	83,032
KA2JL	75,194
G3KXA	71,500
PY2EJ	56,560
KZ5LC	49,650
OD5CN	48,114
EP2AG	43,056
K2IEG	39,673
K1RTB	30,358
W8KIA	26,448
W6EKZ	25,110
W3JTC	23,688
XW8AS	9,350

7 Mc

K2GXI	2,680
K2DGT	2,280

Multi-Operator

Single Xmtr

CO8RA	56,875
W8NGO	42,765

Multi-Xmtr.

K2GL	319,144

number, *i.e.:* 1200/DL1FF/123. This means that you worked DL1FF at 1200 GMT and received his number 123.

2. A QSO can be reported only once, and not back to the same station, even though the contact was made on another band.

3. No more than a maximum of 10 QTC's can be sent to the same station.

4. Keep a uniform list of QTC's sent. *i.e.:* QTC 3/5. This means that this is the third series of QTC's sent and that 5 QSOs are now being reported.

Classifications:

There are two classifications, Single operator and Multi-operator.

Awards:

Awards are made on the basis of all band operation only. Certificates will be awarded to the highest scorer in each country or country/district. There will also be an award to the top station in each continental area. In cases of sufficient participation, second and third place awards will be considered.

Although time is very short it is strongly recommended that contestants write to the DARC for official log forms. Send a large self-addressed envelope and include 5 IRC's for Air Mail.

Mailing deadline for logs is March 31st and they go to: The DARC DX Bureau, Post Box 333, West-Berlin-Rudow, Germany.

New Mexico

Starts: 0800 MST Saturday, January 20th
Ends: 2000 MST Sunday, January 21st

This is the third annual New Mexico QSO Party and offers an opportunity to those interested to earn credits toward WAS, Worked New Mexico Counties and the Sandia Base Friendship awards.

1. No time limit or power restrictions. All bands can be used and the same station can be worked once on each band.

2. Scoring: New Mexico stations; 1 point per contact, multiplied by the number of States, U.S. possessions, Canadian provinces and Foreign countries worked.

Outside stations; 3 points per each New Mexico station worked, multiplied by the number of New Mexico counties worked.

The same station can be worked once on each band for point credit but not for multiplier.

3. Your log should show in this order: Time, station, QSO NR, RST or RS, and state, possession, province or country. (New Mexico stations will indicate their county.)

4. Certificates will be awarded to the 4 top scoring stations in New Mexico as well as the highest scoring station in each State, Posession, Canadian province and Foreign country. There are also special certificates for multi-operator stations and the highest scoring U.S.A. station.

5. Frequencies to watch: 3600, 3835, 7050, 7250, 14080, 14250, 21050, 21300, 28100, 28600, 29000 and 50.28 mc.

Logs must be postmarked no later than February 20th and go to: The CHC Chapter #1, Att: John C. Kanode, K5UYF, 408½ Cornell Drive, SE, Albuquerque, New Mexico.

QCWA

Starts: 2300 GMT Friday, February 9th
Ends: 2300 GMT Sunday February 11th

This is the fifth Annual QSO Party sponsored by the Quarter Century Wireless Association. Altho open to QCWA members only it offers an opportunity for non-members to contact QCWA members and fatten their total for the K6BX QCWA awards.

Members of course will submit their logs and be eligible for the QCWA Plaque donated by the National Headquarters. This award goes to the station contacting the most members and is finally retained by the member who wins it three times.

There is no point scoring or multiplier involved, just see how many different members you can contact on all bands, phone and c.w.

To make it easier for the judging committee, your log should show in this order, time in GMT, contact number, station worked, RST or RS report, QTH, name and QCWA membership number.

The activity will usually be found around these frequencies: c.w.: 3540, 3655, 3790, 7005, 7030, 7100, 14100, 21110 & 28110 kc. a.m.: 3810, 3950, 7230, 14240, 21340 & 28900 kc. s.s.b./l.s.b.: 3804, 3999, 7204 & 7299 kc. s.s.b./u.s.b.: 14300, 21410, 21440 & 28690 kc. RTTY (if any): 7105 & 21140 kc.

For those members located East of the Mississippi River logs should be sent to: Stearns Poor, W1PO, 128 Mill Street, Hanover, Mass. For those on the West side of the Mississippi your logs go to: Edward Washburn, W2RG, 6748 Rogers Avenue, Merchantville, N.J.

CQ WW 160

Starts: 0200 GMT Saturday, February 24th
Ends: 1400 GMT Sunday, February 25th

This is the third Annual *CQ* 160 meter c.w. contest. Previously this was a contest limited, for the most part, to W and VE entrants. However, so many of the DX brethren from other lands have made their wishes known to extend this affair to completely include them that from now on we shall do so.

In last year's contest a total of 805 stations in 44 States (including Hawaii), Newfoundland, Nova Scotia, Quebec, Ontario, Saskatchewan, Alberta, British Columbia, Cyprus and England participated.

Rules

1. It is a c.w. contest *only*.

[*Continued on page 90*]

The USA-CA Program

BY CLIF EVANS*, K6BX

THIRTY-SIX USA-CA applications representing 16 states and 6 ARRL countries have been received as of November 11th as we go to press. Those whose applications arrived within the date 'system' for determining a number *one* series include: (not final total)

USA-CA-500

K1BUR	W8IBX
W1GKJ	W8NAN
K2PFC	W8WT
†W4UF	K9EAB
W5AWT	WØMCX
K5DGI	KH6DKA
W5NXF	KL7MF
W5PSB	PJ2AF
K5UYF	TG9AD
K6SXA	VE3BKL
W6YC	Andy Rugg, SWL
K6YMZ	

USA-CA-1000
K4BAI

The foregoing closes out the number *one* series of USA-CA awards for the entire U. S. and countries represented. Applications from many parts of the world have not yet had time to arrive and permitting assignment of final numbers, which, for the number *one* series will be determined by lot; following which numbers thereafter will start at the sum total of all number *ones* under the fair play 'system'.

Other USA-CA-500 applications, in order received, include †W6PCA, W5AWT (new class), W5AWT (new class), WØARO, WØARO (new class), W2FLD, W8CXS, K8EUX, W3DKT, †W4RNS, WØ1UB, †W1YPH, and W6BIL. K7NHG came in for the number *two* USA-CA-1000.

Many Chagrined

From hundreds of letters received and the OLD MAN's experience, it is obvious that too many of us took it for granted that with all our shoe boxes filled with QSLs that USA-CA-500 was in the bag, and were chagrined to find when the 'chips' were counted, too many were repeat performances from highly populated counties. OLD MAN K6BX was one of those boastful souls who just knew he'd be up there among the number *ones* but after processing around 6,000 QSL cards received since 1957 (all destroyed before that time), came up with a disappointing total of 457 counties to join the horde of other chagrined 'also rans'. We, like others, are now thumbing back through records, and QSLing missing counties as possibly we should have done in first place.

On the basis of the foregoing we can only be amused when some joker writes he could spend several dollars for USA-CA-Record Books to get the USA-CA-3079 Special Honors Plaque as though it was just around the corner in a few years. As the OLD MAN told you, USA-CA is not just an award to be knocked off in a short burst of effort; USA-CA is a lifetime Program of hobby, fun, learning and satisfying pleasure. The tremendous scope of the Program is such that many of us OOTCers and even OTCers might just not be around long enough to take that Plaque to ham Heaven with us, not that we won't try.

Many folks have written that while going through stacks of QSLs searching for new counties, it was worth a college course in U.S. Geography. Others, like the OLD MAN, were pleasantly rewarded by finding qualifying cards for applying for several previously overlooked awards already won but among the missing.

QSLs and QSL Card Failures

For the past year or so the League and almost every other "authority" has been pleading that hamdom awaken to significance of the QSL and 'intelligence' it should convey. Even so, a too high percentage of QSL cards in present use display almost total ignorance on the subject.

It has been repeatedly proclaimed that a QSL card is the final courtesy of a QSO and that a bond of fraternal friendship has not been sealed until we have exchanged confirmation QSLs which fulfill so many of our hobby-pleasure needs. Certainly, there are some among us who just don't 'bother' to QSL. Also there may be some who are not stirred with some feeling of gratitude or appreciation upon receipt of QSL cards. Let's hope the number who do not hold QSLing a courtesy, number a small minority.

The great majority of hams the world over find deep pleasure in receiving QSL cards. Most, actually seek such cards for confirmation data for the thousands of awards offered for

*United States of America Counties Award Custodian, Box 385, Bonita, California

†YL's

operating achievements. It is of little consequence whether or not any individual is interested in awards; he owes it as a common courtesy to respect the needs of fellow hams by at least returning a QSL courtesy received.

That brings us to the basic intelligence a QSL should convey if it is to be of reasonable "value" to a recipient. Needless to say, most any one appreciates obvious effort to enhance esthetic value; however, beauty without reasonable intelligence more often is a disappointment. Let's summarize minimum basic intelligence that a QSL card should provide: Fact is, let's take a sample of what constitutes a noteworthy attempt at realistic QSL card design. See picture of KH6DKA's QSL card.

Note KH6DKA's QSL card data flows like a story. Note one does not have to search from back to front or otherwise for KH6DKA's full QTH. Note he gives info on past calls held and background data on rig used. Note he names his county. Note only GMT time/date are used. Note KH6DKA lists Clubs and organizations with which affiliated, and amateur awards won, and importantly, he separately lists those awards available to others for which his card is a credit. The OLD MAN opines that those who are fortunate enough to receive KH6DKA's card get much pleasure in the story it tells and thereafter feel a closer fraternal friendship for Bill. Fact is, Bill's QSL carries enough intelligence that from it alone a journalist could concoct a feature story. It is just a case of why sell either yourself, or your over-the-air friends, short.

KH6DKA's QSL which exemplifies a well-designed card giving intelligence of a nature that it comprises a story and becomes of considerable value to recipients.

As a final comment on QSLs, let's remember that for years, over half of U.S. states had all county awards and now with the advent of USA-CA, counties of all 50 U.S. states are represented. Remember also that most all major countries have awards for working their equivalent counties. Germany has their DOKs, Sweden their Laans, Russia their Oblasts, France and Canada their Provinces, England their Counties, Japan their Prefectures and New Zealand their Branches . . . with similar Geo-political subdivisions in most countries. Today, a QSL card which does not identify such County, Laan, etc., is usually a sad disappointment to a recipient and forces him to seek such information from other than the sender of the QSL card.

Arizona Celebrates Statehood

In celebration of 50th year of statehood, the state of Arizona is making available an Arizona Semi-Centennial Certificate for contact with 35 Arizona stations during the year 1962.

The Arizona Development Board and the Arizona Amateur Radio Club are jointly sponsoring the Centennial Certificate which will be certified by the Arizona ARRL SCM and signed by the Governor of Arizona. We will try to bring you a picture of the award at a later date.

To get the Arizona award, send list of 35 Arizona stations worked; certified by two other licensed amateurs or a radio club officer, to the Arizona ARC, P.O. Box 7155, Phoenix 11, Arizona. There is no charge and QSL cards are not required to be sent. List should provide complete log data.

The Arizona Centennial will cause amateurs in that state to be highly active during 1962 and provide good opportunity for others to win the "Worked All Arizona Counties Award" and the "Worked All Tuscon Award". The WAAC is sponsored by the Arizona SCM for working all 14 counties. To get this award send the 14 QSLs and return postage. The WAT requires contact with 15 different Tuscon stations for U.S. hams and 10 for others. To get the WAT send list with full log data and SASE or one IRC to The Old Pueblo RC, P.O. Box 2014, Tuscon, Ariz.

Needless to say, the Arizona Centennial activity during 1962 will help build up many "rare" counties toward the USA-CA. For Arizona map and counties, refer to a USA-CA Record Book.

Georgia Rare County DX-P's

As most awards hunters know, Georgia has an all county award which requires working *all* 159 counties even though half of Georgia's counties are not populated with hams. Your scribe has received hundreds of letters complaining that such requirements are ridiculous because even an obsessed person couldn't work all of Georgia's counties in a normal life time. We've got news for you; at last report, second hand, we learned that sponsor's XYL has won the Georgia all county award.

Needless to say, hams all over the world are irked about the Georgia award and refusal of its one-man sponsor to modify rules. DXers are especially incensed and as a result the Public Relations of all Georgia hams is suffering. Well, several Georgia hams are attempting to repair some of the PR damage by making regular DX-P's to "rare" Georgia counties, not to help towards the ridiculous afore-mentioned award but to help hams the world over to work new Georgia counties for USA-CA credit.

Dick Brandt, W4SVJ and DX-P companion Jack Dixon, K4MYC are living examples of

the fun and pileups to be experienced by so-journeying into rare counties with most every week-end a holiday. Dick and Jack are with the Air Force, and when they get off alert they like to head out to new 'frontiers' of field-day fun. They use a Cheyenne TX and a HQ-170 RX into a Mosley vertica' trap antenna for operations on 10, 15, and 20 meters. An Onan Power Supply provides the juice. A look at Dick and Jack's past schedule gives indication not only of ham fun enjoyed but interesting places visited.

Dick, W4SVJ, showing reaction to pile up while operating from rare Glynn County, Ga. (See pic of K4MYC) Dick said the Confederate flag was for protection!

Field Day Schedule: (1961)

26-28 May: Summer cabin at Bear Cove, near Bryson City in Swain County, N.C.

4 July: Intersection Highway 18 and 49 South of Gray, Ga., in Jones County, Ga.

9 July: Lake Sinclair in Putnam County, Ga.

16 July: Intersection Highway US 41 and Ga. 49 in Peach County, Ga.

29 July: Jeckyll Island State Park, Glynn County, Ga.

30 July: Hazelhurst, Jeff Davis County, Ga.

2 Sept: Operating from top of Clingmans Dome, Smoky Mountains National Park, Sevier County, Tenn.

3 Sept: Black Rock Mountain State Park, near Clayton, Rabun County, Ga.

4 Sept: Carters Ruby Mine, near Franklin, Macon County, N.C.

A letter from Dick just received says that he will continue the DX-P's throughout the Winter months and in 1962. Dick comments, "The Ga. Award is ridiculous and useless to even try for. I have not been able to comply with their unnecessary requirements that QSLs must be mailed from the county claimed because I make out the QSLs on my return to Base. What difference does it make as long as the QSL specifically states the location and county at time of contact?" Your scribe can only agree with you Dick.

While many of us cannot take time out for as many week-end Field-Day trips as have Dick and Jack, their excursions do point up the potentialities of increased fun to be enjoyed by locating in a rare county for Field Days rather than sticking around an overpopulated home county. Oh yes, we don't have a future sked for Dick and Jack because they are just like vagabonds; however, we've found out that when they are on 'location', they are quite active on 14080 c.w. from 2000 to 2300 GMT.

Jack, K4MYC, operating portable with Cheyne TX, HQ-170 RX, Mosley 10, 15, 20 meter trap antenna and Onan Power Supply from Jeckyll Island State Park in 'rare' Glynn County, Ga.

Don't Scorn Me Humor

A recent Canadian award is the "Borderline Friendship" for contacting each Dominion of Canada and each U.S. state with common borders, after Jan. 1, 1958, plus one contact with the City of Sault Ste Marie., Ontario or Sault Ste Marie, Mich. The Algoma ARC which sponsors the award, listed the following Dominions and states: Canada; N.B., Que., Ont., Man., Sask., Alta., and B.C. States: Maine, N.H., Ver., N.Y., Mich., Minn., N.Dak., Mont., Idaho and Wash.

The purpose of the award is to commemorate the strong mutual bond of friendship between U.S. and Canada. We won't dispute the friendship and the following is just 'Don't Scorn Me Humor'.

In good humor, CHCer KL7MF in his application for the award chided the sponsor for omitting the biggest state of the U.S., Alaska, which has a 700-mile-long common border with British Columbia. (Copy to K6BX) Needless to say, KL7ME added Alaska to his application for good measure.

Well now, as the old saying goes—Turn the other cheek. When K6BX started making out his application he chided both KL7MF and the "Borderline Friendship" sponsor for slighting Canada's Yukon which also has a common border with Alaska approximately 700 miles long. K6BX's application included both Alaska and the Yukon and we are standing by for sponsor changes in *Directory* listing, also in good humor.

To get the "Friendship" award, send list certified by two other licensed amateurs or radio club official stating that cards were sighted, and

$1 or 10 IRC to VE3EOV, 18 Laurentian Dr., Sault Ste Marie, Ont., Canada.

We suggest that when others apply for the "Friendship" award that they add the approximately 1400 additional miles of "Friendship".

Flying Hams' Club

Unusually high interest is being shown in the Flying Hams' Club sponsored by the Directory of Certificates. At the time *CQ* announced the FHC with picture of membership certificate in September, 1961 issue, the Club had 150 members. Today there are over 300 members and the club members are highly active in aeronautical mobile operations. New memberships have been coming in at the rate of one a day.

The FHC has an awards program of its own with awards for working various numbers of members, members from states, countries and zones in various classes, even including space contacts for future possibilities.

There always has been high interest in aeronautical mobile contacts but until the club was founded, little publicity could be coordinated covering this fascinating area of operations. *CQ* in November issue 1961, carried the story of "Deep Freeze" and the scheduled aeronautical mobile operations throughout the U.S. and the entire Pacific on to the South Pole. This is indicative of what the future holds in prospect for those interested in this exciting aspect of amateur radio.

Membership certificate of the Flying Hams' Club sponsored by the *Directory of Certificates* to promote greater interest in aeronautical mobile operations on a world-wide basis. K6BX is Secretary.

Many hams are not aware that U.S. military and Coast Guard aircraft are permitted to operate amateur radio under certain conditions and that such aircraft are now flying worldwide most every day. Many of the radio or radar operators and even flight engineers and navigators are hams. FHC gives Full Life Membership to Pilots and Associated Life Membership to Crewmen. In the case of military aircraft it is usually a crew member who has opportunity to operate aeronautical Mobile. Many of the FHCers use special A/M QSLs indicating the nature or area of their operations. WA6NPW/AM's QSL pictured, is a good example. For full info on FHC, drop

QSL card of FHCer WA6NPW illustrating both the R4D-8 type of aircraft from which he operates aeronautical mobile and his 'home' grounds, the Mediterranean. Ed favors 15 meters.

K6BX an s.a.s.e. or see the *Directory of Certificates*.

New Mexico

Don't forget the New Mexico QSO Party sponsored for January 20-22. See full details in December *CQ* issue. Word received that CHCers W5CK and K5UYF will operate from Torrence County during the QSO Party.

Advanced word from the CHC Chapter #1, Albuquerque, N.M., is that negotiations are being made at Governor's level for sponsoring an Arizona Statehood awards program for 1962 commemorating New Mexico's 50th year as a state. Hope to have final word on this awards program by next issue but, in the mean time, go after those N.M. counties.

New Mexico is going all out in 1962 to sell the state to the world via ham radio. The Amateur Radio Caravan Club of New Mexico, Albuquerque Chapter, has announced the "Duke City Mobile Award" for working 5, 10, 15, 20, or 25 Mobiles operating in the City of Albuquerque and/or Bernalillo County, or with a permanent resident of these two Areas operating Mobile outside the county. For further details on this award see the *Directory of Certificates* or write the Club, c/o W5WZK, 3813 Los Arboles N.E., Albuquerque, N.M.

[*Continued on page 100*]

Award issued by the Amateur Radio Caravan Club of New Mexico for working Mobiles. The Caravan expects to make many excursions to rare N.M. Counties.

RTTY

BYRON H. KRETZMAN, W2JTP
300 W. 43 ST.
NEW YORK 36, N. Y.

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc.

80 meters	3620 kc
40 meters	7040 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.6 mc

HAPPY New Year! Hope Santa left a Model 28 in your Christmas stocking; or, at least a Model 14 TD. Our mail bag tells us that MARS is still releasing Model 15 and Model 19 Teletype machines at a prodigious rate, all earmarked for radioteletype use. Many, we hear, are being turned over to MARS members with the stipulation that they be put on the air within a specified time. The letters all cry, "Help!" They are generally from fellows who suddenly realize that *CQ* is the only amateur radio magazine with a regular RTTY Department, and they are caught with their subscription down. (*Now is the time to subscribe, fellows!*) Since six and one-half years of back issues are hard to come by, the next question is, "What book should I read on RTTY?" The answer to this is, the *New RTTY Handbook*.

The New RTTY Handbook

The *New RTTY Handbook*, announced in the November RTTY COLUMN, was put together by your RTTY Editor to fullfil the need for a ready reference on this newest and particularly fascinating phase of amateur radio. Sure, if you have been subscribing to *CQ* continuously since the August 1955 issue, you *can* dig through back issues, but here is the way to have all the necessary information at your finger tips, as well as some constructional dope on equipment never before published. If you've ordered yours and haven't received it, please be patient. (The office has been swamped.) If you *haven't* ordered yours, send $3.95 to *CQ*, 300 West 43rd Street, New York 36, New York, and it will be mailed to you, postpaid.

Keyboard Arrangements

With the large numbers of Model 14, 15, and 19 machines getting into ham hands these days, a considerable number of questions arise concerning the keyboard and type arrangements. "What have I got and what should I have?" This is the big question. The biggest objection, naturally, is to the commercial keyboard and type with fractions instead of punctuation marks. The fractions type arrangement is made for stock market quotations, and the machines having this arrangement generally come from a Bell system operating company.

Machines obtained through MARS, of course, are those that were used by the military, and the big objection is to those supplied with the weather symbols instead of punctuation marks. Figures 1 to 6 show these standard type arrangements. After we describe the various arrangements we will tell you where to get the right one for RTTY operation and how to make a change.

Figure 1, the Communication type arrangement "FX", is the one that is most likely to appear on a Bell system Model 15 printer or the Model 15 perforator-transmitter of the Model 19 tape set. (The figures *H* MOTOR STOP function is disconnected for RTTY operation.) Note that the zero (figures *P*) prints the same as the letter *O*. The blank key, just to the right of the LINE FEED key, may or may not appear on the keyboard of the machine.

Figure 2, the Weather Symbol type arrangement "FD", most likely came from a Bell system company that provides weather bulletins, perhaps for the FAA. This arrangement is used on the Model 15 page printer, the Model 15 perforator-transmitter of the Model 19 tape set, and on the Model 14 keyboard perforator. Note that no MOTOR STOP function is provided, and that the zero prints the same as the letter "O".

RTTY The Hard Way... No. 7

"No . . . the name isn't Jake and no . . . I don't know anything about the fifth race at Santa Anita!"

Fig. 1—Communication Keyboard, Type Arrangement "FX"

Figure 3 is the Communication "JX" arrangement most adaptable to RTTY operation, and is most likely to be found on the military versions of the Model 15 page printer and keyboard, and the Model 15 perforator-transmitter of the Model 19 tape set. (The TG-7-( ) is the military field version of the Model 15 page printer and keyboard.) This arrangement is identical to the "FX" arrangement except that the zero (figures *P*) has the slant bar through it.

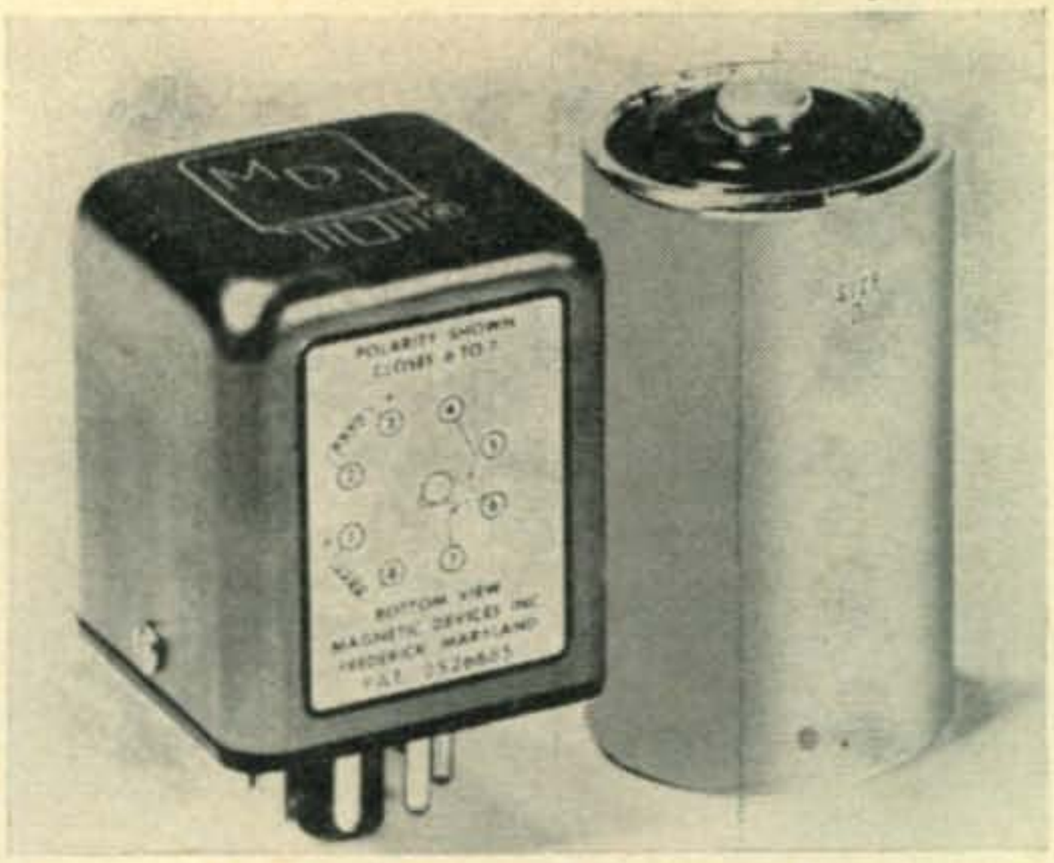
Fig. 2—Weather Symbol Keyboard, Type Arrangement "FD"

Figure 4 is the Communication arrangement "JU" and is used on Model 14 keyboard tape perforators used on systems (land line) employing the MOTOR STOP function for motor control. It was not intended that the figures *H* MOTOR STOP mechanisms would respond correctly when the figures *H* combination is transmitted automatically from tape. (Incorrect operation would result.) Therefore the figures *H* keytop position has been left blank as a reminder that it should not be perforated in tape.

Fig. 3—Communication Keyboard, Type Arrangement "JX"

Figure 5 is the Weather Symbol arrangement "KQ" and is found usually on military versions of the Model 15 page printer with keyboard,

Fig. 4—Communication Keyboard, Type Arrangement "JU"



New, small size, polar relay, made by Magnetic Devices, Frederick, Maryland.

the Model 15 perforator-transmitter of the Model 19 tape set, and on the Model 14 keyboard perforator. It is identical to the "FD" arrangement except that the zero (figures *P*) has the slant bar through it.

Fig. 5—Weather Symbol Keyboard, Type Arrangement "KQ"

Figure 6 is the Communication arrangement "KH" and is found usually in military versions of Model 14 keyboard tape perforators used on systems (land line) employing the MOTOR STOP function. It is identical to the "JU" arrangement except for the slant bar through the zero (figures *P*). Like the "JU" arrangement, the figures *H* keytop has been left blank as a reminder that this character should not be perforated in tape.

Fig. 6—Communication Keyboard, Type Arrangement "KH"

Changing Type Arrangements

Replacing keytops is simply a matter of pulling off the old ones and snapping on the new ones. A glance at the type basket of a Model 14 or 15 printer might cause one to hesitate changing the type as each type slug is soldered to the typing arm. Changing these soldered-on type slugs is not as difficult a procedure as it might seem. The main requirement is that you should use a good 100 or 200 watt

soldering iron. A soldering gun is not recommended for this job.

To remove a type slug, block the typing arm out where you can work on it. Heat up the arm, just below the slug itself, until it loosens, then slide it off. While the arm is hot wipe it clean of solder with a cloth. Now, slide the new slug on and tack-solder it in place. Unblock the type arm and check its striking position on the paper to see that the printed character lines up correctly with the rest of the type. If it doesn't, heat up the arm and move the slug slightly. Be careful not to get the iron on the type slug. Once the slug is properly positioned on the typing arm, solder it permanently in place. Don't use too much heat!

If you wish to change your type arrangement it is suggested that you order the "JX" arrangements of keytops and slugs. These may be obtained from several sources, among them, W2ZKV, W3CRO, W6AEE, W7HRC, W8DLT, W9GRW, and WØNOY.

A.R.T.S.

The "Amateur Radio Teletype Society" and the "VHF Teletype Society" of Woodside, New York, are no longer in operation, having gone out of existence with the death July 28th of John E. Williams W2BFD. One of the earliest pioneers in amateur RTTY, John Williams had in recent years withdrawn from active RTTY operation and had concentrated on the procurement of machines in the name of the above "societies." Much of his correspondence he wrote under the name of "Art Fleming," by the way. No books or records of "society" operation were found, according to the lawyer who handled the estate.

One of John Williams' few associates in the latter years was Clay Cool W2EBZ who published the "ARTS Bulletin." According to W2ODA, Clay died June 18th in Carlstadt, New Jersey.

Stacked in several stores, used as warehouses by John Williams, were large amounts of teleprinter and associated equipment. There were several hundred Model 12's and Model 26's; *and*, about 1,500 keyboards for the Model 15. All of this was auctioned off. Some of it was bought up by a few local hams and the rest by a junk/surplus dealer. The local hams who bought quantities will eventually make it available to others. By next month we should have more information along these lines.

New RTTY Frequency for Forty

For a good many years now, RTTYers have been unhappy operating around 7140 kc. A nearby (in frequency) foreign broadcast station, running megawatts, has bothered RTTYers ever since f.s.k. became legal on forty meters. In the midwest, band conditions seemed not to be nearly as bad as they are on the east coast. Reports from the west coast indicate that considerable QRM is experienced there. Some RTTYers have slid into the novice portion above 7150 kc, trying to get away from the QRM. This, quite naturally, has not endeared us to the novice gang. It has been agreed that 7040 kc be used instead. This means that RTTY nets would normally operate on 7040 kc and random operation would take place between plus and minus 10 kc. What do *you* think? *(Drop me a postcard and let us know. We will then publish the results of this informal survey.)*

Bits, Here and There

W2BVE of Maywood, New Jersey, has Model 14, 15, and 26 machines to go with his W2PAT Terminal Unit, and is about to build the W5BGP TU. W5JHQ of LaCoste, Texas, wants to f.s.k. his 32V-2.

W6CQK, toroid, polar relay, and filter supplier of Redwod City, California, is moving to Venezuela to work. W6NTK, Box 426, Oakhurst, California, will take over Jack's business. W6AEE of the RTTY Society, Inc., of Southern California, reminds me that their RTTY Bulletin is now $3 per year. *(It's worth twice that.)* Send your subscription to 372 West Warren Way, Arcadia, California.

W7TCK, the Helena (Montana) CD and club station, has 3 Model 15's, 2 Model 14 TD's, and 2 Model 14 Typing Repreforators to use with a DX-100. W7WWG reports that the Portland (Oregon) RTTY group, sometimes called the Northwest RTTY Club, is looking for a new name. Chuck Mitchel, W9THE, 450 N. Lake Shore Drive, Mundelein, Illinois, is the Kleinschmidt specialist. K9OEF of Broadview, Illinois, has a Model 12 ready to go on a.f.s.k.

VE6WT has built a W2JAV TU to go with his Model 15. G2UK reports that LA1NF is promoting RTTY in Norway, and has Lorenz and Siemans machines. *(C.C.I.T. speed, no doubt. See last month's* COLUMN.*)* YV1EM of LaSalina, Venezuela, is getting set for RTTY with the aid of W6CQK.

Comments

Would you like to see a picture of *your* RTTY ham shack in *CQ?* Well, it's really very easy. Just mail it to the RTTY Editor, *CQ* Magazine, 300 West 43rd Street, New York 36, New York. It doesn't have to be a large fancy one, either, nor do we need the negative. Simply mail a glossy print; anything up to 8" by 11".

If you have written to the RTTY Editor and your answer seems to be delayed, please be patient. As announced, your RTTY Department is moving back to W2-land. In addition, several business trips overseas are expected. We promise to answer every letter as soon as possible. (Don't forget the self-addressed and stamped envelope.)

73, Byron, W2JTP

ham clinic

CHARLES J. SCHAUERS, W4VZO
c/o CQ, 300 WEST 43rd ST.,
NEW YORK 36, N. Y.

REMEMBER the time when you could not buy a good reliable crystal for use at the higher ham frequencies for under $20.00? Remember the tuned plate-grid oscillator that often sounded like a tug-boat whistle with a cold? Remember your first electron-coupled v.f.o. and the trouble you had making it settle down? If you don't, you're a relative new-comer to ham radio.

Today for less than $5.00 you can buy an excellent crystal that relieves you of one of the major ham worries—off-frequency operation. Even for frequencies in the 220 mc or 420 mc ham bands, a good overtone crystal performs when even a temperature compensated and voltage regulated oscillator stage needs constant checking.

A crystal, if used in the circuit it was designed for, will operate on ham frequencies at the manufacturer's stated tolerance, as long as environmental temperatures are kept within a reasonable bounds.

Any frequency controlling circuit is affected by temperature changes.

Broadcast, TV and other commercial stations *do* use crystals for frequency control. To maintain a frequency within 20 cycles requires a thermostatically controlled crystal oven. Some hams who have the patience and test equipment have achieved some remarkable stability with minimum drift in their v.f.o.s; but regardless of what they do, they cannot approach the accuracy of a crystal operating in a well-designed circuit. Of course, by well-designed is meant that attention has been given to proper component selection and placement, the control of temperature effects on sensitive circuits by thermal shielding etc.

The "care and feeding" of crystals requires knowledge that takes study and expe-rience.

"How come the surplus crystals I bought at a real bargain do not work in my circuit?" is a question often received by HAM CLINIC. Or: "say, in checking the frequency of a crystal I got the other day I found that its plus or minus .01% accuracy is way off—why?" And: "the manufacturer only recommends 125 volts on the plate of the oscillator tube used in his overtone circuit. I tried 200 volts and she perks fine—why is this?"

Another question that seems to bother some new-comers is: "is it cheaper to grind and/or lap my own crystals?"

Answering the last first, an emphatic *no* is the answer. Making one's own crystals can be done and is a lot of fun—for those who have the time and patience. But those of us who remember the days when we had to do our own remember the hard, long and frustrating hours it took to come up with a crystal which would finally work.

For *precision* crystal work a manufacturer needs a large number of *special* tools and instruments. To make a reliable crystal from the raw quartz requires a conoscope, diamond filled copper bladed saw, X-ray machine, etching bath, dicing saw, lapping machine, edging machine, chemical bath, temperature test oven and finally an electronic test bench. These, more or less are used in the order given.

New techniques developed by the larger crystal manufacturers make "mass" production *nearly* possible, but each crystal must be treated as an individual unit and handled as such.

Considering the engineering and work involved in making a crystal by today's modern methods, the current price charged is inexpensive. Even if the price was doubled today's crystal would still be a bargain.

Roughly handling a crystal is the surest way to make it inoperative. Hermetically sealed crystals are impervious to dirt and air moisture but they can be damaged by heat extremes, dropping or using them in a circuit where higher than recommended voltages are used.

Some surplus crystals work fine if they were hermetically packed when stored during or immediately after World War II—or they were disassembled, cleaned and tested prior to sale. Rubber seal gaskets used in most surplus crystals have deteriorated in many instances and allow moisture to creep into the holder proper.

Crystals used at the higher frequencies are thin and cannot stand much current nor can they be mechanically shocked. On the other hand, fundamental crystals in the low frequency ranges (100 kc etc.) are pretty thick and sturdy.

The first impulse of the young ham when he has oscillator trouble is to disassemble the crystal. This is murder—crystal murder. If he

is lucky enough to get the crystal back into its holder in *clean* shape he may encounter mounting and pressure trouble. Before sending the crystal back to the manufacturer for repair, the young ham should try another crystal.

If you *must* remove a crystal and want to clean it, first scrub the crystal in warm soapy water with a tooth brush. Then soak the crystal in a 1½% solution of ammonium hydroxide. After this, rinse it thoroughly in running water. The next step is to remove the water; this is done by placing the crystal in acetone or pure solvent which will combine with water. Then allow the crystal to dry in a warm air stream. Finally, rinse the crystal in a good grade solvent, handling the crystal with tongs. Allow the crystal to air dry (by evaporation) twice. Never use a cloth directly on the crystal. Holder parts are cleaned the same way but these may be dried in an oven set at 320° F. (160°C.)

Most reliable crystal manufacturers supply suggested circuitry for their crystals. They know the parameters which give the best possible operation, *i.e.,* static capacitance, series capacitance, inductance, voltage across the crystal, series resonance, anti-resonance and crystal activity or performance index. Circuits other than those recommended by the manufacturer may be used, but of course at the risk of the buyer.

In general, crystals are usually tested in a specific oscillator circuit designed to present a *specific* capacative load to the crystal. The manufacturer will tell you what this load is in micro-microfarads. If you follow his suggestion you'll find that the crystal will take-off (oscillate) well, have good output and will stay within the tolerance set by the manufacturer (all other parameters being equal).

This month we present the circuits recommended by International Crystal Manufacturing Co., Inc., of Oklahoma City, Oklahoma.

Figure 1 shows the recommended circuit for use with their 5th and 7th overtone crystals above 60 mc. Incidentally, any triode tube

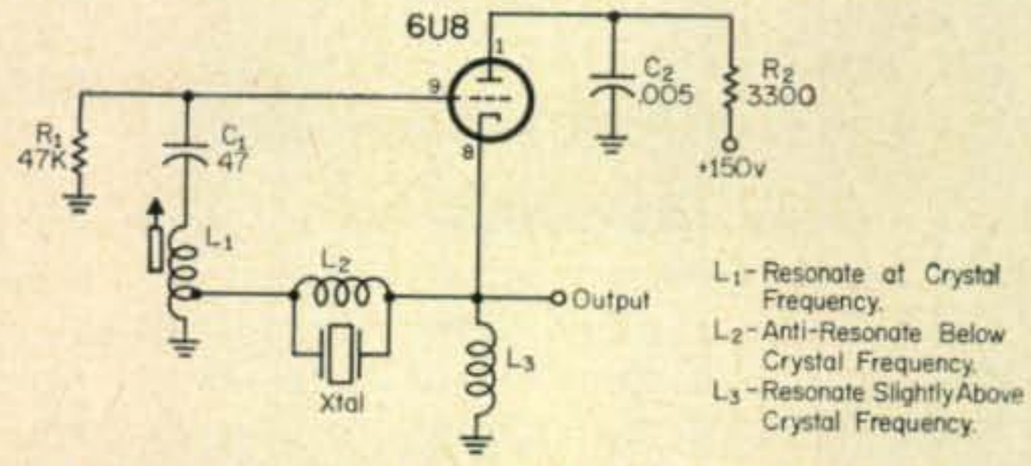


Fig. 1—Recommended circuit for use with International Crystal 5th and 7th overtone crystals above 60 mc.

having inter-electrode capacitances within 1 or 2 mmf of those of the triode portion of the 6U8 may be used. However, it is recommended that you stick to the 6U8 for its pentode section can be used as a buffer-amplifier.

For use with 3rd overtone International crystals, the circuit in figure 2 is recommended. Note that the grid resistor can be varied in value for optimum operation.

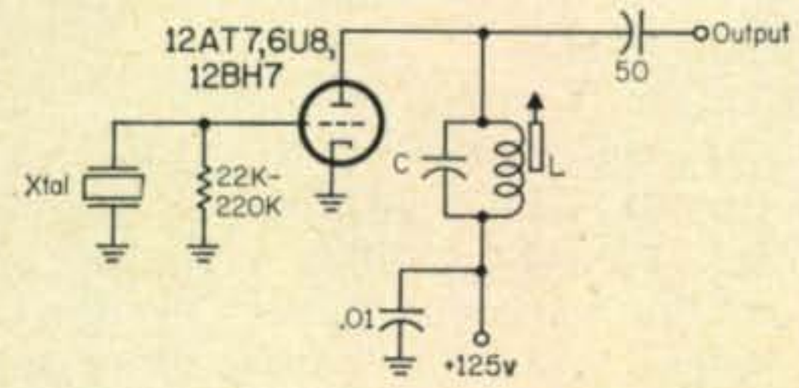


Fig. 2—Circuit for use with 3rd overtone crystals manufactured by International Crystal. This circuit provides reasonable output with the greatest stability. Use of other circuits may result in crystal heating and subsequent damage.

The circuit given in figure 3 is for use with International fundamental crystals. This circuit will work with any fundamental crystal.

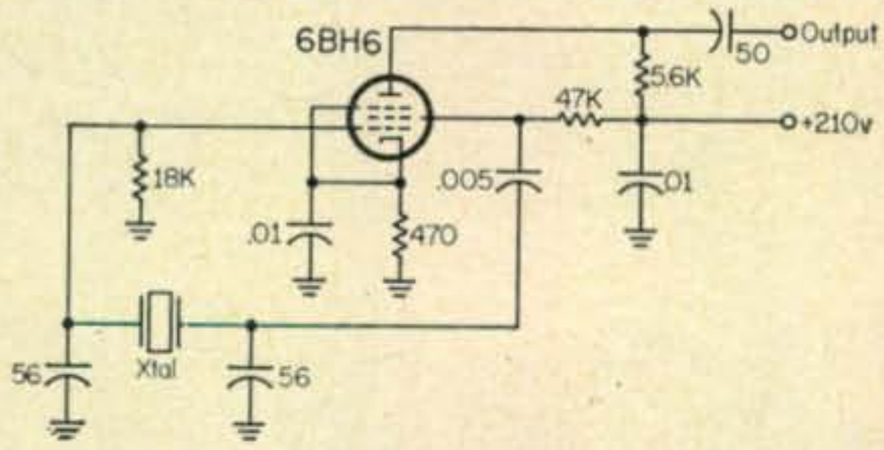


Fig. 3—This circuit is suggested by International Crystal for use with their fundamental frequency crystals. The load capacitance in this circuit is 32 mmf. See table I for the effects of higher or lower load or shunt capacity upon the accuracy of fundamental frequency crystals.

Table I, taken from an International Crystal Bulletin shows how crystal frequency varies with load capacitance.

As the circuits recommended for use with crystals of other manufacturers are made available, we will gladly present the information here.

Observation

As we all know, seldom does a manufacturer of radio tubes design them specifically for amateur radio use. Usually, industrial and military requirements serve as the impetus for a new type tube design. Of course, the amateur and amateur radio equipment manufacturers

Table I

Load Cap.	50 mmf	32 mmf	20 mmf	10 mmf
MEASURED	1999.950	**2000**	2000.060	2000.200
FREQUENCY	2999.800	**3000**	3000.200	3000.600
IN	3999.700	**4000**	4000.400	4001.000
KC	6999.200	**7000**	7001.200	7003.300
	13998.000	**14000**	14003.100	14008.100

Frequency variations of fundamental frequency crystals caused by variation of load capacity. The figures shown are for International Crystals. These crystals are calibrated for a load capacity of 32 mmf (bold face).

benefit from the research and design efforts of all tube manufacturers.

A case in point is RCA's wonderful little tube, the Nuvistor. Here is a tube that hams the world-over had been waiting for. Now used in receivers, converters and even miniature transmitters, the second million of these tubes are on the production line.

What makes the Nuvistor attractive to the ham is its use in v.h.f. and u.h.f. circuitry with spectacular success.

One of the Nuvistor series in which the ham should be interested is the RCA 7587, a sharp cutoff tetrode. Although primarily designed for industrial applications, it is a general purpose tube and is particularly suitable for r.f.-i.f. mixer service and in wide-band video amplifier circuits. It has a very high transconductance at low plate current (10600 micromhos at 10 milliamperes!). Its filament only requires 6.3 volts at 150 milliamperes and as a class A_1 amplifier will operate at 125 volts plate and 50 volts screen voltage. Its plate dissipation is around 2.2 watts maximum. It fits a Cinch Mfg. Co. socket No. 1336510001.

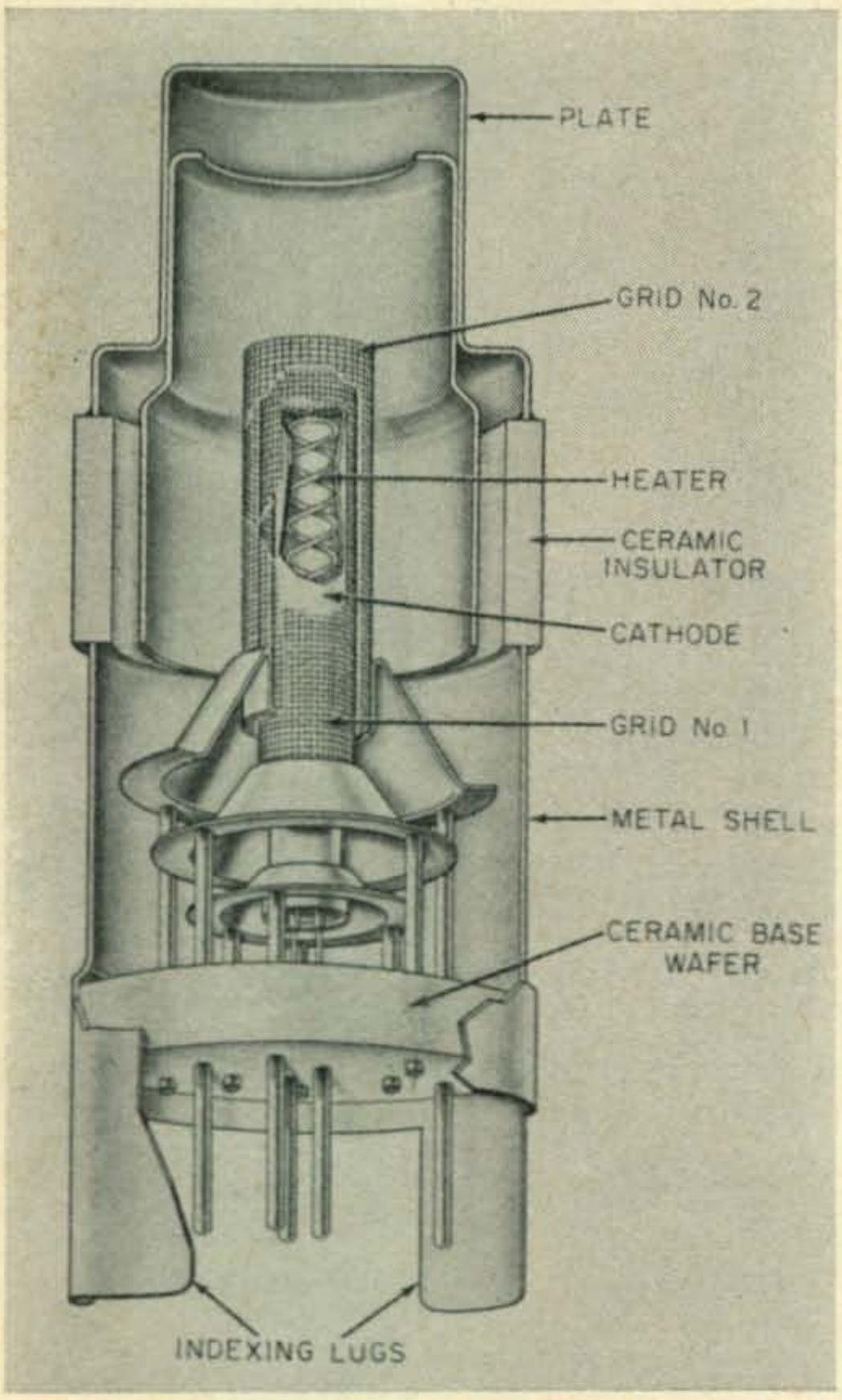


Fig. 4—Cutaway view of the RCA 7587 tetrode Nuvisor suitable for i.f., r.f. and mixer service into the v.h.f. spectrum.

Figure 4 shows the internal and external construction of the RCA 7587 Nuvistor. You can see that it is a rugged little giant.

Observed: transistors have a long way to go to catch up to the vacuum tube. As more manufacturers come out with new developments in the tube field we radio amateurs will no doubt benefit from them.

Suggested: that we hams use these new tubes and experiment with them; by so doing we can also make contributions to the research effort of those companies who have done and are continuing to do so much for the improvement of radio-electronic circuit efficiency.

Questions

S.S.B. Exciter Power—"I want to build an s.s.b. exciter-transmitter which will be used to drive a final to around 1 kw p.e.p. Is this possible with say 50 watts of power with a grounded-grid final?"

Yes, but it will depend upon the tube you use.

S.S.B. Linear—"If you were building up a small linear could you suggest a tube which would work as well as a pair of 6146s?"

Yes. Try the 6DQ6. You'll be hearing more of this tube before too long.

Scales for the HQ-120 and HQ-129X—"I understand that there is a scale available somewhere for the HQ-120 and 129X for the 15 meter band. Is this true?"

Yes. Write Hammarlund Mfg. Co., 460 West 34th St., N. Y., N. Y. I'm sure they have some left. I believe the cost is around $3.95, for an entirely new ham-band scale for these two old reliable receivers.

Galvanic Corrosion—"I live near the seashore and note that in both my receiver and transmitter that there is an accumulation of a hair-like fuzz between certain parts and wires. Is this some type of fungus or what?"

Could be. However, I am inclined to think it may be the flow of current between two dissimilar metals in an NaC1 (salt) atmosphere. Anti-fungus lacquer can be used with *some* success. In extreme cases the installation of a small piece of zinc near affected parts will work. This is a problem that has existed for years.

DX-40 to 6 m—"Whatever happened to the 6 meter conversion you were going to make on the DX-40?"

I did buy a DX-40 for the sole purpose of making the conversion. I did start it, but the move from Europe, letters from readers to answer, and a complete re-write on the Scope Book (part of the manuscript lost in transit) kept me from finishing the job. Let us hope I can get back to the promised task. In the meantime, why not try the ideas on the DX-40 to 6 meter conversion given in the August 1958 issue of *QST* on page 146, and in November and December 1956 *CQ* for the Globe Scout to 6 meters?

Transistors—"What transistor do you recommend for replacement for those found in the d.c.-d.c. power supplies by Heath?"

Try the 2N278.

Scope Monitor—I'm looking for a com-

mercial scope monitor which covers 4 to 54 megacycles that I can use with my transmitters. Would you care to make a personal recommendation? I want one which is not specifically designed for s.s.b. and which will allow me to display either a trapezoidal or envelope pattern. Can do?"

Can do. See the photo of the James Millen Mfg. Co. type 90932 monitor oscilloscope. It contains built-in link-coupled tuned circuits which cover all the amateur bands from 3.5 to 54 mc. It will show the linearity or non-linearity in Class B r.f. amplifiers, parasitic oscillation, neutralization and r.f. output. Although I do not have one, I have seen one in operation, and I think it is a good investment. The unit can also be used, with proper exterior circuitry, as a panadaptor. However this unit does not contain vertical or horizontal amplifier circuits—none are needed for the applications for which it was designed. It runs cool and uses solid state rectifiers to get the high anode voltage required for operation of the 2BP1 CR tube.

The Millen #90932 monitor oscilloscope.

Static—"Just before, during and after a rain storm, I can hear a 'click, click, click' in my receiver. About two hours after the storm has passed, my receiver returns to normal. What gives?

No doubt precipitation static. Try a Cushcraft lightning arrestor if you use a coaxial cable and at the receiver connect a quarter watt neon bulb through a 1 meg resistor across receiver antenna and ground terminals. If you are using a flat-top or doublet antenna, try connecting a piece of #18 copper wire about 8 inches long at each end so that it will hang from the flat top—this may help too. To get away from precipitatjon static, aircraft use small dissipation tails on wing tips, rudder etc.

Frequency Stability, Etc.—"When I tune or lightly tap my receiver I can hear a noise that approaches a 'ringing' in the loudspeaker. I also note that the set jumps frequency. Any ideas?"

Yes. First check your oscillator tubes for microphonics—replace them. Next check the main tuning gang for mechanical stability and for proper rotor contact. Some cases of "frequency jumping" and microphonics have been cured in *some* receivers by re-soldering connections and running a rear and front ground strap to the main tuning gang with heavy braided wire.

Ground Wire Size—"What size ground wire (diameter) should be used to cover a distance of 12 feet?"

The larger the better. I would recommend using #6 or larger.

Mercury Battery Storage—"Can mercury batteries be refrigerated as carbon-zinc cells are to increase shelf-life?"

No need to. More information on batteries in general coming up.

Magazine, etc.—"Are you still furnishing names of foreign hams to receive old magazines etc?"

No, the program is finished for the time being. If you have any old Call Books however, drop Clif Evans, K6BX, Box 385, Bonita, Calif. a line. He's still in the business of helping foreign hams on call books. Too bad there are not more hams like him around—our International relations would be much better off.

900 Watts—6 Meters—"Where can I get a diagram of a 6 meter transmitter in the high power range, 500 to 1000 watts using 4E27As?"

Try the December 1951 issue of *CQ* . . . if you have or can get one.

BC-221 Freq. Meter—"Any articles appear in *CQ* on the BC221 frequency meter?"

Sure. April 1947, August 1949, and January 1948 issues had info on the BC-221. The '48 issue covered the set generally, the '47 covered a power supply for the set and the '49 issue covered a tone modulator to be used with it for receiver alignment purposes etc.

SX-71 Improvement—"What issue of *CQ* contained information on the improvement of the SX-71 receiver?"

The September 1954 issue.

Thirty

Questions from the newcomer or Novice are welcome by HAM CLINIC. When you write, please enclose a self-addressed stamped envelope. If we cannot help you directly we will certainly tell you where you can get the information you seek.

The opinions and statements in this column are those of the author (unless otherwise indicated) and do not reflect passive or active endorsement by the publisher or any governmental or civilian agency.

If you like HAM CLINIC let the editor and fellow hams know. But if you do not, send your gripe personally to the author, it will receive quick attention.

72, 73 and 75, Chuck

Novice

DONALD L. STONER, W6TNS
P.O. BOX 137, ONTARIO, CALIF

To wind up our discussion of tubes and circulitry, let's examine the operation of the cathode follower and circuits for phase inversion.

A cathode follower is a single-stage amplifier in which the output is taken from across the cathode resistor. This circuit is essentially an impedance matching device for matching a high-impedance circuit to a low impedance circuit without discriminating against any a.c. frequencies. Its voltage output is always less than the input voltage, but it is capable of power amplification. Some of the advantages of cathode followers are low input capacitance and distortionless output.

Serious losses can result from the high input capacitance in triode tubes. This is due to the fact that the resistive load causes a leading current in the grid circuit and the plate-to-grid capacitance adds to the normal grid-to-capitance to produce a larger capacitance at the input of the triode. The cathode follower circuit (fig. 1) will reduce this capacitance to approximately 1/10th the actual value and will increase the input impedance by about 10 times.

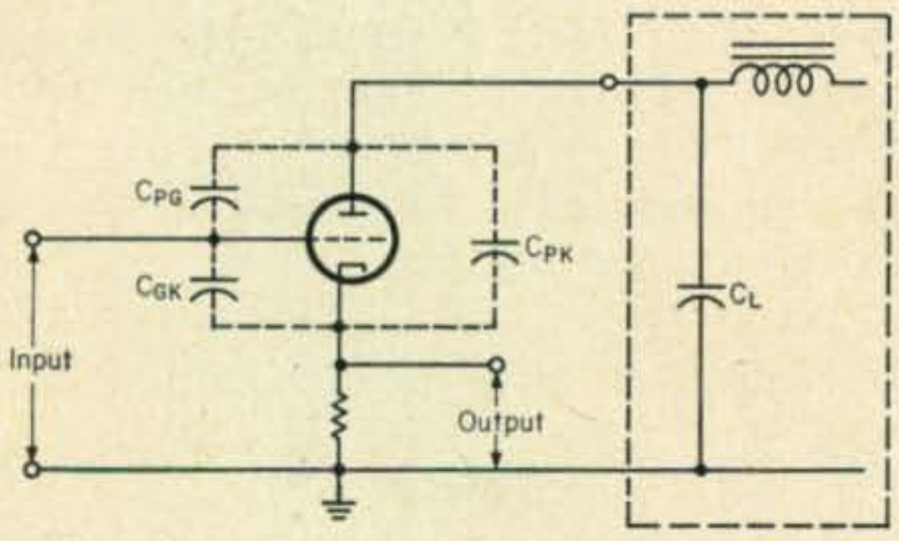


Fig. 1—The cathode follower circuit can be used as an impedance matching device. Capacitor C_L is the output filter in the power supply.

Another advantage of the cathode follower is that it introduces very little amplitude distortion into the output, since it is a degenerative circuit in which negative feedback is always produced by an un-bypassed cathode resistor and since its output is taken from across the cathode resistor and not the plate.

Three of the most important considerations in the design of cathode followers are gain, input and output impedance and size of cathode resistor. Since the gain and the size of the cathode resistor are the only variables in a cathode follower and impedance is in turn related to both, you should be acquainted with the formulas for computing them. These can be found in the *Amateur Radio Handbook*.

Now, let's look at phase inverters. A phase inverter is a circuit which produces an output voltage of opposite polarity, to the input voltage without distorting the waveshape.

Literally, the commonly accepted term, phase inverter is something of a misnomer, since phase is ordinarily associated with time and there is no appreciable time difference or phase shift between the output and input circuits of an ordinary phase inverter. Such a circuit is only an apparent phase inverter. In reality it is a polarity inverter.

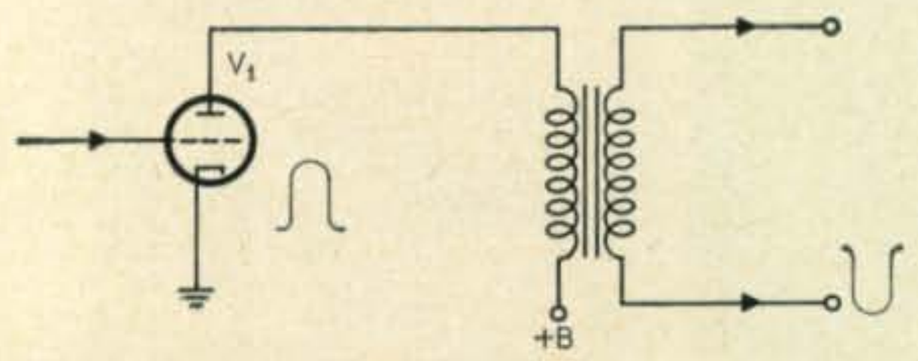


Fig. 2—Polarity (or phase) inversion can be obtained with an ordinary interstage transformer.

A simple method of inverting the polarity of a waveshape is by a transformer. To understand how a transformer inverts polarity, assume that the output wave pulse at the plate of tube V_1 in fig. 2 is positive and that tube V_2 requires a negative pulse. This requirement can be met by using the polarity inverting property of an ordinary transformer since, in all transformers, a current through the primary induces a voltage in the secondary of opposite polarity to the primary voltage. Of course, if the output or input connections of the transformer are reversed end-for-end, the output and input voltage will have the same polarity. In transformer inversion, it is clearer to think of the output as a voltage whose polarity is inverted relative to the primary voltage except when a sine wave signal is used where polarity inversion is referred to as 180° phase-shift.

Under some conditions, it is necessary to reverse the polarity of a waveform without changing its amplitude. Although a transformer may be used, it is much better to use an ordinary *RC* coupled amplifier with an un-bypassed cathode resistor as shown in fig. 3. This circuit inverts phase since any vacuum tube amplifier

connected in this manner has an output of opposite polarity to the input. In other words, a positive going signal on the grid produces a negative going signal at the plate. There is little or no amplification because of the degenerative feedback introduced into the grid by the unbypassed cathode resistor. This degeneration occurs because the cathode voltage rises as the grid voltage rises, preventing the swing of voltage between the grid and cathode from reaching the amplitude of the applied signal.

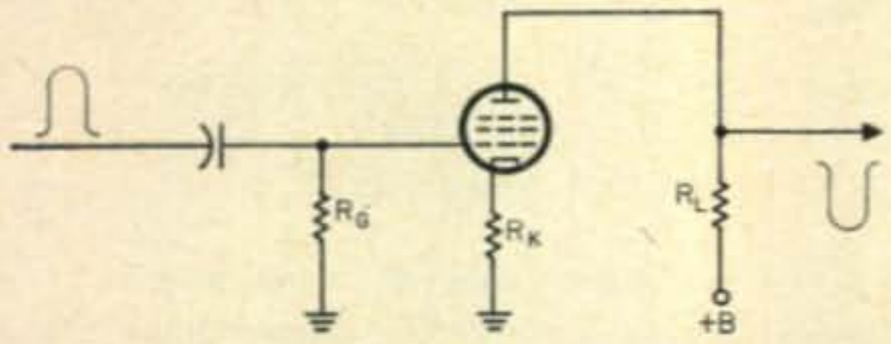


Fig. 3—Polarity inversion can also be obtained with a vacuum tube. If R_k is large enough, the stage will have little or no gain.

A paraphase amplifier is a combination amplifier and phase inverter, which converts a single input to a push-pull output. Paraphase amplifiers are used where waveshapes of equal amplitude and opposite polarity are required for operating circuits in push-pull, as in the modulator of an amateur transmitter. There are two types of paraphase amplifiers, the single-tube and the two tube paraphase amplifier.

With a single-tube paraphase amplifier, the output is taken from both the cathode and the plate as in fig. 4. The cathode resistor R_L and the plate resistor R_L are the load resistors. These resistors are equal and since the same current flows through both, equal voltages appear across them. The voltage across these resistors are opposite in polarity since the output is taken from the positive end of the cathode load resistor and the negative end of the plate load resistor.

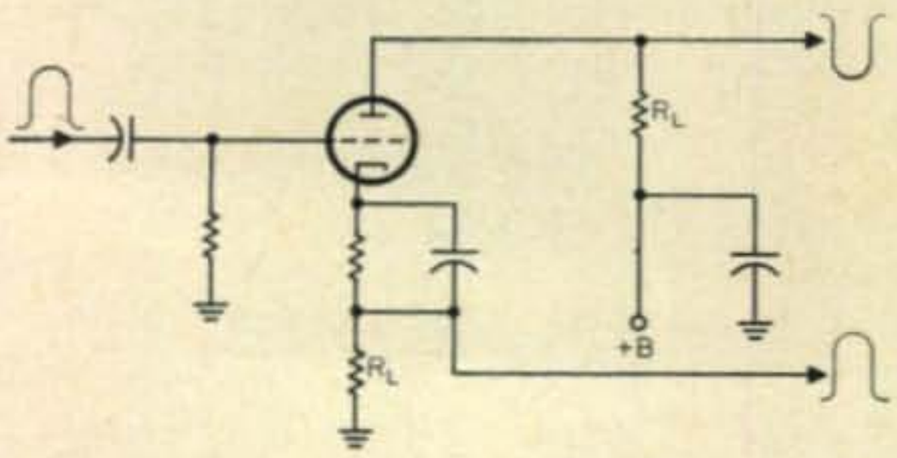


Fig. 4—A vacuum tube can also be connected to produce outputs of both polarity. This circuit is called a paraphase amplifier.

The two-tube paraphase amplifier consists of one tube which acts as a conventional amplifier and a second which inverts the output of the first tube. The two tubes in combination thus produce two equal output voltages opposite in polarity.

Fig. 5 shows the circuit diagram of a typical two-tube paraphase amplifier. The first tube, V_1 amplifies the input waveform, shown at its grid, and impresses the amplified output across the voltage divider consisting of R_1 and R_2 is

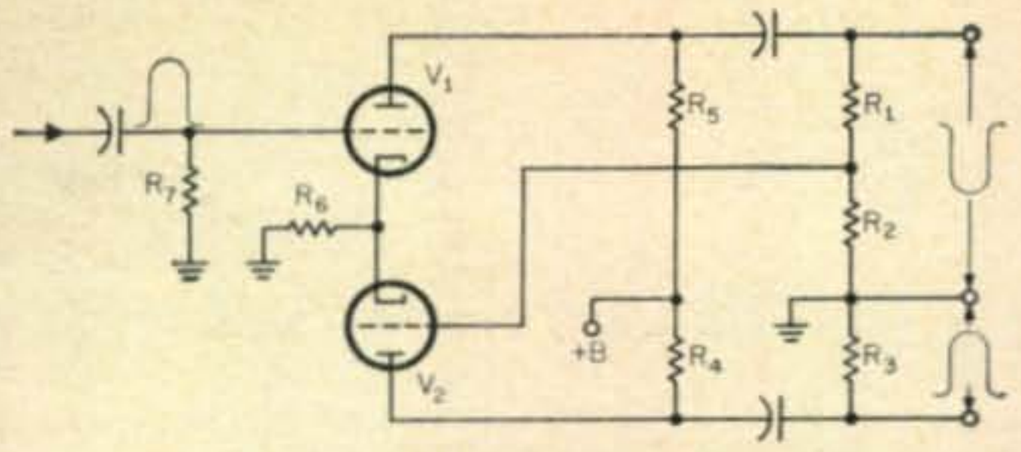


Fig. 5—Two tubes can be used in the paraphase amplifier. This circuit is often found in amplifiers and modulators.

of such value that the varying voltage across it has the same amplitude as the voltage on the grid of V_1. The voltage across R_2 is impressed on the grid of V_2, the phase inverter tube, where it is amplified. Since the plate load resistors, R_5 for V_1 and R_4 for V_2 are equal, the outputs of the two tubes are equal. The phase inverter inverts the phase of the voltage applied to its grid, making it opposite in phase to the voltage output of V_1. Note in this connection that the waveshape in the output of V_2 is in phase with the grid voltage to V_1. Phase inversion has occurred in V_1 and again in V_2, thus shifting the phase of this voltage back to its original polarity.

A Modulator You Can Build

To illustrate some of the principles we have discussed over the past few months, let's look at a typical modulator which you may want to add to your existing c.w. transmitter. This assumes that your General class ticket is one the way, of course- hi.

The circuit diagram is shown in fig. 6. A 12AX7 dual triode is used as the first and second amplifier stage, with the VOLUME (or modulation level) control connected between the two sections. This builds the tiny microphone voltage up to a high level, the exact amount depends on the setting of the VOLUME control. The amplified voice signal is applied to the primary of T_1 and is coupled to the secondary to drive the modulator tubes. Note the connections on T_1's secondary. Connected in this manner the transformer delivers a push-pull signal, that is, when the yellow lead is going positive, the green lead is negative-going. The 6L6 modulator tubes increase the small microphone voltage to approximately the 40 watt level which is more than enough to modulate most Novice transmitters.

Transformer T_2 is a multi-impedance type, that is, it is capable of matching most types of tubes found in Novice transmitters. There are several taps on the secondary to permit selection of the correct tap. Here's how you figure which tap to use if you don't want to experiment with the various connections. Determine the voltage on the plate of your transmitter (BE CAREFUL!) and read the plate current as given by the meter. Then divide the current in amperes into the voltage. For example, let's say you ran a Novice kilowatt (75 watts- hi). Your 6146 might have 750 volts on the plate and

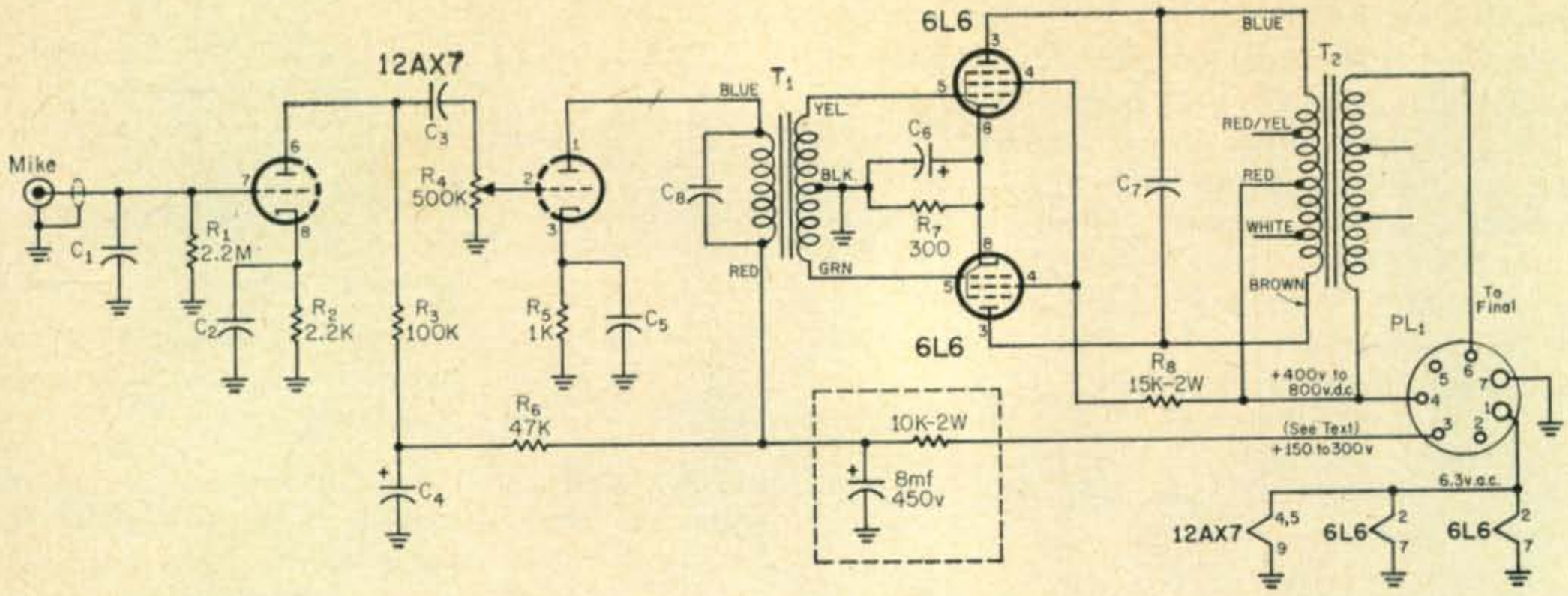
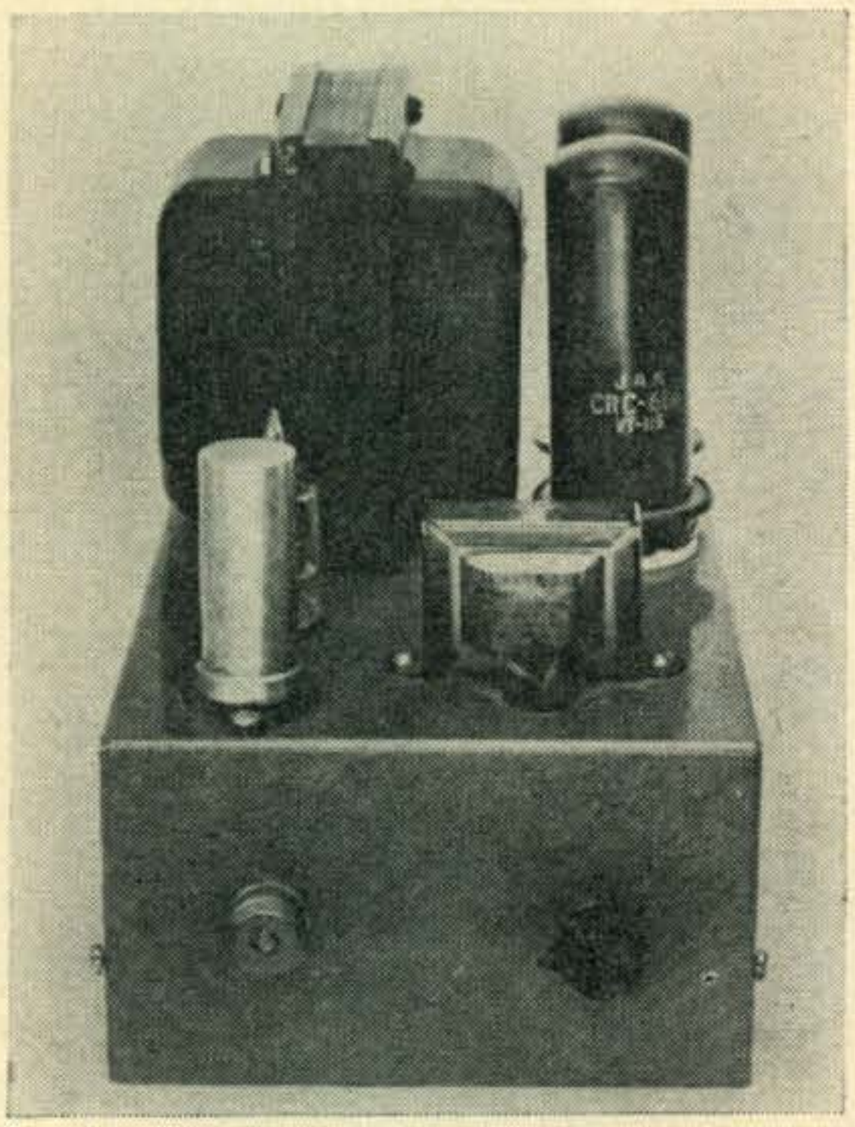


Fig. 6—Schematic for the modulator useful in converting Novice transmitters to phone operation. Note that C_8 was added after the photographs were taken. Components in the dotted lines are explained in the text.

C_1—100 mmf disc ceramic.
C_2, C_5—25 mf, 25 v. pigtail electrolytic (Sprague TVA 1205).
C_3, C_8—.01 mf 600 volt paper.
C_4—10 mf electrolytic can, 450 volts (Sprague TVL-1705).
C_6—150 mf, 50 volt pigtail electrolytic (Sprague TVA 1311).
C_7—.01 mf, 1600 volt buffer capacitor.
J_1—Microphone connector (Amphenol chassis mount).
PL_1—7 pin male connector (Amphenol 86-RCP7S).
R_4—500K volume control, audio taper (Centralab B617).
R_7—300 ohm 10 watt wire wound.
T_1—Audio interstage transformer (Triad A-31X).
T_2—Multi-tap modulator transformer, (Stancor A3835).

Miscellaneous parts required; Chassis 7" × 5" × 3" (Bud "Minibox", CU-2108) 2 ea. 8 pin tube sockets with rings; 1 ea. 9 pin tube socket; 1 ea. five terminal phenolic tie point strip; 1 ea. phenolic terminal tie points strip; 13 ea. 6/32 nuts bolts and washers.

load to 100 ma making it the legal maximum input of 75 watts. Rather than multiplying the current by the voltage to get watts, divide the current into the voltage. 100 ma, or 0.1 amperes into 750 volts equals 7500. This is the load impedance of your transmitter. You would connect the transmitter to the two secondary leads on T_2 which provides the closest to 7500 ohms. If the transformer you use doen't have 7500 ohms, you can change the loading current to match a different value.



The Novice Modulator. Mike Connector and gain control are on the front apron.

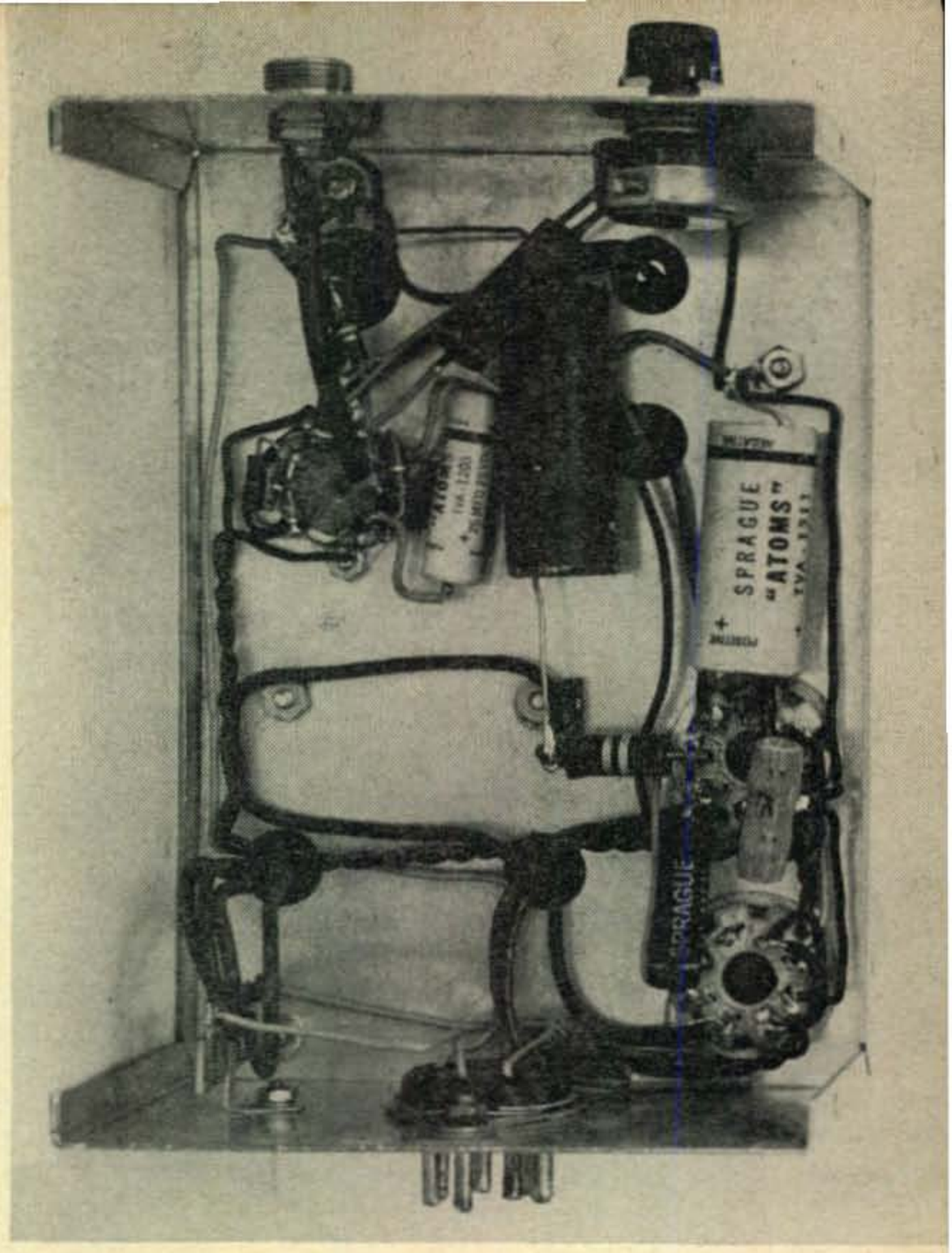
Construction

The chassis layout is shown in the photos & was found to be relatively "uncritical" with the exception of the parts around the first half of the 12AX7. These parts should lay close to the chassis and have very short leads. The lead from pin 7 to the mike jack should be shielded. Note that I used a 7 pin plug to connect the modulator to the transmitter. Note also that only five pins are used. You can use any convenient plug you happen to have so long as it has more than 5 connections.

Installation

The other end of PL_1, the power plug, is connected to a similar plug on the rear apron of your transmitter. The filament current of the modulator may overload your transmitter power transformer (it probably will) and it would be a good idea to install a five ampere, 6.3 volt filament transformer in the transmitter to supply this extra power. The +B power can be "swiped" from the transmitter if it is between 400 and 800 volts. You will also have to locate the intermediate high voltage power supply point (the line that feeds the oscillator and buffer) and connect it to point 3 of the power plug. This voltage should be between 150 and 300 volts. If it is higher than this value, you have to install the extra components shown in the schematic within dotted lines.

The modulator is connected to the power amplifier tube in the following manner; locate the wire from the power supply high voltage to the bottom end of the tank coil (link coupled



Underside view of a push pull 6L6 Modulator built on a 3×5×7 "Minibox". Layout is relatively uncritical.

transmitters) or the bottom end of the r.f. choke (connected before the pi in a pi-network transmitter). Disconnect this wire and connect it to pin 4 of PL_1, connect a wire from pin 6 of PL_1 to the point in the transmitter from where this wire was disconnected. Then when you plug in PL_1, the power supply current will flow through the cable to the modulator, through the secondary of T_2 (and become modulated) and then back to the final amplifier tube. What you have done, actually, is to connect the secondary of T_2 in series with the d.c. to the final or power amplifier tube in the transmitter.

For information on the proper modulation level and tuning of the transmitter for amplitude modulation output, you should refer to the *ARRL Handbook*.

Who's DX?

No reports of Novice signals received in foreign lands, this month, but I did receive an interesting letter from S. Javad Mesbahi, P. O. Box 153, Shiraz, Iran, who is interested in electronics and ham radio, and would like to correspond with Novices. Javad offers to teach the Persian language to anyone interested.

Help Wanted

The following persons have requested help in preparing for their Novice license:

W1—Thomas Clarke, 5 Stevers St., Lowell, Mass. Ph. GL 3-3350.

W9—Eugene Plantz, 815 W. Sheridan Rd., Chicago 13, Illinois.

Letters

Bill Maraffio, KN7QIE, 385 Seventh St., Idaho Falls, Idaho, has been licensed since August of this year and operates on 7160 or 7165 with a homebrew 6146 rig and BC-342N receiver. Bill wonders why stations he contacts are "hot" for a QSL and when he sends one, only one station out of five or six sends his in return. A common problem and one without an easy solution! Bill would like skeds with anyone needing Idaho and after December will be on 21.150 (Christmas?). He can also operate six meters.

Don Kuykeldal, KN5KYG (Kool Young Gorilla), 1019 Usher St., Ft. Worth 16, Texas, has been operating for four months and has racked up 30 states plus Cuba on 80, 40 and 15 meters with a Heath AT-1 and SX-28 receiver. The antenna used by KN5KYG is a doublet up about 30 feet. Don says that the little town (in Texas?) he lives in is really a ham kingdom as 10 hams live within a 5 block radius of him! He hopes to have his General by the time you read this as his code speed is up to 20 w.p.m.

Bob Davis, KØFPC, 1005 South Lexington, Harrisonville, Mo., wrote to say he operates on 80 and 40 with a Globe Chief 90A and S-40B plus suitable dipoles. He doesn't have much time for operation (college freshman) but offers to help prospective hams in any way he can.

Kato Craddock, K4RON, 206 Walnut, Sylacauga, Alabama, writes to say that there is one county in Alabama that has no licensed Amateurs—Coosa county. For those trying for a Worked All Counties Award, Kato plans to operate from Coosa, in the near future, on 40 meters c.w. tuning up from 7150. If interested, drop him a line.

Peter Bondy, WV2QHE, neglected to send his address but did mention that he has had his ticket since Jan. 61, and has worked 33 states and 40 countries since that time. Peter's first DX QSO was with UA3FM. That was followed by a really impressive list of countries, including UR2, LA8, 4X4, 4S7, HA1, ZC4, SVØ, SP1 and many similar choice ones. Peter is 16 and a senior in high school. He operates late in the afternoon and evening on 21.102, 21.108 and 21.126 with his SX-101 and Eico 720 into a TA-33 beam. Look for Pete on 40 meters also.

That winds up the NOVICE column for another month and also is the last one for me. I am moving over to the VHF department to fill a vacancy there. Walt Burdine, W8ZCV, not a new comer to *CQ* will be taking over shortly. I hope you will give him as much encouragement as you have given me in the past.

I want you to know that I have enjoyed know-

[*Continued on page 101*]

VHF

BOB BROWN, K2ZSQ
C/O CQ, 300 W. 43 ST.,
NEW YORK 36, N. Y.

50mc. 144mc. 220mc. 420mc. and above

SEEMS like all we hear about today is nuvistors . . . nuvistor pre-amps . . . nuvistor converters. Just how good are they? In very rough terms, they are a 417A at a $3.00 price. Or at least that's what some say. On today's market one can get 23 db gain for $13.95 on 50, 144, or 220 mc. Sounds too good to believe, doesn't it? Well don't let all this commercialism fool you. You just can't beat these nuvistors. I'm constantly getting letters from fellows giving X company a plug for their new nuvistor preamp. Rather than make recommendations, all I can say at this point is try 'em! Of course, if you're like most v.h.f. men and don't have a spanking new nuvistor converter, you'll simply have to manage with what you've got.

A constructive way to spend a few wintry evenings is to realign and test our existing converters. You may be surprised at the deterioration of performance your old-faithful converter may have suffered since its last checkup. On the other hand you may want to try your hand at building up a brand new converter, Nuvistor or otherwise. There are literally dozens of excellent converter designs floating around in *CQ, QST, CQ's V.H.F. Handbook,* etc. and the design and construction will naturally be taylored to each individual circuit. The procedure for tuning and aligning almost all of these crystal controlled converters, however, is basically the same regardless of its specific design.

The first step is to check all wiring for errors before you apply voltages. If a grid dip meter is handy, the resonant frequency of each tuned circuit should be measured with all converter tubes in place. Slight adjustments should be made to the coils where necessary to bring the circuits to the approximate resonant frequency.

The second step is to adjust the crystal oscillator and doubler stages. A #48 or #49 (2 volt, 60 ma) pilot lamp with a 1" diameter loop of wire soldered to base terminals is held near the oscillator coil and the oscillator plate circuit adjusted until the lamp glows. Excessive feedback in the oscillator may be noticed as variations in lamp brilliance or as "birdies" heard in the station receiver when the converter is on.

The final step is to adjust the coupling between the various stages of the converter for optimum noise figure. The first adjustment to make is the antenna coupling circuit. The antenna tap of the r.f. coil, or the antenna link coil should be varied for best noise figure. If a cascode amplifier is used, the filament circuit should be opened and the neutralizing coil adjusted for minimum signal leakage when a signal is applied to the antenna circuit. The second step is to adjust the coupling between the RF amplifier and the following stage. Too much coupling will result in spurious signals, while too little coupling will result in a deterioration of the noise figure. Coupling capacitors should be tapped along the inductance to obtain the best value of n/f. More details on noise figure adjustments can be found in *V.H.F. for The Radio Amateur.*

Now you might adjust the level of the oscillator voltage injection. This may be done by varying the oscillator-mixer coupling capacitor, or by changing the degree of coupling between the injection coils, if inductive coupling is employed. In some instances the n.f. may be materially improved by hand selecting the tube employed in the first r.f. stage. And don't forget to measure all electrode voltages of the tubes to make sure that they are being operated within the specifications set by the manufacturer.

W6DNG

Not too long ago I called W6DNG to find out his side of the K1HMU-W6DNG 144 mc moonbounce QSO as described last month in this column. As expected, Bill was also running a full kw (4X250's) but using a single turnstile and two long yagis for a total of 88 elements on that fateful September 14th evening. He has been experimenting with other antennas, but this turnstile-yagi combination seems to work out best. On the receiving end, a paramp was built and installed but troubles developed and Bill ended up using his reliable 416B standby paramp. Good show at that, though! Below is a letter from Bill telling his end of the Moonbounce story.

Dear Bob:

I hesitated about writing because I thought Ned, K1HMU would supply all the dope about our experiment. Ned really deserves much credit and praise for his terrific job of assembling, researching, building his station, writing letters and a thousand other things. I got real busy after Neds first letter; I was really interested in and delighted to find a man dedicated to the progress of the art, and I wanted to be part of this venture too. I'm glad it did pay off, maybe only a small amount in the eyes of many, but I think we did real well considering the short preparation time that we each had. In the three weeks from the time I received Neds first letter until our skeds began, I gathered info on several types of antennae, sort of processed the info, designed some antennas to meet my limited requirements (I live in a fairly heavily populated area—nuff said?) During that period I built two seven turn helices with seven foot reflectors, and two 24 foot, 40 element turnstiles (tried one of those back in '54), acquired four synchoros, built a two channel servo amplifier and the mechanism for azimuth-elevation antenna operation. I wanted to use a polar mount, but I have a metal tower and the v.s.w.r. goes out of sight when these antennas operate above thirty degrees in the polar mode, so I used az-el. The v.s.w.r. did rise at the higher angles but whatcha gonna do, you gotta work the guy. I sure got a lot of experience pruning and tuning the turnstile jobs. During the tests, I used four antenna configurations: 4 horizontal and 2 vertical long Yagis; heard signals on frequency the 2nd day, August 29. Changed the antenna on August 30 to 2 Yagis and 2 right hand Helices. Heard signals on frequency near the end of the sked September 1. Had to take down the round ones; to much wind resistance for the redwood frame. I hated to do this since these looked like very promising contenders. I then put up the 2 turnstiles. Heard very weak, very buzzy K1HM . . . During 2nd period I heard . . . DNG DE K1H . . . This was the 4th of September. NIL on September 5. No moon Sept. 6-11th. NIL on the 12 and 13th. September 14, two pings in 1st period, then NIL for a long time (ten minute periods of listening to all kinds of noise and the thought of the other guy not even being on, and stuff like that kind of bugs you). Also we had no liaison except the good ole U.S. mail. Then at 1652 MST (PDST) I heard . . . 6DNG DE K1HMU S3 S3 . . . signals were in anywhere from one to fifteen seconds. Then my period came up. I rogered and sent back S3 S3 R R, broke, and stood by. More of the same R S3 BK many times. NIL during the next period. K1HMU was still in there with an occasional S3 call. Then my turn came again with more of the same R S3 BK then all quiet. I guess the moon had set on Neds end. NIL on the 15th of September, our last day. This had been a great experience. I got just as big of a kick out of this as I did about thirty years ago when I made my first contact. It's quite a thrill to hear a signal that has come about a half a million miles and to know that part of it was because of something you built yourself. Well, so much for that. Equipment here was a paramp used for the first four days. I then reverted to the 416B pre-amp into 6CW4-417A converter into 75A-4 with 800 cycle filter into an audio filter, then into the recorder and headset. Transmitter was an 8 mc hi-stability oscillator down to a pair of 4X250B's with 2000 v.d.c. at exactly 500 ma. All sending from this station was manual at 3 to 6 w.p.m. The antenna was run part time automatically; part time visual-manual control. (Sideral clock mechanism into mechanical computer into two servo loops to the antenna rotator and elevator motors.)

Well, Bob, that's about all I can say at this time, I'm a c.w. man you know.

Bill Conkel, W6DNG

W2SHU manning the log at K2BJP/2 during the August CQ W.W. V.H.F. Contest.

Evergreeners

News arrives of the Evergreen 50 and Up Society of Seattle, Washington. From their monthly club paper it sure looks like an active group. Meeting nights are the first Wednesday of the month at Building 30 at the Sand Point Naval Air Station. Contact W7FAS. Activity centered on 50.4 mc.

Mailbag

K4FLR—"Will be on 220 mc with two weeks at the latest. Already have converter going. Will be using Tecraft equipment, while the antenna is a ten element beam 60 feet high. Am very interested in 220 mc work and would like to hear from members of the 220 fraternity. My frequency will probably be around 220.050 and 200.200 mc. Will look for letters from you 220 fellows who can tell me something about propagation on this band." *Ok, Dick, good luck with the mail. K4FLR's QTH is: Dick Turk, RFD 2, Box 15, Gainesville, Georgia.*

K9EID—"Sunday, October 22, I worked nine states on two meters. Things were in fairly

good shape but not the best we've heard. Did manage some Huntsville, Alabama, stations, though! Here on 6 meters I have been doing very well on ground wave. Been working into Princeville, Illinois, (K9HAE, 300 miles); Burlington, Iowa (KØSVT, 325 miles); Rolla, Mo., (WØLLU, WØEEQ, 170 miles); Moline, Illinois (W9WXR, K9ETS); and Devenport, Iowa (WØDJG, 270 miles). Most of this has been done on 2 way s.s.b. I have been working these stations regularly about 0130 CST each morning and 1030 CST on Saturday and Sunday mornings.

"I have the Thunderbolt on 2 meter a.m. now and have the s.s.b. generator almost completed. Using a Tecraft 2 meter transmitter with a few modifications. I will drop you a line when I get it finished. The s.s.b. activity is picking up on 6 meters around the St. Louis area. We now have WØNYF, K9SFX and myself on regularly with KØWPU, WØWEQ, W9BLZ, and KØLSK building like mad. We have selected 50.125 as a s.s.b. net frequency and the stations are following this as they get lined up." *Some group, Bob! Looks like s.s.b. is really here to stay on v.h.f.! Keep us posted as new ones pop up.*

KØZQR/Ø—"I have done some work on 6 and a little on 2, mainly with simple equipment. I plan to get a better rig on 2 when I can. But I would like to work the higher bands too! Wonder if you could advise me of any 220 mc and up activity in this area?" *What say fellows? Art's QTH is: A/B Arthur E. Roberts AF1760-7055 (KØZQR), D-55 3436 Sch Sq (PATS), Lowry AFB 30, Colorado.* "The gang around here on 6 just seem happy to stay on 6. I like to experiment in a most limited way. Would like to know others that do too.

K3HHS—"The Bucks County Amateur Radio Club is happy to announce its sponsorship of taped code practice sessions. M.C.W. transmissions varying from 8 to 15 w.p.m. will be transmitted by K3HNP on 50.62 mc from 1900 to 1930 EST, Wednesday evenings. Dave will also comply with requests for additional practice at other speeds and times."

Satellite Scatter Coordination

Must we remind you once again to sign up? If you haven't already done so, write to K2QBW at the Massachusetts Institute of Technology Office for Satellite Scatter Coordination. (See previous columns).

The techniques of satellite scatter communication are, with but few exceptions, the same as generally used at v.h.f. in meteor scatter work. The stations involved have contacted each other in advance, by radio or mail, to arrange a schedule, and to synchronize clocks and plan tactics. Because of the weak signals involved, and the incoherent nature of the returns (remember Doppler smear?), they have decided to use c.w., at the highest speed consistent with each other's consistent copying ability.

The stations decide in advance which satellite to use, and using orbital ephemerides, figure out when the satellite is expected to make a near approach. They aim their beam antennas, if they have any, in the direction of the near approach point. As in meteor scatter, the general approach is to use tandem transmissions at intervals of 15 to 30 seconds. There is one important difference, however. In meteor work, one has until his next schedule, typically an hour, to make the grade. Thus, a good deal of often superfluous information is exchanged. Suppose W2CXY has a schedule with WØAXU. It might go like this: WØAXU, WØAXU, WØAXU DE W2CXY, W2CXY, etc. for 15 seconds. Assuming WØAXU does not hear him, he will then call W2CXY for 15 seconds, and back and forth until one of them copies the other's call. Let's say CXY hears it first. He would then change his routine to WØAXY DE W2CXY S2 S2 S2 S2 (if that is his strength) every 15 seconds until he hears W2CXY DE WØAXU R R R R S1 S1 S1 S1. He must not roger AXU's transmission until he stops hearing the S1, indicating that his roger has been accepted. The QSO is then over (whew!). In satellite scatter, we generally have exactly one burst, or maybe two, to complete the QSO. Such a long-winded procedure is obviously wasteful, if not altogether impossible. So, we adopted an abbreviated procedure which has been judged by ARRL to be "adequate for the purposes of the (satellite scatter) experiment." Note that if you desire WAS credit for your QSO you must still use the longer porcedure.

In satellite scatter, the bands are usually deserted. The likelihood of mistaken identity is extremely slight. Thus, we can dispense with the exchange of calls, except for the every-ten-minutes rule. The two stations agree on use of a three-letter code, based on strength. Letters are used instead of numbers, because they are easier to copy. One such code is as follows:

Z Your transmissions have not yet been heard (SØ).

N: I roger your transmission, and your signals are, or were at their strongest, S1.

M: I roger your transmission, and your signals are, or were at their strongest, S2 or better.

Realistically speaking, you should not need stronger values. The procedure would be as follows: Suppose W3ABT had a schedule with K9GDF. Ten to twenty minutes before the time of closest approach, each station would start off sending ZZZZZ every 15 to 30 seconds, as above, and continue until someone, say GDF, copies Z from his counterpart. Assuming ABT's signal was S1, K9GDF would change his routine to N N N N. When ABT copies the N, he would change his routine to M, say, assuming GDF was S2. They would continue like this until ten or twenty minutes after the pass, for reasons to be explained later. It is not

[*continued on page* 101]

DONALD L. STONER, W6TNS
P.O. BOX 137, ONTARIO, CALIF.

semiconductors

AMATEURS tend to cling to favorite circuits and this writer is no exception. When asked about crystal oscillators, the circuit shown in fig. 1 is recommended. It has many redeeming features, in addition to not requiring any coil taps. The voltage stability, for example, is excellent. A supply voltage variation between 8 and 14 volts shifts the frequency of oscillation less than 10 cycles at 5 mc. It will continue to oscillate at a battery end-life voltage of less than one-volt. The temperature stability is also outstanding. Increasing the case temperature to 85°C results in a frequency shift of less than 100 cycles. Further, the circuit is equally useful with fundamental and overtone crystals. Recently it was discovered that the oscillator could be "rubbered" several kilocycles, making it quite useful as a VXO (variable crystal oscillator). More about that later. First, let's see how it works.

Like most oscillators, the circuit shown in fig. 1 is actually a Colpitts in disguise. This can be seen by removing extraneous details such as bias, grounds and power to redraw it as in fig. 2. We know that the ground, or common point, can be placed anywhere in the circuit.

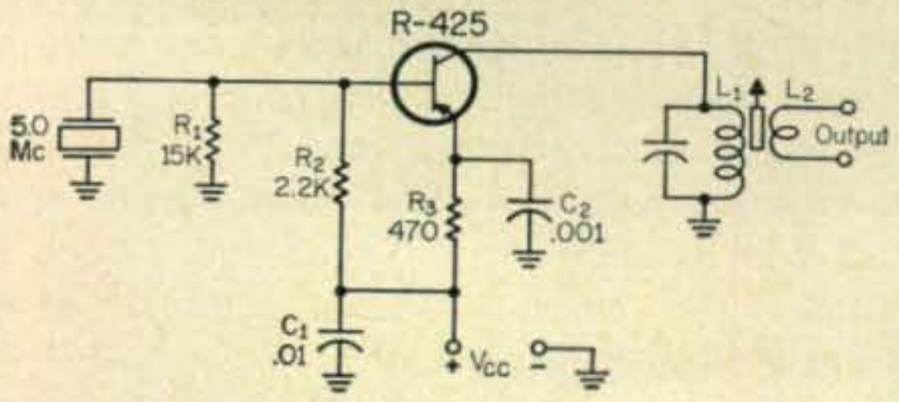


Fig. 1—Circuit of the basic Colpitts type oscillator described in the text.

In this case the ground would be at the junction of C_2, C_3 and L_1. Feedback occurs between collector and base, with the ratio of C_i and C_2 determining the amount of r.f. feed back to the base. Actually C_i and C_2 represent a capacitive voltage divider placed in shunt with L_1, which artificially taps the emitter on the lower end of L_1. Thus the feedback phase is 180° out at the bottom of L_1, with respect to the top. This also provides an effective impedance match since C_2 is many times larger than C_i, the junction capacitance. This results in a lower impedance which permits excellent power transfer of feed back energy through the crystal to the base.

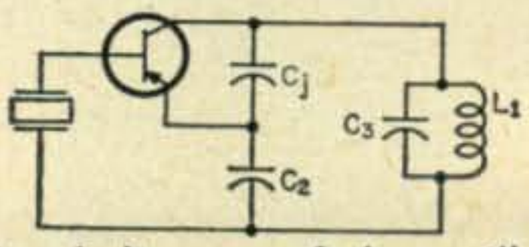


Fig. 2—Functional diagram of the oscillator shown in fig. 1.

The L/C ratio should be mentioned, when discussing the operations of this circuit. If too little C (C_3) is used, the performance of the circuit is degraded. It can cause insufficient tuned circuit Q which can, in turn, degrade waveshape. In certain applications this could be an important consideration. In addition, the capacitance of C_i is subject to variation due to many external factors such as temperature, V_{cc} and bias current. Making C_3 large helps to mask the frequency instability caused by these variations. Generally the value of C_3 in picofarads can be determined by dividing the constant 1,000 by the frequency in megacycles. Thus the oscillator in fig. 1, operating on 5 mc, employs a capacitor of 200 mmf for C_3.

With the values shown in fig. 1, the circuit should oscillate at exactly the series resonant frequency of the quartz crystal. The adjustment of L_1 will affect the frequency of oscillation only slightly, that is, not more than a few hundred cycles. This is a result of slight phase shifts in the feedback energy. The maximum r.f. output will occur simultaneously with oscillation at the series resonant frequency.

The equivalent circuit of the quartz crystal is shown in fig. 3. Note that it is represented by an inductance in series with a capacitor and a resistor. In parallel with this combination is an additional capacitor (C_e).

An external capacitor in shunt with the crystal will effectively "pull" the series resonant frequency of the crystal in a direction which is lower than its natural frequency (f_o). However, this is the same as placing a resistance in shunt with the crystal due to reactance of the capacitor. Either a capacitor or resistor shunting the crystal will tend to damp the vibrations and lower its effective Q. The net result, with excessive loading, is the circuit stops oscillating. The exact amount of "pulling" or frequency shift, will be determined by the activity of the crystal and the amount of feedback current. In any event, the output

power drops in proportion to crystal loading and the maximum frequency shift is seldom more than one or two kilocycles.

A capacitor in series with the crystal will increase the frequency of oscillation above f_o. Again, the capacitive reactance represents a resistance in series with the crystal which decreases the feedback voltage. Thus as C is reduced, the output falls in proportion and a point will be reached where the oscillator refuses to oscillate. As before, the amount of "pulling" is seldom more than one or two kilocycles.

If only we could get "inside" the crystal to vary C_s or L, it would be possible to vary the frequency with ease. Unfortunately C_s and L are only represented as electrical characteristics and are actually physical, being determined largely by the mass of the crystal.

In fig. 3, C_1 is actually quite small, being in the order of millipicofarads. Since at resonance, X_L+X_c must equal zero, it can be seen that the crystal has an extremely high L to C ratio. This is further confirmed by the extremely high typical Qs in the order of 10,000 to 25,000. Thus one can correctly assume that modifying the crystal characteristics with inductance will have far more effect on f_o then will capacitance.

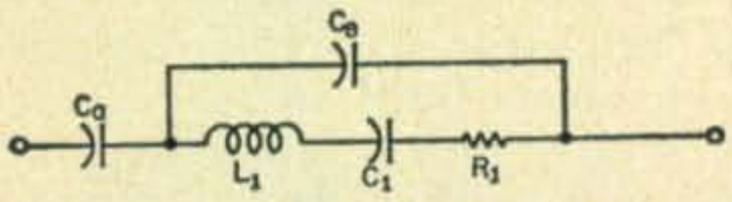


Fig. 3—Equivalent electrical circuit of a quartz crystal as discussed in text.

In experiments with the oscillator in fig. 1, this proved to be the case. A J. W. Miller #4308 (33-68 μh) variable inductance, connected in series with the crystal (at the ground end) will lower the frequency of oscillation some 10 kc without adversly affecting stability or output power. The usable pulling is actually less than 10 kc however, since it is not possible to reach zero inductance by pulling the slug out of the coil. It should be pointed out that no attempt was made to see how far the crystal could be pulled. This depends on so many factors that it should be determined by the experimenter himself, using available components. The excellent stability at a pulled frequency removed from natural f_0 by 10 kc, indicates that several times this figure could be reached in actual practice.

It is interesting to note that the process could be reversed by shunting the inductance with a small variable capacitor. As the capacitance was increased, it pulled the frequency higher, back across natural f_o and finally ceased oscillating approximately 10 kc higher than natural f_o. A total frequency displacement of 20 kc was not possible, however, due to the minimum capacitance of the variable capacitor.

Additional work with this circuit by experimenters should prove interesting. A second R-425 buffer-amplifier would provide sufficient power gain to drive a Central Electronics 10A or 20A exciter. If the frequency was reduced to 4 mc, and the buffer-amplifier tuned to the second harmonic (8 mc.) it would drive a Gonset Communicator or similar unit as a 2 meter v.f.o.

The coil L_1 (fig. 1) is 18 turns of #26 close-wound on a 3/8" slug tuned form. The link, L_2, is determined by the load requirements. To drive a following transistor it would normally be 2 turns of #26 wound at the cold end of L_1. The transistor is made by Texas Instruments and is available from their distributors or by writing the author.

Transistor Tester

Let it be said at the outset that the new Heathkit IM-30 is not just another "connect the base bias and see if the collector current goes up" transistor tester. No indeed! The IM-30, a beautiful piece of equipment, will reveal everything about the transistor under test but the sex and age! Unlike the usual $9.95 transistor checker, this unit indicates actual d.c. alpha and beta gain, base current, collector voltage, collector current, leak voltage, shorts, collector to emitter leakage current (I_{CEO}) and collector to base leakage (I_{CBO}). With an external oscilloscope and audio oscillator, a.c. current gain, a.c. transconductance, base impedance and collector impedance can be determined. In addition it also reads forward and reverse characteristics of diodes.

The circuit of the IM-30 is far too complex to show here, for the switches alone would take up two pages! However, the gain test simplified circuit is shown in fig. 4. The system developed by Heath is quite ingenious, to say the least.

For this test, the meter shows the difference between the voltage drop across R_s and that across GAIN TEST control R_{24}. This is, I_c (collector current) times R_s (meter shunt value) equals I_b (base current) times R_{24} (GAIN TEST control). The gain, beta, is directly proportional to the setting of R_{24}. R_{24} has a calibrated dial (0-150) which indicates beta or alpha directly. Alpha equals beta divided by beta plus one. If at any time the gain of a transistor is higher than 150, the Gain HIGH-LOW switch can be placed in the high position. This places resistance R_h (which consists of resistors R_{15}-R_{19}) in series with the Gain Test

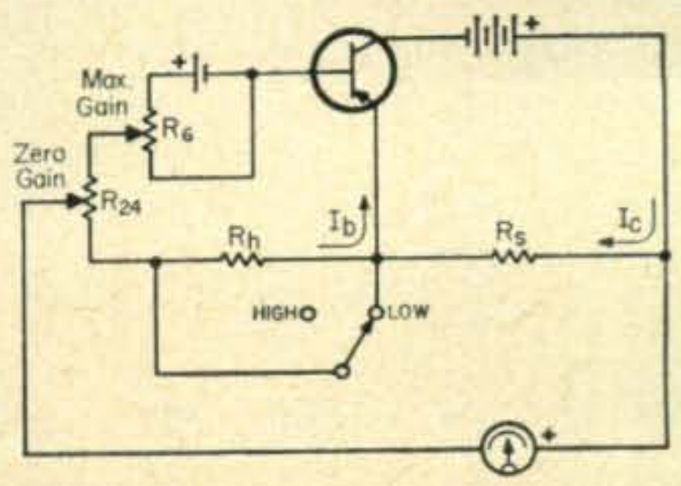


Fig. 4—Simplified circuit of the GAIN TEST setup of the Heathkit IM-30 transistor tester.

control and extends the beta scale from 150 to 300. Resistance R_h varies with the position of the COLLECTOR CURRENT switch.

The switching circuit changes the sensitive 15-0-15 μamp. meter to the appropriate range and circuit position for the other tests. The versatile tester permits setting up virtually any static voltage or current conditions. For powers not handled by the internal 9 volt battery, the tester can be switched to external power.

The wiring of the unit is more complex than one might assume. It required approximately 20 hours to finish and test for it has about the complexity of a tube checker. The clear and concise instruction manual makes the job as easy as possible.

The IM-30 performs as well as units costing several times its $55.88 price. If you need something better than a simple GO-NO GO tester, the IM-30 has my stamp of approval for its excellent performance and outstanding value.

The new Heathkit IM-30 Transistor Analyze

Semiconductor News

The format is being changed slightly this month to try to pack more information in less space. The mailing address which will reach a particular manufacturer is given first, followed by the new products and special comments, if any. Numbers in brackets are the data sheets on the particular products.

One word for those people who like to receive lots of mail. It costs the manufacturer a tremendous amount of money to prepare and mail data sheets. Don't abuse the privilege by indiscriminate requests for data sheets simply to keep your mail box full.

General Electric, Rectifier Components, Auburn, N. Y.—New 150 ampere Silicon Controlled Rectifier series with peak rating to 500 volts (brochure 170.30). A 70 ampere SCR has been added to the 2N1909-2N1916 family and is known as the C5OE (brochure 170.20A). Recent announcement of re-entry into semiconductor signal diode market with the SD-150 (brochure 70.80) a silicon planar, epitaxial, passivated computer diode which features a 2 nanosecond recovery time, and the microminiature version, the MSD-150.

Heath Company, Benton Harbor, Mich.—New items of interest to amateurs include the HM-10 "Tunnel-Dipper," a grid-dip meter with a tunnel diode rather than a tube ($34.95) and their GW-21 CB Walkie-Talkie which should make an excellent transceiver when converted to 10 meters. The GW-21 is priced at $44.95.

Hoffman Semiconductors, Arden Dr., El Monte, Calif.—The latest issue of *SPAN* includes data on an interesting new line of industrial silicon transistors, with prices attractive to experimenters, a description of the new blue space solar cells and an article on solid state relays.

IERC, 135 W. Magnolia Blvd., Burbank, Calif.—An interesting report on junction and case temperatures for power transistors in a variety of environments (test report #172A).

International Rectifier, El Segundo, Calif.—Two new Silicon Controlled Rectifier families, 10 ampere 2N1842 through 2N1849 (SR-356) and 16 amperes 16RC2-16RC40 (SR-351B) are rated to 400 volts PIV. Entry into SCR trigger device market with a new double-base diode in TO-18 package (SR-365). Announcement of 1000 to 2500 volt miniature diodes, types *Q* 10X —Q25X (XSR-230). New literature includes *Rectifier News* with a description of an SCR relaxation oscillator for pulse testing of diodes (Summer 61), subminiature glass zener diode catalog (SR-265), and high voltage rectifier stack bulletin (SR170).

Microwave Associates, Inc., Burlington, Mass.—New literature includes short form catalog on computer diodes (61-CD), microwave semiconductors (61-MS) and data file on miscellaneous types. MA have an excellent line of Varactor diodes for parametric applications.

National Transistor, 500 S. Broadway, Lawrence, Mass.—New germanium diode catalog (A-101) on 150 types.

Pacific Semiconductors, Inc., Hawthorne, Calif.—Granted AF contract for development of 10, 20, 50 and 100 ampere transistors. Also working on silicon unit to generate 25 watts at 100 mc. New products include ten Varicap devices with Qs of 50-125 and working voltages from 25 to 100 v, for use in parametric amplifiers and frequency multipliers.

Philco Semiconductor Corp., Lansdale, Pa.—New series for battery operated a.m. receivers, types 2N1726-29, 2N1785-80 and 2N1864. New series for communications equipment, types 2N1746-47 and 2N1865-67 for 4.5 and 10.7 mc i.f. amplifiers. Other new devices include 150 mw MADT devices, 2N779B, 2N977 and 2N2048 for computer and high frequency r.f. applications, a computer device, 2N976, which can switch from off to on in 10 nanoseconds, silicon epitaxial mesa types 2N2086-7 which can switch at 15 mc with currents as high as 300 ma, SPAT chopper transistors T2363 and

[*Continued on page 103*]

YL

BY LOUISA B. SANDO, W5RZJ
4417 ELEVENTH ST., N.W.,
ALBUQUERQUE, N. M.

WINNERS in the YLRL "Howdy Days" contest held Sept. 26-27 were K5YIB, for highest YLRL member score (109 point), and K1RPI, high non-YLRL member score (31 points). Onie, W1ZEN, comments that not many YLs sent in logs, but others who did placed in this order: W1ZEN, K5OPS/ø, K1KYB, K1ONT, K1EKO, WA6AOE, K1IZT, W1HOY, K1SLS, K5TXQ, WA6BJB, WA6-OKG, K9TVN, K1ADY, W3TSC.

13th YL/OM Contest

Here are the dates for the 13th YL/OM Contest, sponsored by YLRL: Phone — Feb. 24-25, 1962. C.W. — Mar. 10-11, 1962. All licensed YLs and OMs anywhere in the world are invited to participate in this one. Complete rules will appear in this column in Feb. *CQ*.

ZS News

From ZS6GH, Diana, we learn that in the South African Radio League annual contests held in August the YLs proved themselves first-class operators and showed the OMs how it's done! ZS6EQ, Renche, won the Senior Trophy for c.w. ZS1RM, Margery, came in second on c.w. Renche also won the "Irvine" trophy, donated by Diana, which is for YL operators. In the phone section ZS6MN, Maggie, placed fourth and won the Iris Hayes (ZS2AA) trophy offered by the S.A. Women's Radio Club. ZS5OB, Edna, came in second in the YL section and won the Edith Bennett (ZS6BD) trophy. The S.A.R.L. had a new section this year—for husband/wife teams (how about that?) which was won by ZS5TP, Jack, and ZS5TW, Alice.

Buckeye Belles

Last spring Ohio YLs on The Chix on Six net decided they should have a state organization. After a number of on-the-air meetings, K8ITF, Marge, came up with the name Buckeye Belles. At present K8MZT, Shirley, is serving as president and W8OTK, Alice, as treasurer. The gals meet at conventions and hamfests for eyelash QSO's. In additionl to two 6 meter nets, they meet on 3900 Mondays at 8:30 A.M. EST, K8MZT NCS; Wed. on 7260 at 1:00 P.M. EST with K8ITF, Marge, and W8HWX, Lillian, as NCS. They also have a c.w. net on Wed. on 7178 at 10:00 A.M. EST with KN8ALO, Marilyn, NCS.

Any YL in Ohio is welcome to join the club. There are no dues, but donations are appreciated to carry on publication of their newsletter, *The Buckeye Burr*. The club offers a certificate: Ohio amateurs contact 20 Belles, all other W/K stations make 10 contacts, 5 contacts for DX. Send list with log data, including the YLs' club membership number, certified by another Ham, together with 25¢ to cover cost of mailing, to W8MBI, Marie Helmiński, 3943 Concord St., Toledo 12, Ohio.

Another certificate, offered by the Ohio Council of Amateur Radio Clubs is WOLA—Worked Ohio Ladies Award. Make contacts with 25 YLs living in Ohio, no date limit, and send certified list with log data to K8MZT, Shirley Rex, 2225 Mt. Vernon Blvd., N.W., Canton 9, Ohio.

"Here's How" Party

The Los Angeles YLRC celebrated Founder's Day with a "Here's How" luncheon party on

K8MZT, Shirley Rex, president and organizer of the Buckeye Belles, also started the Chix on Six net. With a Tech. license earned in '58 she had 46 states confirmed and 80 YL contacts on 6 meters before getting her General in '60. K8MZT and OM, Chuck, K8MZS are members of AMCROSS, and enjoy phone patching for out of state and MM stations. Gear consists of Invader 2000, HQ-170, Johnson 6N2 and they work all bands from 2 to 20.

Oct. 14 at Schaber's Cafeteria in L.A. Posters on the walls, done by WA6AOE, Maxine, president of the club, depicted the club's 15th birthday, told of the "Contest Queen" and how to get acquainted real fast by checking into YL nets. The "Here's How Old We Are" poster, depicting a cake with 15 candles, listed the 10 charter members: W6's MWO, NSP, TCN, TDL, UHA, UXF, VWR, WQK and WSV. The Contest Queen will be the LA YLRC member who earns the highest total points in any and all six YLRL contests, plus Ladies Day (second Monday of each month).

WA6AOE's aim is to promote ham radio for women and extensive publicity brought many guests to the meeting—Novice licensees and ones interested in getting started. Theme of the "Here's How" program was planned not only to interest new hams but to show older hams new ways to enjoy their hobby. It was such a success the L.A. club felt others might be interested.

The "Here's How" party, arranged by K6OAI, Anita, got under way with W6DXI, Gladys, telling "Here's How the YLRL was organized," and giving a brief history of the organization, its purpose and growth. Next W6CEE, Vada, exhibited YL certificates available and told "Here's How to get them." W6JZA, Elsa, then spoke about the many nets and "Here's How to participate in them." W6QGX, Harryette, brought to the newcomers "Here's How to get into a contest, how to operate, and how to keep a log."

W6UHA, Maxine, next spoke on DX, telling the "Here's How" of when and where to find it and the satisfaction to be derived from working DX. K6KCI, Irma, the s.s.b. enthusiast, gave the "Here's How on s.s.b. operation." Traffic and its "Here's How" was discussed by WA6CKR, Mickey. The girls learned about its handling and how to make out a radiogram form. The would-be hams were interested in "Here's How to become a Ham", and they were advised to seek help from local school programs or local ham clubs. In conclusion, K6BUA, Midge, gave the "Here's How" of c.w. operation; how important it is to keep up on code and the satisfaction to be derived from c.w.

The meeting proved intensely interesting as each girl was an expert in the phase of ham radio on which she spoke. To show the "Here's How" of the L.A. club, five scrapbooks, kept over the past 15 years, were on display.

Visiting DX

Other YL clubs have been doing interesting things, too. On Oct. 7 the N.Y.C. YLRL held a luncheon at The Three Crowns Restaurant in honor of visiting DX YLs. Attending were VK1YL, Denise, and her OM, VK1ATR; and VQ2WZ, Susan. Others included W1ZEN and OM W1RCJ, W1ZJS and OM W1SBW, K2MGE and her jr. YL, WA2HTI, WA2GPT, W2TBU, W2JZX, W2QWL, K2TEX, W2IQP,

YLs enjoying TYLRUN party at Brownfield, Tex. weekend of Nov. 4, snapped by W5TYN, Betty. L. to r., seated: K5DAB, Ruth; K5HNM, Ruth; K5IRB, Donnie; K5BNQ, Doris; KØGZO, Ginny; standing: W5UXW, Opal; K5OPT, Ruth; W5RYX, Lynn. The WHOOTs have invited TYLRUN members to Dallas for next year's get-together.

K2OTW, K2JYZ, W2EEO, K2ETC, WA2FQX, W2OWL. VK1YL and VK1ATR told about frequency allocations in Australia and VQ2WZ described living in Northern Rhodesia.

Several other clubs have held elections recently. New officers of the Georgia Peaches are: Pres., K4LIU, Merita (who has a new baby girl, her first); V.P., K4IFF, Lin (who is also certificate custodian); secy, K4FLW, Marilyn; treas., K4BDZ, Martha; NCS, K4KIH, Kathryn; P/C, K4DNL, Olivia; membership, K4ZNK, Betty; historian, K4WNH, Hazel. Olivia points out that QSOs with Peach members living in surrounding states count for ½ point toward the certificate if made *prior* to March 31, 1961. Since that date all Georgia Peaches have been full members and each contact after March 31, 1961 counts for a full point.

Members of WRONE held their annual fall luncheon on Nov. 4 at the Red Coach Grill, Saugus, Mass. Sixty-seven YLs attended and enjoyed slides and comments on Hawaii from guest of honor KH6CKO, Kay Bloom. The 1962 officers were introduced: Pres. K1ADY, Mary; V.P., K1EKO, Edie; sec-treas., W1ZJS, Edith; membership and net chm., K1LCI, Virginia; hospitality, K1ICW, Mary.

K5GBX, Bernell, certificate custodian, points out that it is no longer necessary to have the date of issuance of membership on QSL cards from TYLRUN members for the cards to be valid for the TYLRUN YL-OM certificate (for contacts with 25 members of TYLRUN)

Coming Conventions

The All California YL Convention — BAY-LARC's of San Francisco are sponsoring this year's get-together. Dubbed the "YL April Fool Fun Fest," dates are March 30 through April 1st, and there will be food, fun, frolic and favors for all. Exact place to be announced.

12th Annual Midwest YL Convention—To be held in Flint, Michigan, May 18-19, 1962 with

[*Continued on page 103*]

DX [*from page 52*]

International Quiet Sun Year

SWL/Dave Powell of Gibralta and G-land, suggested an International Top-Band Year during the coming low Sun-Spot activity anticipated in 1964-1965. This word was passed around, and we now have word from George Jacobs, W3ASK, PROPOGATION Editor of *CQ* from which I quote: "About Douglas Powell's (G-Gibralter/SWL) suggestions on an International Top Band Year. It sounds good and you might want to tie this idea in with the International Quiet Sun Year now being planned by Scientists around the world, for the 1964-1965. This would be the sequel to the IGY which took place a few years ago. The IGY was held during peak sunspot activity, the IQSY would be held during the minimum solar activity. Top band investigation during this period, on an International basis, could contribute much in the way of propogation research . . . . W1BB would appreciate comments on this. For W1BB's part, this sounds like an excellent idea. All 160 meter hams who desire to help would be supplied with special reporting log forms, etc., which would be handled through some central agency for the IQSY and thus coordinated and integrated most fully with other scientific endeavors. However, a special 160 meter department to be used to centralized all 160 meter work—avoid confusion and retain our identity and contributions as a Top Band group, most fitted to contribute to an IQSY study would seem logical. D. W. E. Powell, originally proposing ITBY for Hams, offers to submit draft of proposed log reporting form.

QTH's and QSL Managers

CO2ZQ Rafael Estevez, c/o Brickell Apartments, 1177 Brickell Ave., Miami 32, Florida.

[*Continued on page 96*]

Propagation [*from page 55*]

decline during 1962, but at a somewhat slower rate than during the past year. A smoothed sunspot number of 43 is forecast for January 1962, and the cycle is expected to decline to 28 by the end of the year. While 1961 was still a year of moderate solar activity, 1962 will mark the beginning of the present cycle's low period. According to latest estimates, the present cycle should continue to decline until it reaches a minimum, which is now forecast to occur sometime between December 1964 and May 1965. *CQ*'s prediction of the smoothed sunspot numbers likely to occur during 1962, and for the remainder of the cycle, is shown in fig. 2.

The predicted decline in solar activity for 1962 is expected to result in a further decrease in 10, 15 and 20 meter openings. Except for circuits to some southern areas of the world, not many openings are forecast for 10 meters, and considerably fewer openings are expected on 15 meters during the new year than occurred during 1961. Fifteen meter openings are most likely to occur during the winter months, with the band open for short periods of time from a few hours before noon, to a few hours after

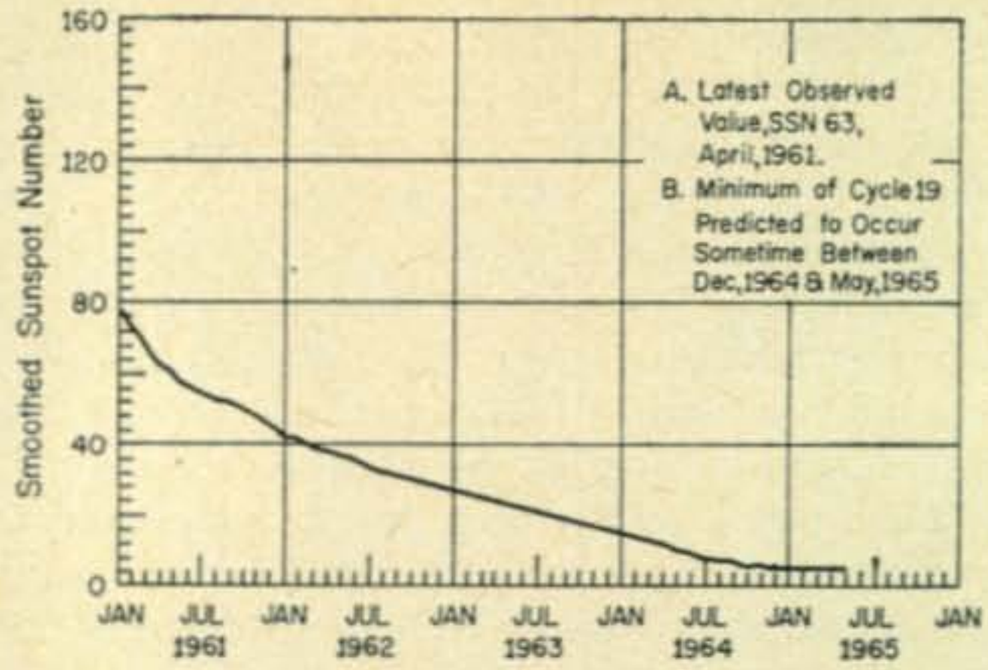


Fig. 2—Predicted smoothed sunspot numbers for the remainder of Sunspot Cycle 19 from January 1962 to May 1965. The actual sunspot minimum is expected to occur at *B*.

noon. Openings on 20 meters will be confined generally to the period between sunrise and the late afternoon hours, and there may be many areas of the world to which the band will not open except on rare instances.

On the other hand, conditions on 40, 80 and 160 meters are expected to continue to improve during 1962. A greater number of nighttime DX openings are forecast for each of these bands, to more areas of the world than during the past year, and with noticeably stronger signals.

Shortwave propagation conditions during the coming year, therefore, are expected to be poorer on 10, 15, and 20 meters, but considerably improved on 40, 80 and 160 meters.

73, George W3ASK

Sideband [*from page 62*]

order. Some of the other calls were W6GY, W6VLD, W6BMC, K6CRP, W6GVV, WV6TVM, K6RDP, WV6QGL, W6FHR, and W6LGU. To all these hams and any others we extend our sincere sympathy.

Last we heard, Phil, W1CRA, now of Hingham, Mass., was still communing with Nature, enjoying the beauties of his new QTH. But his thoughts were slowly turning to beams and dipoles and we have high hopes that Phil's signal will soon be booming out again . . . Another welcome voice that was missing for many months was that of Gus, K9EBA, who re-appeared with the news that he had been busy building himself a transceiver.

Will, WA6GLF, has asked us to mention the following: "Will any ham born in the United Kingdom now licensed in the United States or Canada please communicate with Will Schuman, WA6GLF, 111 West Hillcrest Blvd., Monrovia, Calif.?" We can assure anyone in the above categories that Will has no sinister ulterior motive. He just wants you to know about the "Ex-G Club" which is growing by leaps and bounds and gives its members a chance for many on-the-air get-togethers on various bands and modes. Reg, W3HQO, is President and also Editor of the Club's most interesting *Bulletin* which is crammed full of news about people we all know and like.

We seem to be running into a number of retired military gentlemen lately on sideband. Walt, W5EIL, has settled in Houston, Miss.; Mac, W5HCZ, in Gulfport, Miss.; and a host of others who are now enjoying the fruits of their labors . . . KØRDI, usually mobile, was a daily contact on 20 meters for many several years ago; now Charlie is K9LAZ in Indianapolis and

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For further information, check number 18, on page 110

eager to renew old friendships. He inquired particularly after Bill, W5CAC, and his lovely XYL, Alice, so you Websters, please get back on 20 and give your many friends a treat . . . Rundy, OD5CT, and Ray, W6MLZ, were guest speakers at the SSBARA's November meeting in New York. It took place after our deadline for this column but we'll bring you up to date on the doings next month.

Our fervent wishes for a Happy, Healthy, and Peaceful New Year go out to one and all.

73, Irv and Dorothy

Contest Calendar [*from page 64*]

2. For W/VE/VO contacts made with other W/VE/VO stations . . . 2 points per QSO. For W/VE/VO contacts to any other part of the world . . . 10 points per QSO.

3. For all other countries . . . 2 points per QSO to stations within the same country; 5 points per QSO to stations in other countries except W/VE/VO QSOs which shall count 10 points per QSO.

4. KH6 is a "state" but QSO points count as a "foreign country". However, as a multiplier it counts only as either a state or country but not both. QSOs to District of Columbia count the same as Maryland.

5. A multiplier of 1 for each State, Canadian province and foreign country worked.

6. Final score: Total points multiplied by total multiplier.

7. Sample logging—W2EQS 589001 NJ

8. Awards: A most attractive certificate to the top station in each State, Canadian province and foreign country.

Your logs should be postmarked no later than March 15 and go to: *CQ*, Attention 160 Contest, 300 West 43d Street, New York 36, N. Y.

Ed. Note

It's no news that conditions for the Phone week-end were pretty miserable for the U.S.A. and surrounding areas, and except for the last few hours of the contest, they were way below the normally low expected conditions. A big disappointment was the 40 meter band which just did not come up to expectations. Even so, a certain select few got through consistently and some surprising good scores have been submitted, as indicated in the following claimed scores.

Now don't get perturbed if yours is not listed. These are only a few of the higher scores from logs received as of November 15th.

Scores

A couple of real pile-ups were created by HV1CN and XT2Z, especially the latter. And some top scores are expected from CX2CO, HC1AGI, VP5BL and VQ4RF.

Now if George Jacobs doesn't come up with a better forecast for the c.w. week-end he had better leave the country. Sorry George.

Trust your Christmas was a merry and pleasant one and that the New Year will be peaceful and prosperous for all of us.

73 for now, Frank, W1WY

Results of the 1961 Helvetia 22 Contest

U.S.A.

W1ADM	1560
WA2DIG	776
W1FZ	588
W8MUR	468
W1WY	216
KØIKL	126
W5WZQ	90
W3MGP	12
W5ARJ	12
W5KC	3

Other Countries

OD5LX	765
OA4FM	750
PY4AYO	360
VE3BWY	360
VE1AE	330
VQ4KRL	192
ZS4MG	27
VE3JZ	3

European

OH2LX	10164
G3EYN	9675
YU3CDE	9480
DL1CF	9009
PAØVO	7560
DJ4SB	7250
OH2AA	7030
SM5AJU	6840
PAØADP	6588
PAØVB	6528
OK3KAG	5600
SM5TW	5202
DM2ATL	5130
OH5SG	4830
OK2KJU	4700
IT1TAI	4653
DJ2IV	4410
OM1VA	4386
G3HZL	3580
OH1QP	3510
SP9ADV	3393
SP8HR	3256
DJ3XK	3204
OZ4H	3180
DL7FU	3150
PAØHG	3108
OH2DW	2772
OH2PO	2646
SP8MJ	2550
OH8QA	2520
DM2AGH	2418
OH7NW	2347
OY7ML	2205
OH3PY	2181
OH3NS	2109
SM3BEI	1995
HB1DX/FL	1980
UQ2AS	1965
SM3CNN	1620
SM5AEV	1620
OH9PF	1530
OH2PT	1512
OK1KRS	1458
DJ4VO	1445
SM5KV	1377
YO8RL	1370
LA5UF	1326
OH3WH	1296
OK1AAA	1242
OK1IK	1242
LA5QC	1224
SM6CWP	1224
OH3TY	1152
OZ6RL	1140
DJ6LV	1125
SP2CO	1080
OK3PA	1071
DJ1UE	900
OH6RC	900
OH5NB	885
SM5BPJ	864
SM5CZK	840
OK2LN	810
UR2KAE	792
OH3SO	765
TF3AB	756
SM3BCZ	756
OK1ACF	675
DJ2XP	594
OH3PJ	528
LA5HE	468
SM6CJK	450
DM2AQL	441
OH2RW	429
YU3SF	396
DL1YA	396
YO6EX	390
OK2BCJ	363
SM3CJD	363
YU3IH	324
ON4CE	264
DL6BP	240
G3JUL	240
OK2OU	216
PAØHGT	216
I1FMC	210
OK2KU	176
OK2BBJ	168
SM5CCE	168
OZ4RT	168
SP5AIM	126
OH2FS	126
SP5AHW	75
LZ1CW	63
OK1AMS	57
SM6BZT	48
I1ER	48
HA5FQ	48
OK3WX	48
SM3ATG	45
SM5CHA	27
HA5AM	12
OK2ABU	12
OK2BCB	12
OK1OO	12

How's Your Antenna [*from page 29*]

three band beam antenna it becomes necessary to select a compromise between the three bands as to which angle of radiation you will settle for on each of the three bands with one antenna height. The ideal situation would allow provisions to raise or lower the antenna. This expensive solution makes the compromise of one height more realistic.

The Multiband antennas have only one drawback, they do not add to the harmonic suppression of the pi-network. A well designed pi-network will provide 35 to 40 db of harmonic suppression. With this in mind you will agree that if you are 40 to 60 db over S-9 across town on 20 meters, you would be S-9 to 20 db over S-9 across town on 10 meters. This is the best you can expect from the pi-network and would be a problem in the more heavily populated areas. A single band antenna gives additional relief as it would present a very high impedance to the second harmonic, and wouldn't readily accept and radiate this second harmonic component as the case with a multiband antenna. Here again, the Matchboxes will be of additional value as they provide another tuned circuit between the pi-network and the antenna, and will add another 15 db to the harmonic attenuation. This is a worthwhile consideration in the areas where the activity on all bands is great since one should be considerate of others.

The effort one expends in thoroughly check-

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Complete Rules Appear on Page 95 of The July Issue.

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ing his antenna system can be very rewarding. You may be very pleasantly surprised to learn that you can double your power, effectively, by spending a half day or more on your antenna system without the outlay of a single cent. The old dipole you stretched between the house and the tree three years ago may be four feet longer than the last time you measured it. How do you know you aren't down to one strand in the center conductor of the coax at the antenna? The other six may have work-hardened and snapped off months ago. A partially defective antenna system, as well as a questionable ground system can be a never ending source of transmitter troubles, TVI, and the reason you don't raise all those calls you hear around the country.

Ground Lead

It goes without saying that a good ground system is important in order to have an effective antenna system. If you are unfortunate enough to have your "Ham shack" above the first floor level, you may find it desirable to tune the ground lead to a half wave length, or multiple thereof, in order to obtain better results. This can be done very easily by installing a roller coil or a variable capacitor in series. There is a world of difference between a good d.c. ground and a good r.f. ground. You actually need both, and the waterpipe is a good d.c. ground in all cases. It can also be a good r.f. ground if you consider how far it is from the transmitter to the waterpipe.

At this point I am sure you will agree, that an antenna will not necessarily transmit as well as it appears to receive, and it is entirely possible that your antenna system can be improved. Good luck in your efforts to increase your effective radiated power, and doubling your number of contacts as well as your pleasure in being an amateur. ■

DXing is Different [*from page 41*]

meaningless bother. The moon, we have found, is a better place just to locate the beam. Of course there is some loss in the feed line.

That's why there is so much space activity in California. The dream of every DX ham here is to go the orbiting TV camera one better, to put a TV *station* in space, to scan the DX areas and report who's on the air, and particularly the frequency he's on. The old saw "if you can't hear 'em, you can't work 'em" is passé here. Our motto is "If you can't see them, you can't tell whether or not they're bootleggers."

But back to the California receiver. Less known than the California transmitter, it represents advancement of the art unequaled anywhere else. For example, there's the California S-meter, which guarantees that all DX stations will get at least an honest S-9 report. This is made possible by installing The California Face, whose numbers *begin* at S-9. This enhances the possibility of a QSL from a flattered rare one using peanut power and the XYL's clothesline.

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Sensitivity is 1.0 microvolt for 10 db, Signal to Noise ratio. Selectivity is ± 0.8 KCS at —6db with Q-MULTIPLIER. TUBES: 6BA6—RF Amp, 6BE6 Mixer, 6BE6 OSC., 6AV6 Q-Multiplier—BFO, 2-6BA6 IF Amp., 6AV6 Det-AF Amp. ANL, 6AQ5-Audio output, 5Y3 Rectifier.

TOP VALUE COMMUNICATIONS RECEIVER

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KT-200WX
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The Communications Receiver that meets every amateur need—available in easy-to-assemble kit form. Signal to noise ratio is 10 db at 3.5 MC with 1.25 microvolt signal. Selectivity is —60 db at 10 kc, image reflection is —40 db at 3 MC. Tubes: 3—6BD6, 2—6BE6, 2—6AV6, 1—6AR5, 1—5Y3.

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Provides maximum convenience and flexibility in either mobile or fixed operation.

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LAFAYETTE HE-50 10-METER TRANSCEIVER
Similar to above except for 10 meter operation **109.50**

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LAFAYETTE HE-34 SWR AND FORWARD POWER METER 16.95

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- For Continuous Use in 52 Ohm Lines
- Switch Selects SWR or Forward Power—No Reversing Necessary
- Highly Compact—Only 2½x5x2½"

The ideal aid in adjusting beams, trap antennas, matching networks, etc., or for tuning transmitters for maximum output.

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☐ Send FREE 1962 Catalog 620 featuring the full line of Lafayette Amateur Equipment
..... enclosed for Stock No.....

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Address.....

City..... Zone ..... State.....

For further information, check number 22, on page 110

Selectivity in a 6 land receiver is phenomenal. It will select about any call area you want to hear. Every morning California hams gather at water coolers and talk about the rare DX they heard the night before. Of course they didn't work any, but California hams are great for s.w.l.

California receivers have other advanced features. More bandspread than a middle-aged stenographer. Sensitivity compares with XYL's the morning after. And receiver stability? Well, here in 6 land that's a word we try not to use. Mainly because out here it's no longer an engineering term, but one our psychiatrist uses as

[*Continued on page 98*]

BC-458 [*from page 40*]

No TVI has been experienced in this strong signal area; but if it is encountered, the usual shielding and filtering measures should be employed.

That's about all there is to it; connect your modulator and ten meter antenna, and you're on the air. Reports have been very complementary as to both stability and modulation quality. During the first few days of operation, despite a declining sunspot cycle and using only a dipole antenna, 17 states and 5 countries were worked. ■

Phase Detector [*from page 26*]

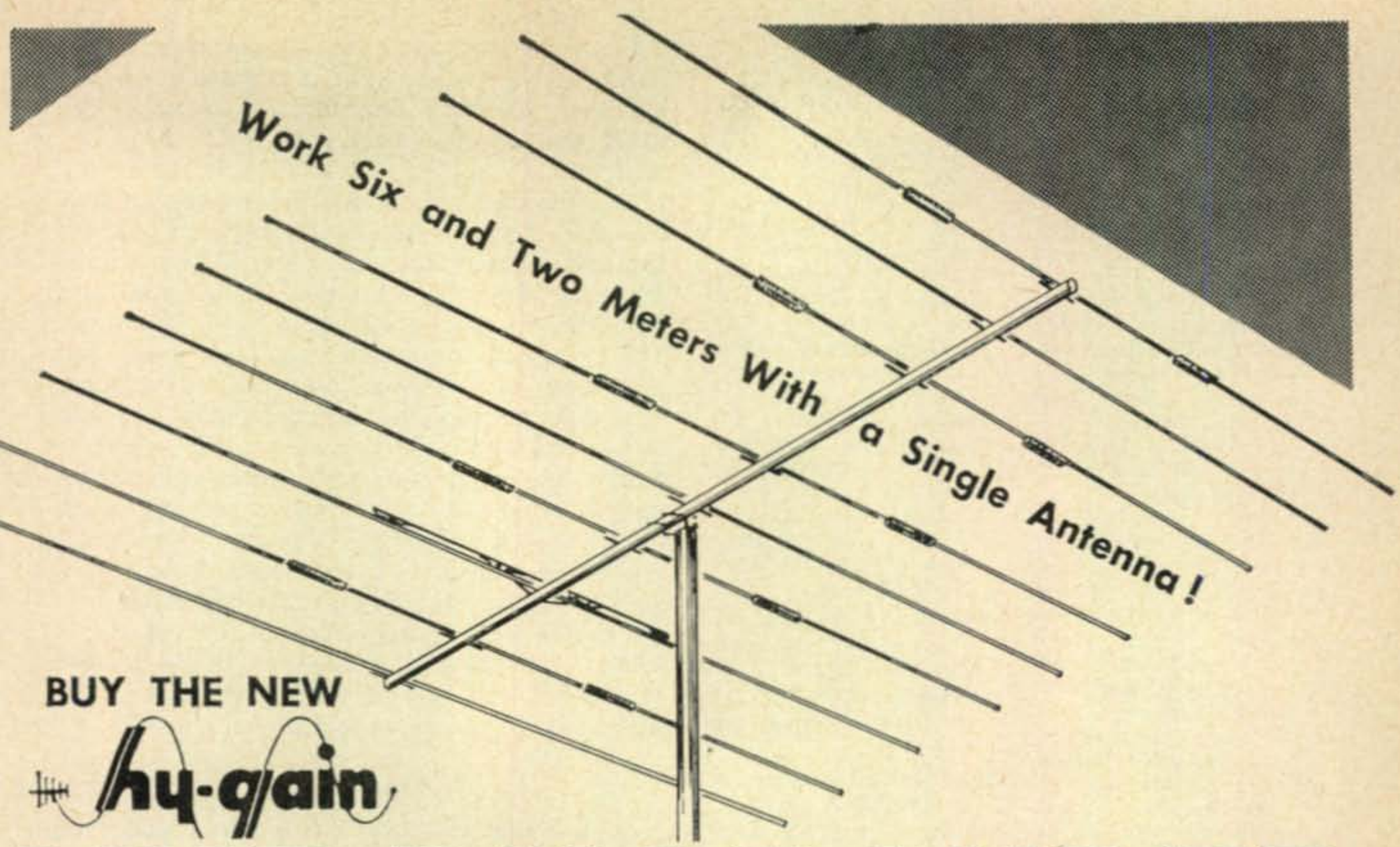
These exercises give the "feel" of the coaxial phase detector and incidentally teach the user much about his station. The instrument makes an awkward measurement easier, and shows where correction may be desirable. It makes the s.w.r. bridge more valuable.

In some cases, the instrument may be used to drive a control system to tune the mobile antenna.[7] Development of transistors, the 12 volt automotive system, and motor-driven rotary inductors[8] makes this approach even more attractive than before.

Where either a wide band of frequencies or large resistance variations are involved, it is possible to "split" an s.w.r. bridge[1] to have a similar polarity-conscious output (positive voltage at *more* than coaxial cable impedance, negative voltage at less impedance, and zero volts on the exact impedance). Here you can have one control system balancing out impedance while the other eliminates reactance.[9, 10, 11, 12]

This little gadget, then, is a ten-to-fifteen dollar ticket to a new side of amateur radio. It's fun to build and test, but only you can determine its ultimate use. ■

[7]Hargrave, "Automatic Mobile Antenna Tuning" *QST*, May, 1955, p. 14.
[8]The Master Mobile Unit, for instance
[9]True, "Automatic Impedance Matcher" *Electronics* Dec., 1951, p. 98.
[10]Hay, "Problems in Automatic Antenna Tuner Design," *CQ*, Jan., 1954, p. 33.
[11]Hay, "The Automatic Match Box," *CQ*, June, 1954, p. 13.
[12]Hutton, "Automatic Antenna Tuning for the Amateur" *QST*, Dec., 1956, p. 15.



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Model DB-62 **$32.95**

COMPLETING THE VHF LINE:

Model 25, 2 Meter, 5 Element	$ 8.95
Model 210, 2 Meter, 10 Element	$14.95
Model 111, 1¼ Meter, 11 Element	$13.95
Model 313, 3/4 Meter, 13 Element	$12.95

Model DB-62 is a single transmission line beam antenna system for 6 and 2 meter operation. Fed with 52 ohm coax transmission line, it develops a forward gain of 8.0 db on 6 meters and 15.0 db on 2 meters.

Front to back ratio averages 15 to 20 db and SWR will remain below 1.5 to 1 on both bands.

The antenna is ruggedly constructed of 1¼" O.D. aluminum boom and 7/16" O.D. elements, factory preassembled.

Net weight, 8.5 lbs.; boom length, 10 ft.; longest element, 10 ft.

FOR FURTHER INFORMATION WRITE DIRECT TO:

Rapsco

RADIO PRODUCTS SALES COMPANY

1237 16th Street Denver 2, Colorado

For further information, check number 25, on page 110

DX [*from page 88*]

CR7FN Fernando Ferreira, Caixa Postal 852, Beira, Mazambique.

EP5X/EQ5X/EQ2AT (See OD5CT).

ET3RS .....via W2JXH.

HH2AID c/o American Embassy, Port-a-Prince, Haiti.

KC6PE .....via W9SFR.

KH6DLD, KH6DLF Sheila and Ed Goodhue, c/o Goodhue Lumber Co., Middleboro Road, East Freetown, Mass.

KL7FLC Arctic Research Labs, ARLIS #2, Pt. Barrow, Alaska.

MP4TAO .....via DJ1BZ.

OD5CT has all EP5X/EQ5X/EQ2AT logs. Rundy will also try and help with HZ1TA cards. Send a s.a.s.e. and IRC's to: L. M. Rundlett, OD5CT, Box 5043, Beirut, Lebanon.

OH2XZ c/o American Embassy, Helsinki, Finland.

PJ2AF .....via K4OGT.

PJ3AR Box 328, Lago, Aruba, Netherlands, Antilles.

SV1AB via W4HUE, Dr. George Mack, 4108 S. W. 5th St., Fort Lauderdale, Fla.

TA2AR .....via PAØWWP.

ex-VK9AD Alan, VK3CX, has all the logs and cards from the VK9AD, Norfolk Island operation. Drop him a card and IRC's if you haven't received your card.

VS5WS .....via G3MCN.

all VS9K Sgt. R. H. Handley, 9 South Ave. RAF Swanton-Morley, Norfolk, England or via RSGB.

XE2WC (XE2PBI) Enrique Costa Avenue, H-187, Tijuana, B. CFA. Mexico.

ex-XT2A Maurice Doulier, 9 Rue du Transvaal, Saint Amand les Eaux, Nord, France.

XW8AS MAAG Laos, Box 179, APO 152, San Francisco, Calif.

YJ1MA W/VE via W1HGT, others via GW3LQP.

ZD6HK Box 24, Blantyre, Nyasaland.

4X4DK .....via WA2KNC.

4X4IX .....via WA2KNC.

5N2JKO .....via W4MCM.

6O1LB Box 136, Mogadisco.

Before It's Too Late [*from page 47*]

the effort you're just another lazy bum and deserve to lose your license anyway.

6. Contacts. The end result is only justified if some effort has been put forth. How much satisfaction depends on how much effort; more effort—more satisfaction.

Not persuaded yet? Well here's why . . . because you haven't got the nerve to stick your neck out and try and better yourself. You're afraid but you really don't know why. Financially unable? Baloney! You can build better gear for less money and you know it. If you don't, look up some of the comparable articles in past amateur publications and see for yourself. If you really want to improve yourself you can; save a couple of dollars a week and build that better piece of gear. Keep what you've got for now and you can still remain on the air while you're improving yourself *and* your hobby. After you've finished your masterpiece you can sell that assembly line stuff to someone else while you operate with your "custom made" gear.

How to start? Make that first move, but start off small if you've never built any *real* gear before. Take your time and above all do a good job. How about that v.f.o. you've always wanted, or perhaps a useful 100 kc crystal calibrator? There's plenty of small gear you desire and need, but have never managed to acquire. Straighten out those items in your parts box, and throw the hopeless components out. Gear is money, but good gear is not necessarily expensive to build. Use what you've got and make the most of it. Why'd you save all those parts if you never planned on using them anyway? Need help or advice but no-one around? After you get started write to the author of the article you select, and list all the info you need. Enclose a stamped, self-addressed envelope and you're sure to get a courteous reply.

A Final Word

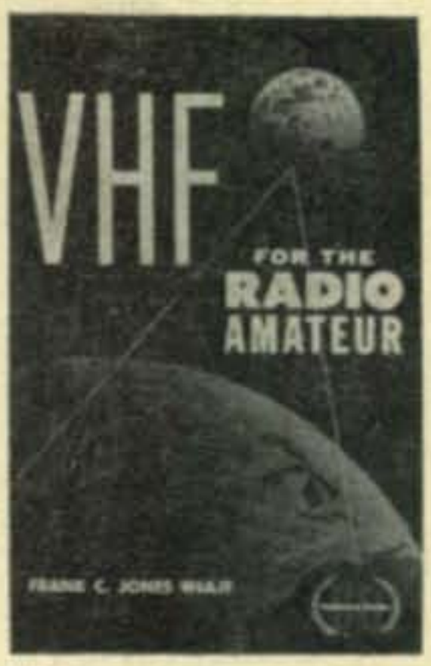
If you find this article stimulates you, you have what it takes; you can do it, but only if you make an effort. While you browse through past issues looking for articles of interest, note the fellows pictured in the DX columns and notice their gear. More often than not you'll find it's homebrew, and pretty nice looking. This is not the result of choice, but rather of necessity. Commercial gear outside the U.S. is expensive and the radio amateur must build his own if he desires to operate. He is a true amateur. Many foreign governments stipulate that the amateur gear to be constructed must be completed in a certain length of time; a deadline, and if the amateur cannot come across with the gear he doesn't receive his license. Why this approach? To better the individual and thus better the country. Our way of life gives us freedom of choice, but when it reaches the point of apathy, that freedom is in danger. Amateur radio is only one small segment of our way, but our way is composed of many small segments. Weaken the link and you weaken the chain. Your hobby is in your hands, hold it tight. ■

CQ HAM MART

For further information on items not shown see Pages 138, 139 of *CQ*, November Issue.

CQ ANTHOLOGY

Most amateurs do not have a good file of back issues of CQ. So we've looked back through the years 1945-52 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. The price is a mere $2.00.

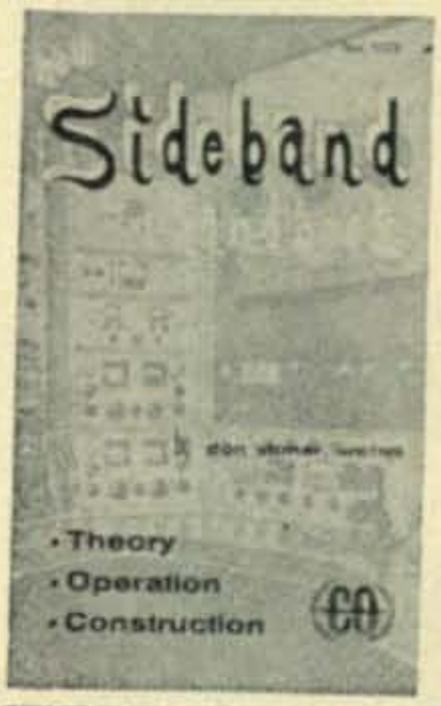


VHF FOR THE RADIO AMATEUR

You can't afford to be without this dynamic new handbook designed with the VHF amateur in mind. Filled from cover to cover with all new and original construction material presented so that you can understand it. Written by Frank C. Jones W6APF, nationally acclaimed for his VHF pioneering. Available now for only $3.50.

CQ LICENSE GUIDE

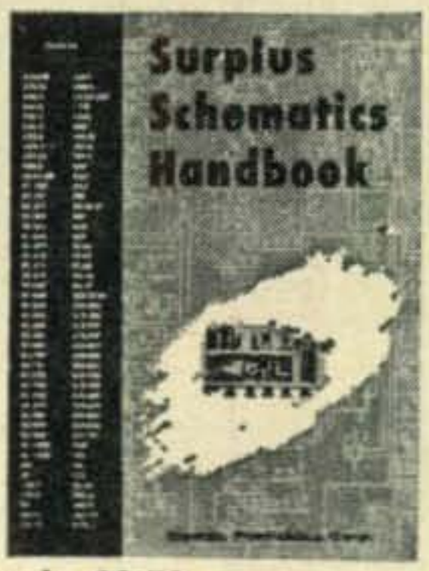
212 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator. All this for only $2.50.



SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, 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 if how to build-it stuff, gadgets, receiving adaptors, exciters, ampliers Price, only $3.00.

SURPLUS SCHEMATICS HANDBOOK



This is a book literally loaded with schematics for al the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many times more difficult that the most involved puzzle, and purchasing a single instruction book can run as high as $3.50. Why knock yourself out when you can have a book with complete coverage on hand in your library? All this for only $2.50.

DX ZONE MAP

Brand New! Amateur Radio World-Wide DX & Zone Map complete, accurate and up to the minute with Prefix, Zone Boundaries, Great Circle beam bearings. 4 Colors, 36 by 42 inches on heavy vellum map paper. Mailed in heavy cardboard mailing tube. Only $3.00.

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DXing is Different [*from page 94*]

he exhorts us to give up DX. But we never will. We're hopelessly hooked on the DX drug and our low standing with our fellow hams may make us sicker, but it will never get us off the air. That's why we run gallons, call you in the middle of your QSO, zero beat your signal, pester you for QSL's, and cuss you when you don't come back. We've been bit by the DX bug and we're sick, wonderfully sick.

We may lose our families and spend our millions, but what care? It's the rare one that counts. So expect to hear us calling, that despised call ". . . . . DE W6 . . . . ." And when you do, don't hate us, we're DX addicts—don't pity us, it doesn't count for DXCC.

Just answer us. ■

Miniceiver [*from page 37*]

was found to be more sensitive to hum when operated with the a.c. power supply.

Detector and B.F.O.

The detector, Q_{12}, has a special circuit. It is somewhat similar to the product detectors in tube receivers and employs a transistor which acts as a mixer for the i.f. signal and the carrier fed from b.f.o. On c.w. and s.s.b., when the b.f.o. is on, its advantages will show clearly. Strong s.s.b. signals are easily readable even if the r.f. gain is full open. The b.f.o., Q_{14}, is a self exciting oscillator and the circuit is a transistorized version of the well known e.c.o. It is indeed stable when there is nothing to heat the components. The b.f.o. coil is a half of a 455 kc i.f. transformer.

Crystal Oscillator

The crystal oscillator has capacitive coupling to the first mixer. Due to the low impedances the coupling capacitor must be quite large, at least several thousand mmf. High Q inductances for the crystal oscillator are important, especially with overtone crystals as in transistor circuits they are inclined to oscillate even stronger on parallel resonance instead of series resonance where most crystals are cut to operate. The difference on 24,500 kc for instance may be 30 to 40 kc. Also the r.f. stages are capacitively coupled to each other. This allows a band switch with only four sections to be used. Extremely small parallel capacitances in the r.f. coils provide a poor LC ratio, thus widening the band pass and eliminating the need for continuous tuning. The coils are tuned to different frequencies on each band to cover the whole band as smoothly as possible. However on ten meters, which is one megacycle wide here, some changes in sensitivity are noticeable depending on how the iron cores are adjusted. This system works satisfactorily on the narrow ham bands simplifying the construction, but cannot be adapted for wide band coverage.

If the two oscillators are not properly shielded and isolated some of their difference carriers

will appear, particularly on 14 and 21 mc bands. The strongest one hits 14303 kc which is the result of 2 × 10.5 mc (xtal) and 2×3348.3 kc (tunable oscillator when receiver tuned to 14303.3 kc) and may be difficult to suppress.

The "Miniceiver" is not a dream receiver according to its electrical characteristics. The main attention was paid to making it compact and making it as good as possible, electrically, was at the time a secondary consideration. ■

USA-CA [*continued from page 68*]

Alaska

Have received several letters suggesting that the requirement of working a member of the Wildwood Station ARC makes the Alaska All County Award difficult to obtain. Not so! The WSARC has seven operators manning the Club station KL7WAF. Other active club members operating own stations include KØCST/KL7, K9GOS/KL7, KL7CHL, WL7DYM and Old Timer KL7AV. WSARC Club station is highly active and expected to join CHC soon, so with all the named actives it should not be too difficult to make the one required contact with a club member.

QCWA QSO Party Next Month

The Quarter Century Wireless Association, QCWA, holds their fifth annual QSO Party through February 9-11th, and this will be an excellent opportunity not only to win the QSO Party awards but, additionally, to win regular QCWA awards for contacting 25, 50, 100, 150, 300, 500, 750 or 1,000 QCWAers. For rules of the up coming February QSO Party, see *CQ's* CONTEST CALENDAR.

To win QCWA's regular awards, normally QSLs must have been received; however, the Custodian, K6BX, will honor a copy of the QSO-Party logs (original copy goes to those running the Party) as proof of contacts for awards purposes. QCWA now has upwards to 3000 members commonly referred to as "Old Goats". Upon request, with s.a.s.e., K6BX will provide a copy of QCWA's regular awards program together with a quick reference, call listing of members. Needless to say, QCWAers quite frequently represent several credits for other awards. Also, the QCWA QSO Party will be excellent opportunity for picking up many new counties.

Well, there you are Mates, as we promised you, just so long as we and YOU continue to convince the *CQ* Editor that YOU want more of this free press coverage of USA-CA and related news, we are sure he'll attempt to 'find' the space. At least you now know both we and *CQ* 'care'.

If you already haven't done so, start the New Year off with the fun to be enjoyed by joining USA-CA Program activities. Complete Rules were in *CQ* July, 1961, issue, or if you'd like a special copy, drop K6BX a s.a.s.e. and we'll load you down with both it and propa-

ganda on all of K6BX's hamdom services and projects. Needless to say, all of the more than 1000 awards available are listed in K6BX's *Directory of Certificates and Awards* (See November 1961 *CQ* for ad info).

A happy New Year of awards hunting and especially county hunting. The Lord willing, we'll be with you come February.

OLD MAN K6BX

Novice [*from page 79*]

ing you and that it has been a thrill seeing so many enter as Novices and leave as Generals. Let's hope the column has contributed to this in some small way. Merry Christmas and a Happy New Year!

73 ES AR, DE Don, W6TNS

V.H.F. [*from page 82*]

necessary that K9GDF copy every M, since he has already copied a Z from W3ABT. The QSO was completed at the moment W3ABT copied N from GDF, indicating that *his* transmission had been received and giving a signal strength report. For the purposes of satellite scatter, a QSO has been completed when a piece of meaningful information has been exchanged both ways. After the contact, the two stations should meet on another frequency to confirm that they have received the information correctly.

Many thanks to K2QBW for this introduction into satellite scatter communication.

Farewell

This will most likely be my last V.H.F. COLUMN for *CQ*. After only a short time here I must leave this post. Next month your conductor will be Don Stoner, W6TNS, a fellow with whom you are already quite familiar. I do wish to mention that I've been very happy in this position and had a great time being at your service, answering mail, making hamfests, and, most of all, meeting v.h.f. men from near and far. Don't send any more mail to this address (Rahway, N. J.). Address it all to V.H.F. Dept., *CQ*, 300 West 43rd Street, New York 36, New York.

It is only fair that I explain why I must leave *CQ:* This column, although a great means of enjoyment to me, is very time consuming. As you may or may not already know, I publish *The VHF Amateur*, a magazine devoted entirely to our phase of the hobby. This is a full time endeavor and involves all too much to take on further literary work here at *CQ*. Occasionally, I may take on an article . . . but I'm afraid deadlines are out of the question now.

In conclusion, might I add that I wish Don all the best here at the V.H.F. COLUMN. Give him your all, fellows.

73, Bob Brown, K2ZSQ

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Type	Nominal Impedance	Price Per 100'	Price Per 1000'
RG-8/U	52 Ohms	**$8.50**	**$80.00**
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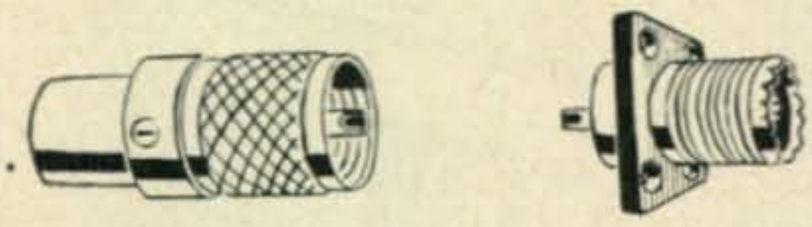
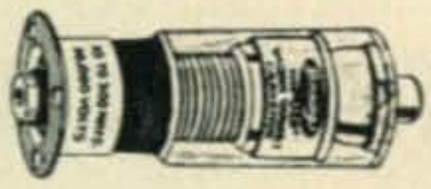
RG-11/U	72 Ohms	**8.00**	**75.00**
RG-11A/U	72 Ohms	**9.00**	**85.00**
RG-58/U	52 Ohms	**4.50**	**40.00**
RG-58A/U	52 Ohms	**5.00**	**44.00**
RG-59/U	72 Ohms	**4.50**	**40.00**
RG-59A/U	72 Ohms	**5.00**	**44.00**



83-1SP Type Coax (Male) Conector for RG8/U, etc. ..... **$ .25**

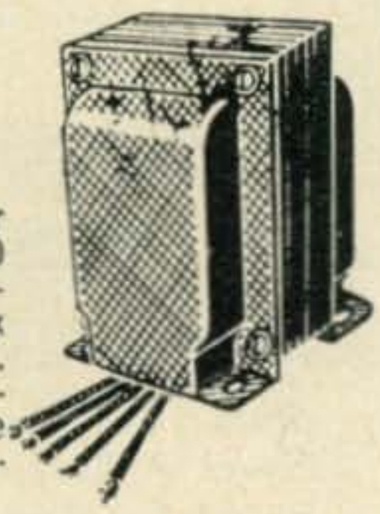
83-1R Type Coax (Female SO-239) Connector for RG8/U, etc. ..... **$ .25**

4" Ceramic Insulator ..... **$ .20**



UCS Jennings Vacuum Variable 10 to 300 MMFD/ 10KV ..... **$ 49.00**

Plate Transformer Pri: 115 VAC at 60 CPS. Sec: 3,000-2500-0-2500-3,000 at 350 Ma. insulated for 10 KV. Size: 4"H x 7 Wx 6¼" D. Net wt.: 25 lbs. New production. Stock: #X-6000/350. **$34.95**



Collins Plate Transformer Pri: 110 V. at 60 CPS. Sec: 800 V.C.T. at 270 Ma. (Secondary insulated for 2500 V.) Size: 4⅞"H x 3¾"W x 4"D. Net Wgt: 8½ lbs. (approx. 10 lbs. packed.) All terminals have 24" color coded wire leads. Order stock No. RAD662S-463. NEW. UNUSED. **$3.50**

SK-100 Eimac Socket for 4KM 3000 LQ, 3KM 3000 LA, 3K 3000 LQ **$125.00**

SK-110 Eimac Socket for 3K 50000 LA, F, and Q; 3KM 50000 PA for 4KM 50000 LA, LF, LQ; 4K 50000 LQ, 4KM 50000 SG, 6 50000 LQ... **$150.00**

22 Volt XMFR/2AMPS (117 VAC/60 CPS) Boxed **$150.00**

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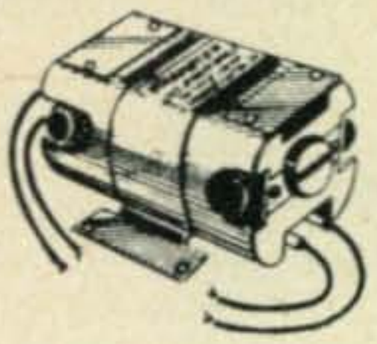
700 Volt Dynamotor Input: 12.6 (21 Amps.) Output: 700 VDC at 260 Ma. Made by Sangamo. Frame and construction very similar to Carter Dynamotors: With mounting bracket frame mounted to dynamotor. Units are brand new in mint condition. In original mfgr's carton. Overall dimension: 3½"H x 4¾"W x 7"L. Net Weight 8½ lbs. **$13.95**



Deluxe Portable Electronic Megaphone Type PAE-2 Consists of 6 tube amplifier, operating from modern built-in 6 volt (non-spillable) plastic wet-cells. Units comes complete with power supply and built-in charging supply to recharge batteries from 115 VAC. Charging supply has timing switch. Furnished with dynamic microphone in horn assembly with trigger switch, cord, and plug. Complete w/book and spare parts. Unit is strictly "Rolls-Royce" throughout. Ideal for ship operation (unit is waterproof).

Output stage 4 tubes in push-pull parallel. Voice capable of operation up to one mile. A limited quantity of these units available. All brand new and in original cartons.

Order Remler Type PAE-2. **$99.00**

VHF Transmitter. Perfect for 2 meter and/or 1¼ meter conversion. Late, modern design. Uses two 6201's into single Amperex 6360 twin Tetrode. Xmtr only 4" x 4" x 11". Only 3¾ lbs. Complete with 10½" chrome antenna. Furnished complete with A and B battery pack, & connection cable and schematic & conversion info. with case: Battery weight: 23 lbs. PRICE **$15.00** with all tubes. (We can ship without battery—same price **$15.00**).

30 Watt Mobile Transmitter: Uses 5618 crystal oscillator into CBS 5516 amplifier. Modern design. Only 7 lbs. net weight including built-in 6 V. vibrator power supply. Completely enclosed in aluminum cabinet 5½"H x 7"W x 8"D). Furnished with crystal that doubles near 10 meter band. Will require slight and easy modification for 10 meter operation. A real beauty. With tubes—**$11.95**

2.5 KW Modulation Reactor Transformer: Primary Impedance: 12,000 Ohms. Secondary Impedance: 7500 or 5000 Ohms. Made for use with single power supply for Class B Audio and Class C R.F. For use with separate power supplies; use one 5 to 10 Henry Choke and 1 Mfd. capacitor. New original boxed. Net wt: 102 lbs. **$42.50**

UG-306/U 'BNC' Rightangle **UHF Connector** ..... **$ .50**

SK-710 Eimac Socket for 4cx300A tubes Special **$ 14.95**

Tube Headquarters of The World!!! Complete inventory of Transmitting Special-Purpose, Radio, TV, Foreign, C.R.—1st Quality Tubes. Name Brands Only. Guaranteed. Sensible Prices. (We carry complete line of Westinghouse Tubes).

Fahnsteel FWCT selenium rectifier 50 v. @ 200 amps., 20 lbs. ..... **$ 25.00**

304TH/TL tube sockets ..... **$ 1.15**

R.C.A. CRV-59 AAC TV camera xmitter with 1846 Icon ..... **$ 95.00**

TBK-20 500 watt CW rig, 2.0-18.1 mc., new, less Power Supply f.o.b. Atlanta **$275.00**

For further information, check number 31, on page 110

Semiconductors [*from page 85*]

T2357 which have an f_t of 6.5 mc, extremely low noise transistors, typically 3.9 db at 200 mc for the r.f. amplifier, types T2028 (r.f.), T2029 (mix.) and T2030 (osc.). Philco has developed considerable experience in thin-film work and is now marketing microelectronic devices. Latest application notes include transistor receiver a.g.c. (#712), CB Transceiver (#715) and a three volt broadcast receiver (#717).

Texas Instruments, Box 5012, Dallas 22, Texas —New devices include a high speed PNP germanium mesa, type TIX 895, has an f_t of 2.5 kmc!, 2N985, 2173 and TI 897 epitaxial mesas for 10, 100 and 200 ma switching, respectively, multiple logic element type TI-603 combining two transistors and four diodes in one package, compound element with a current gain of 7,000 combining two planar silicon devices in the TI-602, the TIX-896 NPN germanium mesa for switching 20 ma in 18 nanoseconds. Of special interest to amateurs and experimenters is the new alloy diffused mesa transistor series for a.m.-f.m. equipment, types TI-385-89, auto radios, types TI397-9, CB transceivers, types TI365, 395 and 396, and a.m. receivers, types TI363, 364. Designed for the entertainment market, these devices are attractively priced. A similar series for industrial communications, known as the DALMESA, are designed for all frequencies from d.c. to 100 mc. The series includes types 2N2188 through 2N2191. New literature includes technical information on the recently announced TI TIX 690 "field effect" transistor (more about this next month), data on low level operation of the 2N929 and 930, Application Notes (Aug. '61) on DC-DC Germanium Power Converters and a new short form catalog on the entire TI line of transistors and other semiconductor devices.

73, de Don, W6TNS

YL [*from page 87*]

W8ATB, Esther as chairman. Advance registration is $2; send yours in early to W8ATB at 4098 E. Atherton Rd., Flint, Mich.

1962 Southwestern Division Convention — World-famous Disneyland will be the setting for the 1962 S.W. convention on June 1, 2, 3, sponsored by three Orange Co. amateur clubs. W6PJU, Mildred, is one of the vice-chairmen and will be in charge of YL-XYL activities. The convention will use the new convention hall and the Disneyland Hotel. This is one *all* the family should enjoy.

National Convention — September 1-3, 1962 (Labor Day weekend) at Portland, Oregon. The Portland Roses are planning YL-XYL activities. W7HPT, Beverly, says the knitted wool afghan, main YL prize, is lovely, done in shades of orange, green and brown.

Season's Greetings to you all—may you have happy holidays and a wonderful year ahead!

33, W5RZJ

Ham Shop

Rates for the HAM SHOP are 5¢ per word for advertising which, in our opinion is obviously of a non-commercial nature. A charge of 25¢ per word is made to all commercial advertisers or business organizations.

Your copy should be preferably typewritten, double spaced on one side of the page only.

We do not bill for advertising in the HAM SHOP. Full remittance *must* accompany all orders.

Closing date is the 15th of the 2nd month preceding date of publication.

We reserve the right to reject advertising which we feel is not of an amateur radio nature.

Because the advertisers and equipment contained in the HAM SHOP have not been investigated, the publishers of *CQ* cannot vouch for the merchandise listed therein.

Opportunity to volunteer service to a non-profit scientific research project. Object: investigation of electromagnetic phenomena such as radio astronomy, scatter propagation, and moon-bounce. An administrative staff of 25 people with knowledge and skills in electronic and related fields is needed. For details write Radiometric Research, Ltd. Box 4335-Annex, Las Vegas, Nevada.

ATTENTION Mobileers! Leece-Neville 6 volt 100 amp system $50; 12 volt amp system $50; 12 volt 60 amp system $60; 12 volt 100 amp system $100. Guaranteed no ex-police car units. Herbert A. Zimmermann, Jr. K2PAT, 1907 Coney Island Ave., Brooklyn 30, N. Y. Tel. DEwey 6-7388.

For Sale: TV Cameras, Teletype, Panadapters, Transmitting Tubes, Transistors, SSB gear. Write for list. Spera Electronics, 37-10 33 Street, L.I.C., N. Y. STillwell 6-2199.

ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog. Fabulous bargains. Meshna, Lynn, Mass.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 P.P. DePaul, 309 South Ashton, Millbrae, Calif.

WANTED: Teletype printers, perforators, reperforators transmitter-distributors test equipment: Model #14, #15, #19, #26, #28, etc. All types Collins receivers, 51J, R-388, R-390, 75A, etc. Cash, or trade for NEW amateur equipment. Write Tom, W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048).

WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft. Box 399, Mount Kisco, N. Y.

"The VHF Amateur"—At last a magazine for VHF'ers! Don't miss a single issue! Send $2.00 for year or $1.00 for six big issues . . . 67 Russell, Rahway, N. J.

GARAGE DOOR OPERATORS $59.95. Rugged chain drive automatic units. Highest quality. Free literature. DEMSCO, INC., Sebring 22, Ohio.

SELL: Used 200V Like new. $639. Organs and Electronics, Lockport, Ill.

WANTED: TEST EQP'T, TS or AN/URM, UPM, ARM, etc. TELETYPE TG-7, Models 14, 15, 19, 26, 28, printers & reperforators: Revrs & xmtrs: BC 610E, I; AN/GRC-3 & higher, RT-66, -67, -68, Collins 51J. 17L3, -4, 18S-2, R-388, -390, -391; ARN-14 and -30; APR-9, -10, ARC-21, -34; APS-10, -31, -33, -42 etc. We pay freight. Amber Industrial Corp., 75 Varick St., New York 13, N. Y.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash for each item that you want preserved. 24-hour service. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N. Y.

QSL's. Samples free. Phillips W7HRG, 1708 Baidge Street, The Dalles, Oregon.

QSL's . . . CB . . . SWL cards . . . Dime. Flimcrafters, Martins Ferry, Ohio.

Outstanding QST or WPE samples 25¢ (refunded). Sackers, W8DED, Holland, Michigan.

QSL—Kromkote 3 color . . . order 200 get 25 each of 8 different styles—many styles. Samples 10¢—Progress Printing, Box 1154, Biloxi, Miss.

QSL's four colors glossy stock forty design send $5 for 200 and get surprise of your life. 48 hour service satisfaction guaranteed. Constantine Press, Bladensburg, Md.

GLOSSY 3-color QSL cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, Somerset, N.J.

QSL's SWL's. That are different, colored, embossed card stock and "Kromekote." Samples 10¢. Home Print, 2416 Elmo, Hamilton, Ohio.

QSL's Samples 15¢. Rubber stamps: Name, Call Address $1.35. Harry Sims, 3227 Missouri Avenue, St. Louis 18, Missouri.

QSL's-SWL's samples 10¢. Malgo Press, Box 375 M.O., Toledo 1, Ohio.

QSL's. SWL's XYL-OM's (Sample assortment approximately 9¾¢). Covering designing, planning, printing, arranging, mailing, eye-catching, comic, sedate, fantabulous, DX-attracting, protoypay, snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minnesota.

QSL's—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QSL's SWLs, CB, WPE. Nicholas & Son Printery, P.O. Box 11184, Phoenix 17, Arizona. Samples 5¢.

QSL's. Samples, dime. Print Shop, Corwith, Iowa.

Certified QSL's-SWL's . . . Unique designs, speedy service. Catalog 25¢ (Refundable) Certified Printing, Box 1023-A, Whittier, California.

Multiplex Adapter—Circuit board, set of 5 coils, sockets and complete instructions $15.00. D. L. Stoner, Box 7388Q Alta Loma, California.

Hi-Fi-FM receivers—will swap for telescopes, cameras, radio equipment. W1BYX, Box 122, Rockville, Conn.

WANTED: NC 66 state condition and price first letter. John Caspersen, Box 35, Andover, New Jersey.

Convert any television to sensitive, big screen oscilloscope. Only minor changes required. Plan $1.95. Relco Industries, Box 10563, Houston 18, Texas.

Learn Code quickly and easily by my simplified system. Only $3.00. John Kinsey, W2SUF, Box 61 Oneonta, New York.

New Ranger $175.00, New Courier $150.00, Heath Cheyenne, Commanche, AC supply, Mobile Mt. all new $185 complete. RME 4300, clean $85.00. Boyd Kelty, 141 Aldrich, Youngstown 9, Ohio. SW2-4971.

FOR SALE: HRO-60 with matching speaker and coils A, AC, B, C and D. $300.00. K5AON, 867 Berkinshire, Dallas, Texas. (DAvis 7-2200).

Dummy Load Glo Bar type 250 watts int. complete with SO-239 special purchase $4.95. Ham Kits, Box 175, Cranford, N.J.

FOR SALE: Two 804 tubes, new, $9.50 each. One 4C35, new, $12.00. S-Band wavemeter, CW-60/ABM, excellent condition, $10.95. Bruce Steller, 624 Drumwood, McMinnville, Oregon.

FOR SALE: 100V transmitter, used very little, good as new $525.00. Will ship in original case. Best of references. Basil McGinty, W4ZS, River View, Ala.

TOROIDS: 88 mhy with mounting hardware. Uncased; like new. Information sheet included. $1 ea., 5/$4.00 Postpaid. KCM, Box 88, Milwaukee 13, Wisconsin.

FOR SALE: NC-300, Series 460, $200; DX-35, $30; with manuals. Also 3 new 304TL's. Jim West, W4THR, Lookout Mtn., Tenn.

COLLINS 75A-1 $215; 75S-1 with noise blanker (cost $125. extra), $445.00; B&W 51SB generator, $125.00; KW matchbox, latest model, $95.00. W8WGA.

WANTED: Tubes, diodes, transistors, any quantity, all types, also military, commercial lab-grade test equipment, components, PRC, GRC equipment, aircraft equipment by Collins. TOP PRICES. Write details, Bob Sanett, W6REX, V&H Radio & Electronics, 2053 Venice Blvd., Los Angeles 6, California.

DX-100 with improved loading control, $150. NC-98 $75. Both like new with manuals. Al Brand, 415 E. Sycamore, Sycamore, Illinois.

Elmac-AF 67, $90.00. Elmac PMR-6 $50.00. Gerard Moor, 375 Richmond St., Providence, R.I.

Teletype, model 26 with keyboard. Manual, roll paper, extra pellets $95. plus shipping. Hallicrafters SP44 Pan-adaptor $35. HT-18 FM tranciter $35. 304TL tubes $10 each. General Radio type 726-A VTVM. Bill Doctorman, K6AEZ, 150 Genevieve, Camarillo, Calif.

SWAP KWS-1 and 75S-1 for what have you even money. W7EHQ, P.O. Box 1316, Tacoma, Washington.

WANTED: Gonset VHF adapter 108-128 mc model #3014 6 volt or similar for aviation band 108-156 mc. Cash or trade photo equipment. Alex Calder, 1261 Merriam Avenue, Bronx 52, N.Y. JE 8-0485.

WANTED: BC639 receivers, advise price, condition. We pay freight. Amber Industrial Corp. 75 Varick Street, New York 13, N.Y.

A-1 reconditioned equipment. On approval. Trades. Terms. Hallicrafters S-85 $79. SX-99 $99.00. SX-100 $199.00. SX-111 $199.00, SX-101A $299.00. HT-32, HT-37; Hammarlund HQ-100 $129.00, HQ-129 $129.00. HQ-110 $179.00. HQ-150 $199.00, HQ-160 $259.00, HQ-170 $289.00; National NC-183D $199.00, HRO-60 $345.00; Gonset G-50 $299.00; Central 20A $149.00. Viking II $159.00, Valiant $279.00. Thunderbolt linear $299.00, Collins 75S-1, 32S-1 32V-1, 32V-3, 75A-4, KWM-2; Elmac, Globe, Gonset, Heath, Johnson, RME, other items. List free. Henry Radio Company, Butler, Missouri.

TUBES: 304TL's $20.00, 304TH $20.00, 250TH $12.50. 100 TL's $6.00. W4WMX, 207 River Road, Newport News, Virginia.

BC-375 complete $30 and Hallicrafter S-53, $30. Stuart White, 615 Plymouth St., Middleboro, Mass.

LIQUIDATING: $399 buys Central Electronics 600L and 20A (immaculate). $775 new value. Quitting hobby. Clark, 1439 Martin, San Jose, Calif.

WANTED: Commercial or surplus aviation and ground transmitters, receivers, test sets, 18S, 17L, 51R, 618S, GRC, PRC, ARN14, MN85. Bendix, Collins, others. Ritco, Box 156, Annandale, Virginia.

WANTED: very sensitive 30-50 megacycle FM receiver, excellent condition. 117V AC. Francis Andrew, Box 268, Elkins, West Virginia.

Heath 2 meter transceiver HW-2 $35; Heath Q-multiplier $8; Western Electric VOM $9; Heath signal tracer $12; RCA WO-88A 5" scope $55: all in excellent condition. Jac Holzman, K2VEH, 116 W. 14 St., New York City. OR 5-7137.

FOR SALE: FCC90B crystal calibrator with tubes $16.00. WPE3CKI, 2416 South 7th St., Phila. 48, Penna.

VIKING Valiant, in new cond., never used, $320 local sale preferred. Lee Mattis, 548 Arch St., Ryersford, Pa.

WANTED: 6M mobile transceiver and 6 meter converter. Sell Novice code records. A. Molby, KØMVI, Rte. 6, Brainerd, Minn.

SALE: DX100 A-1 condition $150.00. W2AUF, 8426 87th Street, Woodhaven 21, N.Y. VI 9-8379.

National HRO-50TA1 receiver, power supply, speaker, bandspread coils, excellent condition. Price low. Need dough. $140 FOB. R. A. Eubanks, 601 E. 32 St., Chicago, Ill.

SALE: Johnson Valiant, SX-111, Johnson low pass filter, Dow coax relay, D-104, mike. Best offer over $400.00. Will ship and sell separately. K8SCP, 30 Middletown Avenue, Newport, Rhode Island.

TECHNICIANS: Now a publication for and by technicians. Send 25¢ for February issue. "The Technician," Box 465, Billings, Montana.

TOROIDS: 37 hy, 2 hy, 1.7 hy new. Five $3.00 P.P. Collins sealed filters 600 ohms to 600 ohms. Audio lo pass cutoff 3500 CPS, $5.05 P.P. Band pass filter 635 CPS to 865 CPS, $4.95 P.P. WØNHP, 7205 Center Drive, Des Moines, Iowa.

FOR SALE: Quality AM-FM tuner with cover and manual $25. 1-208 FM signal generator with crystals, manual, cables, $50. TS-102A-AP range calibrator, less crystal, $16. 20W amplifier, Hi-fi, $25. BC-603 receiver with AC power supply, converted, $18. BC-603 receiver 6.3V tubes, $12. Albert Aust, 519 Mt. Vernon Dr., Elwood City, Penna.

SELLING entire station: HT-32, SX-88, ART-13 w/ac power supply, LA-1, Hallicrafter panadaptor, Hy-Gain 10 meter beam. All in perfect working order. Contact: Yager, K7NLI, 1701 E. 1st St., Tucson, Arizona.

Chicagoland-Teletype tape equipt. #14 receive only typing reperforator, 60/75 WPM, power pack, relay, wired table, cash only, FL 4-2581, Scarnavack, 1302 W. 60 St. La-Grange, Ill.

Aluminum for every ham need. Write to Dick's, 62 Cherry Avenue, Tiffin, Ohio, for list of tubing, angle, channel, castings, plain and perforated sheet, and complete beam kits.

FOR SALE: Telephone relays—10 MA 24v coils. Assorted contacts, pulled from equipment. 3 uncased relays, ¾ lb. $1.00. 1 pair, in shield can, 1¾ lb. $1.00. Type 13A W.E. repeat coils $1.00 ea. FB for RTTY tuned filter, 1¼ lb. All F.O.B., Al Sirheim, KØKLS, Madison, Minnesota.

College: New HX-500, SSB transmitter (Hammarlund), used less than 1 hour, $575.00, will ship COD. K8RPE, Turner, 239 Marview Ave., Vandalia, Ohio.

SELL: KWS-1, perfect $875; Fisher stereo tuner $150; Bell 3030 stereo amp. and preamp $100; Roberts 4 track stereo $350; Concertone custom, professional, 5 heads, 10" reels, 7½ & 15, carrying cases $750; everything like new, R. R. Lamb, W3VDE, 1219 Yardley Road, Morrisville, Penna.

HALLETT shielded ignition kit. Intended for 1954 Chevrolet P/U but will fit most Chevrolet or GMC 6-cylinder engines. $35.00. David Kaufman, 225 N. 3rd St., Mountain Home, Idaho.

PREMIUM QUALITY used equipment. Over $1,000 units, reconditioned with trial plan and full 90 day guarantee. Terms available. Write for free lists and top trade-in offer on your present equipment. World Radio Laboratories, Box 919, Council Bluffs, Iowa.

FOR SALE: Collins KWS-1 xmtr, $1,000; Collins 75A-4 receiver $500.00; Jones 263 micro-match, $50.00; 189-A2 phone patch, $50.00; All equipment in mint condition. K. Keyte, 112 Earnestine Street, McLean, Virginia.

DX-100 OWNERS: Increase power by 50%. Run 240 watts AM-300 watts CW or SSB. Complete kit and instructions for adding another 6146 to final only $19.95. Similar kit for TX-1. Order or write. W4KUV-W4NZS, Best Radio Service, 610 N. Madison Avenue, Goldsboro, N Carolina.

Two brand new 220 mc gold plated RF finals 200 watt has a 4x250, blower, crystal osc, driver unit made by Bendix 1959, $25.00 each. Complete two meter RF final has pair of 4x150, 110 volt blower, silver bar tank, gear drive tuning, brand new with power plug $35.00. Two very slightly used Eimac 450 TL guaranteed both $25.00. Two transistor power supplies output 600 vdc 500 mill reg. input 24 vdc new $25.00 each. One 300 vdc 150 mill, two 185 vdc 150 mill all 24 vdc input new made by Bendix $10.00 each. One two meter colinear antenna made by communication products $40.00 F.O.B. Ten sigma polar relays for RTTY new $1.00 each. LAF signal generator model 2, 90 mc to 600 mc with cal chart, $30.00 F.O.B. One plate modulation transformer poted type 1 KW of audio $40.00 F.O.B. One scope unit ID-60/APA-10 $12.00 F.O.B. One NC-300 with xtal cal. $210.00. I don't have room for all this gear, so write me air mail, 1121 Notre Dame Dr. W4ZQL, W. L. Perry, Maitland, Fla.

RTTY for sale. Model 14 transmitter distributors, sync motors, excellent cond. $65. Heath SB-10 perfect $65. Or consider trade for other RTTY gear. W8FEU/1, 2065 Commonwealth Ave., Auburndale 66, Mass.

FACTORY-WIRED Ranger $175.00; 100 watt CW transmitter $50.00; BC-342-N $75.00; Cush-Craft groundplane $10.00; Clough-Brengle RLC bridge $10.00; 20 pounds hook-up wire $10.00; twenty years accumulation of tubes, cabinets, amplifiers, parts. Bids? W9NVC or AU 7-5691 in Chicago. No letters!

For further information, check number 40, on page 110

FOR SALE or trade: Central Electronics 100V and Hallicrafters SX-101A. Looking for Collins S/Line or KWM-2. Write W4AAD, 27 River Road, Newport News, Virginia.

SELL: Complete station of 6 and 2 meters. Viking 6N2 transmitter, $100; Viking 6N2 VFO, $40; Viking Valiant (Mint condition. Used only as power source and modulator for 6N2 transmitter), $385; Viking 6N2 converter with Ameco Nuvistor preamp, $65. Or will sell entire group for $525. Also, HQ-180 receiver with i.f. noise silencer, $350. All deals must be cash on line. Write Box RDC, c/o *CQ* Magazine, 300 West 43 St., New York 36, N.Y.

FOR SALE: 2 KW PEP GG linear amplifier—Pair 4-400 A's, completely regulated bias and screen supplies, 4,000 VDC, Powerstat, 48 in. rack, 5 Triplett meters, components value over $750.00. Good cndition. Write The Rev. Robert E. Picking, W3VOA, 407 Pine Street, Danville, Penna.

Let's trade, now in stock new factory boxed 1962 Hammarlund receivers, with clocks, matching speaker, HQ-100 AC $213.95, HQ-110C $273.95, HQ-145XC $298.95, HQ-170C $288.95, HQ-180C $458.95. Trade in your surplus BC-342, BC-348, BC-639, BC-779, BC-794, BC-1004, ARC-2, ARC-34, ARC-38, ARC-44, PRC-6, 8, 9, 10, ART-77/GRC-9, AN/GMD-1, Test sets with SG, URM, UPM, USM, prefixes, BC-221, ARR-5, ARR-7, ARR-15. Advise what surplus you have and Hammarlund receiver you'd like. Top trades given, Bill Slep Company, Drawer 178CQ, Ellenton, Florida.

NEW CV89A/URA8A teleprinter converter, audio input, scope indicator $245.00 SP-600 JX Hammarlund receiver .54-54 mc $295.00. Collins 51J-2, 51J-3 receivers. Alltronics-Howard Co., Box 19, Boston 1, Massachusetts. (RIchmond 2-0048).

SELLING COMPLETE STATION: All like new, perfect. Viking Challenger; Hammarlund HQ-110C, speaker, Dow relay; D-104 mike, push talk base; Heath Q Multiplier, SWR Bridge; AR-22 Rotator; Telrex 5 element 6M, 50 foot telescoping mast, Gotham all band vertical; Eico Grid Dip Meter; Drake 1000 filter; Manuals; many valuable extras. First $475 takes all. Cook, 1629 Burnett Street, Brooklyn, N.Y.

FOR SALE: Complete ham station. Heath "Apache," NC 173 w/speaker, Gotham vertical antenna, SWR bridge, phone patch, heavy duty rotor, doublet antennas. Make an offer. Rev. William Tammen, Reading, Minnesota.

Package Deal: Heath VF-1, DX-35; Globe LA-1; Hallicrafter SX-99; Dow Relay DK 60-G2C; best offer over $200; Bill Rodney, W2IKH, 41 Devonshire Road, Cedar Grove, N.J.

Complete station—Viking II, 866A's SSB wired, blower, PTO, transistor preamp, Drake IA, AM detector $380; Late Zenith trans-oceanic $45; 17" portable TV, monitor, 2nd set $35. Chester Benson, W9IFB, 732 So. 14th, Richmond, Indiana.

Hammarlund 129X perfect condition $100, TB-3 Hornet 3 element KW beam $40, Brand new wired Heath Warrior linear amplifier $250. W4IXJ-CY Broder, 1307 Delaware Ave. Ft. Pierce, Fla.

SX101A like new. Sell $265. D. Robertson, Building 911, Brookhaven National Laboratory, Upton, L.I., N.Y. YAphank 4-6262, Ext 507.

WILL SWAP good used 35mm camera equip, Cannon IVS-2, F/1.8 50 mm Cannon lens, case: for Heath TX-1 Apache, Viking II, B&W 5100B; or Exakta VX, 58mm F/2 Zeiss lens and excellent F/5.5, 400mm Tele lens, plus Cannon for Apache and SB-10, Viking Valiant, BC-610, or NC-300/calib, good 75A3, Rodger, KØGBZ, Quinter, Kansas.

Christmas Bargain: Adventurer xmtr $30.00. Stromberg-Carlson Hi-Z mike with push-to-talk stand $15.00. Vibroplex Champion But $12.00. Adventurer modulator $5.00. All including xtals relays for $60.00. 3-6mcs. ARC/5 and power supply parts $12.00. WA2FCQ, Box 21, Loudonville, New York.

FOR SALE: RME 10-15-20 Converter or will trade for BC-221 or LM in good condition. W. A. Webb, 2310 Lengley, St. Joseph, Michigan.

FOR SALE: Penta PL-172. Never used, tested, Worth $135.00. One only, $40.00. K2EEK, 75-15 177th Street, Flushing 66, New York.

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Contents, Volume III

VOLUME III — APN-1; ARC-5; ART-13; BC-191, 312, 342, 348, 375, 442, 453, 455, 456 to 459, 603, 624, 696, 1066, 1253; CBY-52000 series; COL-43065; CRC-7; DM-34D; DY-8 or DY-2A/ARR-2; FT-241A; LM; MBF; MD-7/ARC-5; RM-52, 53: R-9/APN-4; R-28/ARC-5; RT-19/ARC-4; RT-159; SCR-274N series; SCR-508, 522, 528, 538; T-15 to T-23/ARC-5; URC-4; WE-701-A. Schematics only: APA-10; APT-2; APT-5; ARR-2; ASB-5; BC-659, 1335A; CPR-46ACJ.

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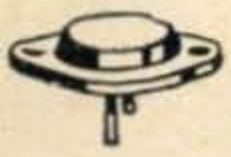

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70	5.60	4.50	10.80
240	8.40	5.70	19.60

50Piv 35Rms	150Piv 105Rms	D.C. Amps	400Piv 280Rms
.25	.45	2	1.00
.60	1.00	3	1.80
.70	1.25	6	2.00
.85	1.50	12	2.20
1.80	2.50	35	6.10
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**Derate 20% for Battery or Capacitive Load or D.C. Blocking!*
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2N671 rate one watt 75¢ @, 10 for $6

For further information, check number 39, on page 110

National's new, low-priced NC-105

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Look over the chart at the right. Have you ever seen so many advanced features at such a remarkable price? These are features the novice wants and needs. For example...exclusive National Q multiplier circuitry operates on CW as well as AM . . . where it's really needed. There are separate RF and audio gain controls. AGC works in all modes of operation!

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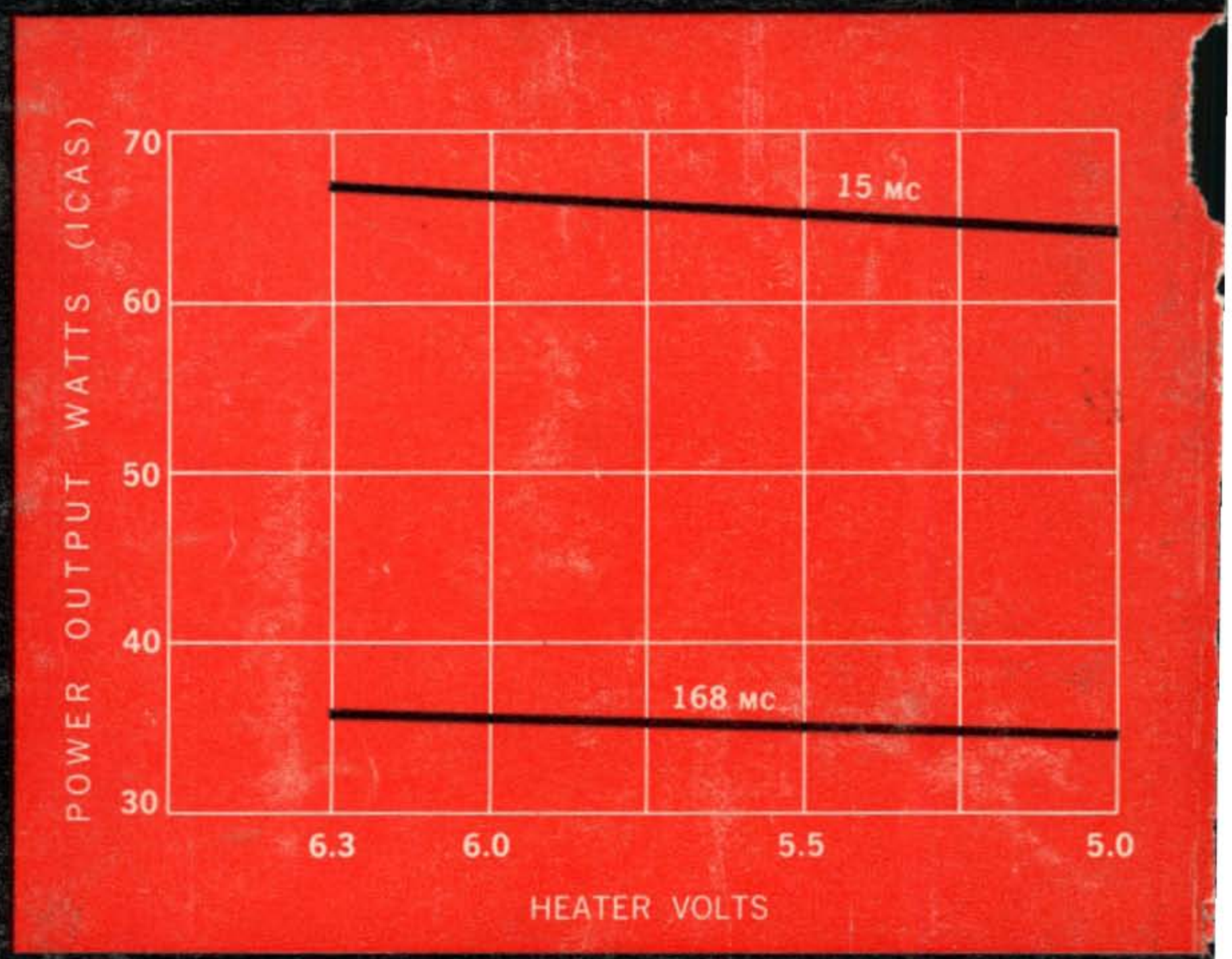

Performance of typical RCA-6146 at
15 Mc and 168 Mc as heater voltage drops

The RCA-6146 Closely Maintains Power Output— When Heater Voltage Drops

The original RCA-6146 design stands out. Here's a beam power tube that closely maintains power output even at maximum capability —when heater voltage drops. Look at the chart. At 5 volts, the drop-off is about 1 watt! The RCA-6146 does this easily—not only at 15 Mc, but also at 168 Mc.

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