March 1965
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HF/UHF Output
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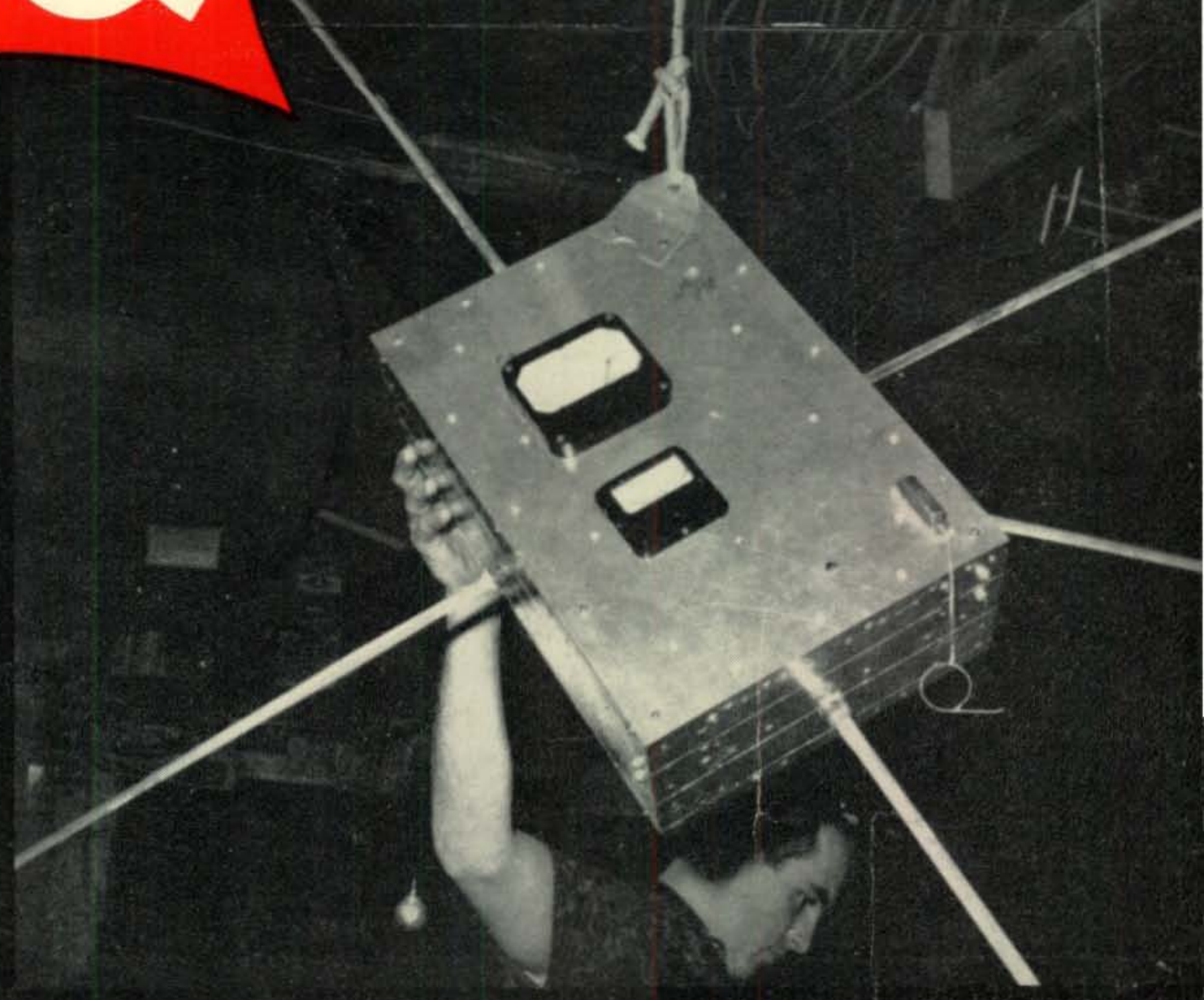

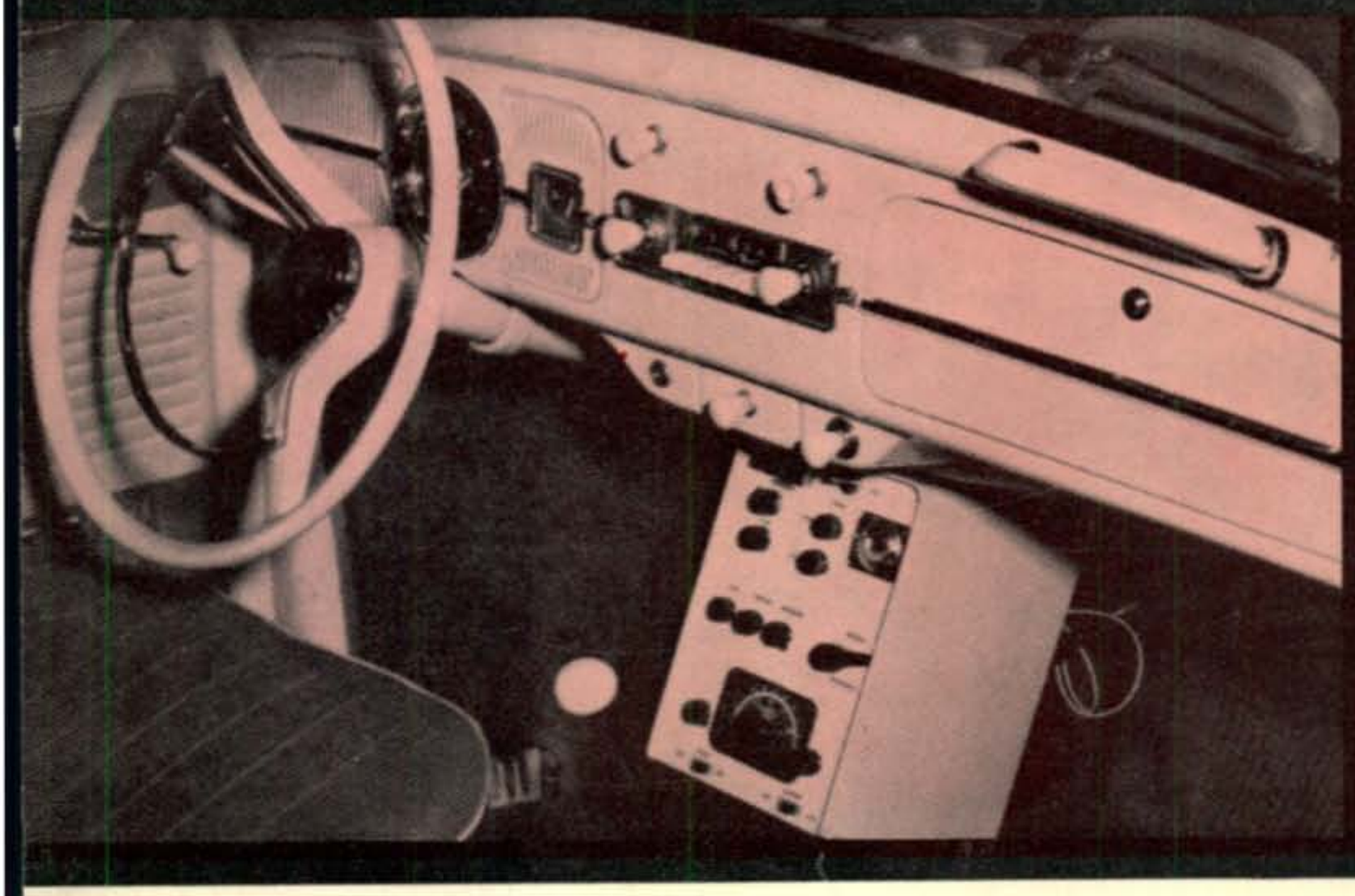

VHF in a Volks

Low Cost Mechanical
Filters from Lafayette

The Tubeless Product
Detector

The CPR Award

The Radio Amateur's Journal

COST
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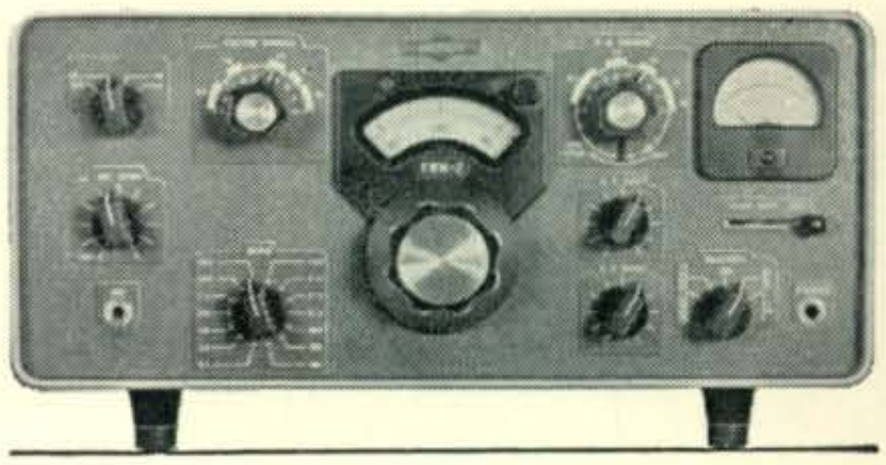
COST
COST!!!!!!!!!!!!!!!!!!

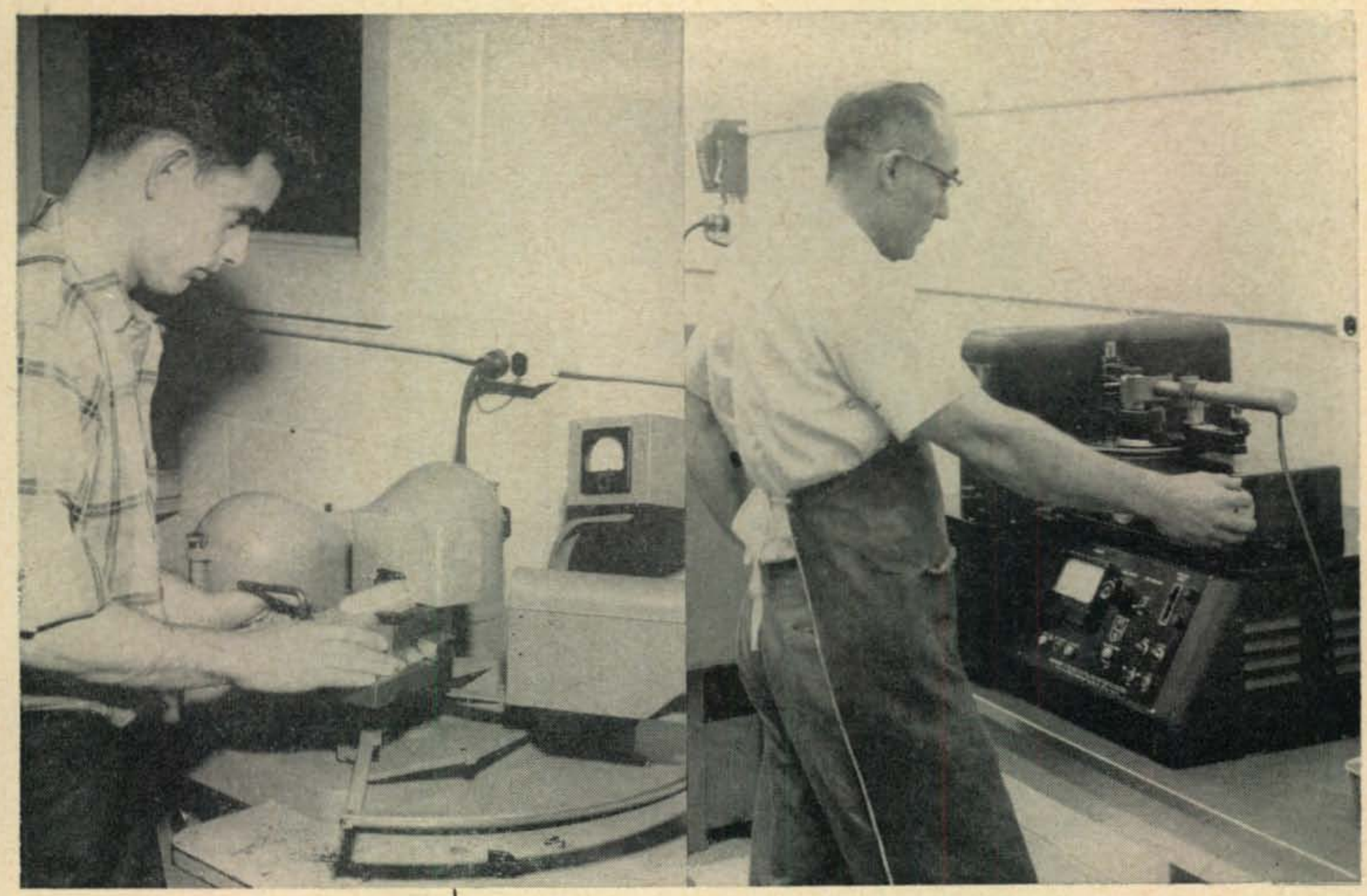
Why is it the most expensive is often the most economical? A paradox? □ No! □ First, with any purchase, and especially with ham equipment, you want self-satisfaction. Next, you want a good investment. □ *What better satisfaction* than to know you have the finest. When you purchase Collins you get such features as complete station compatibility; frequency stability; frequency calibration; more QSO's per kilocycle; mechanical filters; dual or single PTO control; automatic load control; negative RF feedback; light weight; simplicity and styling. And Collins is still the only equipment which has all ten of these features — and is still unexcelled in any of them. □ *What better investment* can you have than in Collins equipment — proven over the years by such famous units as the 32V series, the 75A series, the S/Line — and in the end costing less than the lower-priced units. Collins is interested in protecting your investment by not introducing new models and styles every year or so just to stimulate sales. □ As one of our customers told us, "You can't afford to buy less than Collins." See your Collins dealer. Ask for a demonstration. Then you'll know why Collins is the finest. Why it costs so little to own.



COLLINS

For further information, check number 3, on page 110

X-rays Preorient Raw Quartz for Making PR CRYSTALS...Orientation Verified By X-raying Blanks Coming from Cutter



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Photograph at left shows raw crystal being preoriented. Each bar of crystal must be placed in exactly the right position, as shown by X-ray. The crystal is then locked in place, and the entire jig with crystal is transferred to an automatic cutting machine. Photograph at right shows cut crystals being rechecked by X-ray, to verify precision of orientation.

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For further information, check number 1, on page 110

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features that add up to your greatest tri-band transceiver value

Exclusive Hallicrafters AALC (Amplified Automatic Level Control) providing up to 12 db. of effective compression. RIT (Receiver Incremental Tuning) with ±3 kc. for superior net and CW operation. A superbly designed crystal lattice filter which makes the most of the desirable SSB transmission characteristics. A built-in changeover relay permits direct operation with the HT-45 or other linear amplifier. Sensitivity is less than 1 μv for 20 db. S+N/N ratio. Receiver employs a separate AVC amplifier providing a figure of merit of 100 db. Price: $349.50 less power supplies and mobile mounting kit.

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MARCH 1965 VOL. 21, No. 3

CQ The Radio Amateur's Journal

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Offices: 14 Vanderventer Avenue, Port Washington, L. I., N. Y. 11050. Telephone: 516 PO 7-9080.

CQ—(Title registered U. S. Post Office) is published monthly by Cowan Publishing Corp. Second class postage paid at Port Washington and Garden City, New York. Subscription Prices: U. S. A., Canada and Mexico, one year, $5.00; two years, $9.00; three years, $13.00. Pan-American and foreign add one dollar per year. CQ does not assume responsibility for unsolicited manuscripts. Please allow six weeks for change of address. Printed in the United States of America.

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If you've been planning on increasing your power on six and two meters, here's the tube to use – the Penta PL-177A beam pentode!

The Penta PL-177A beam pentode, just over four inches high overall, is ideal for AM, CW, or SSB. As a Class-C CW amplifier, this reliable tube will deliver 150 watts of *useful power output* at 145 Mcs. – even more on six meters. You'll want to use the PL-177A as a linear amplifier of single-sideband signals, too, because of its excellent linearity, made possible by the exclusive Penta vane-type suppressor grid.

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Send today for your free PL-177A data sheet, with which we'll include a reprint of the December 1963 QST article, "A Medium-Power Band-Switching VHF Transmitter," which describes and illustrates a six and two-meter transmitter using the PL-177A. *The Penta Laboratories, Inc., 312 N. Nopal Street, Santa Barbara, California. 93102.*

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12V DC / 117V AC POWER SUPPLY BUILT-IN!

Small . . .

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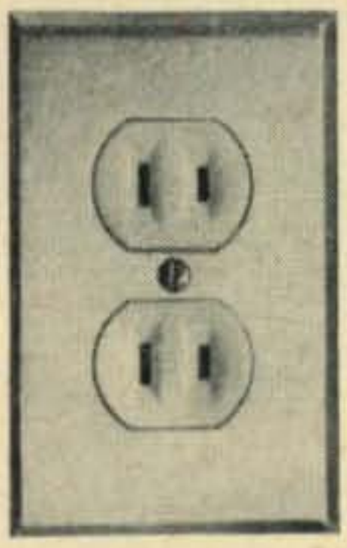
You can plug your SB-34 into the 117 volt AC outlet . . . .

(just use the AC patch cable provided)



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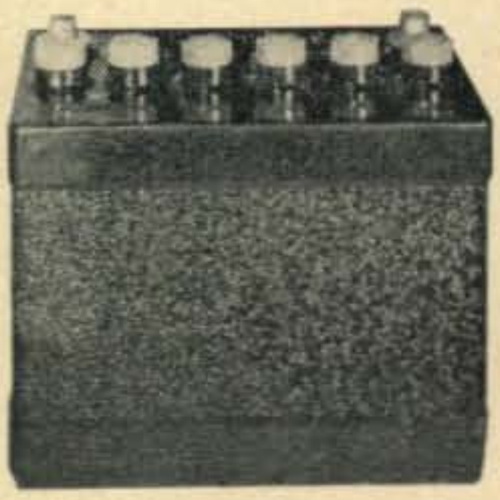

connect it directly to the 12 v. car battery.

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SB-34 draws only 500 milliamperes from vehicle battery when on receiver standby.

Suggested price

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including built-in power supply.

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

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- **Expanded frequency coverage • Delta receiver tuning •**
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- **Solid-state switching---no relays • Collins mechanical filter •**

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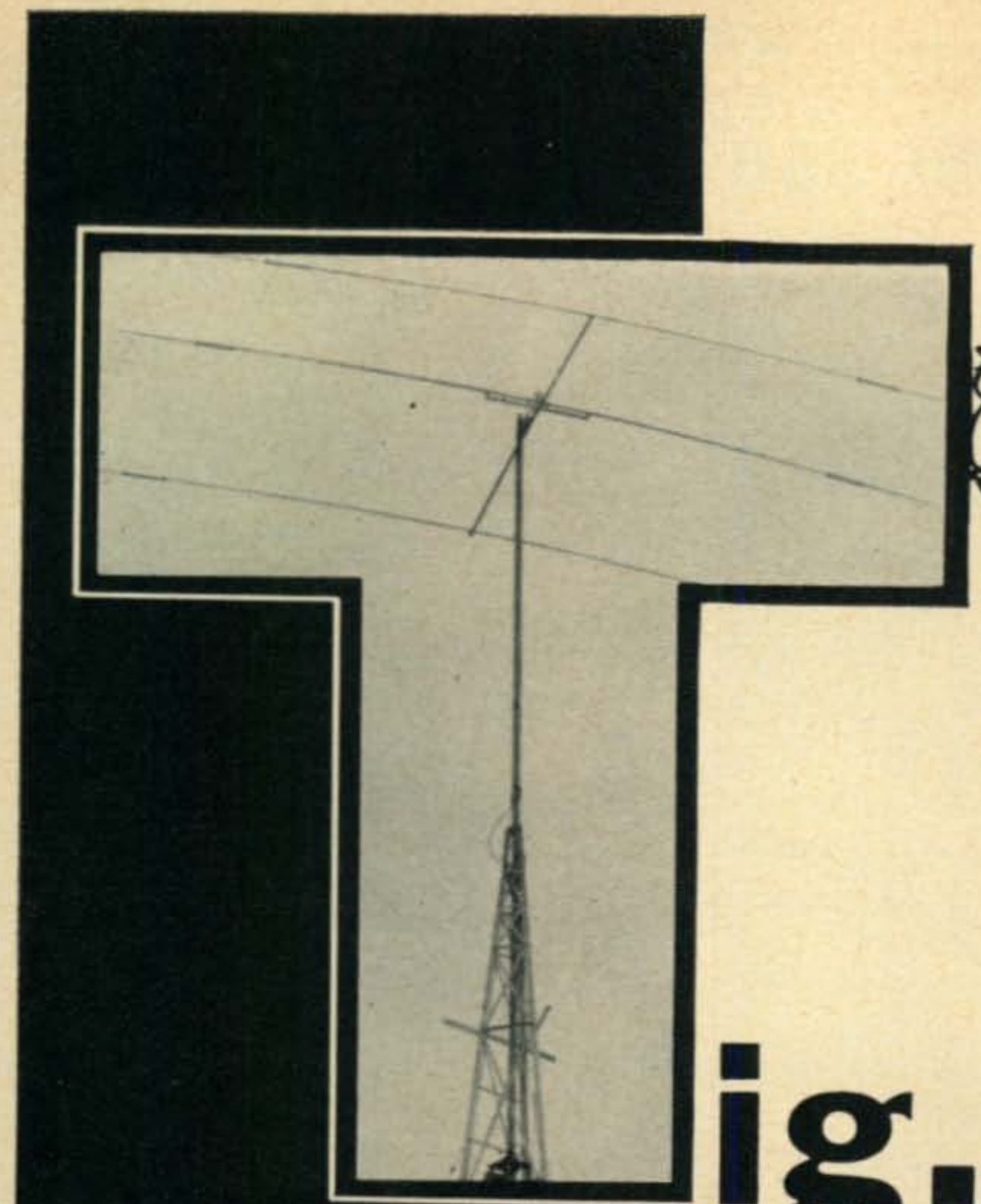
Export sales: RAYTHEON Raytheon Company, International Sales & Services, Lexington 73, Mass. U.S.A.

For further information, check number 5, on page 110



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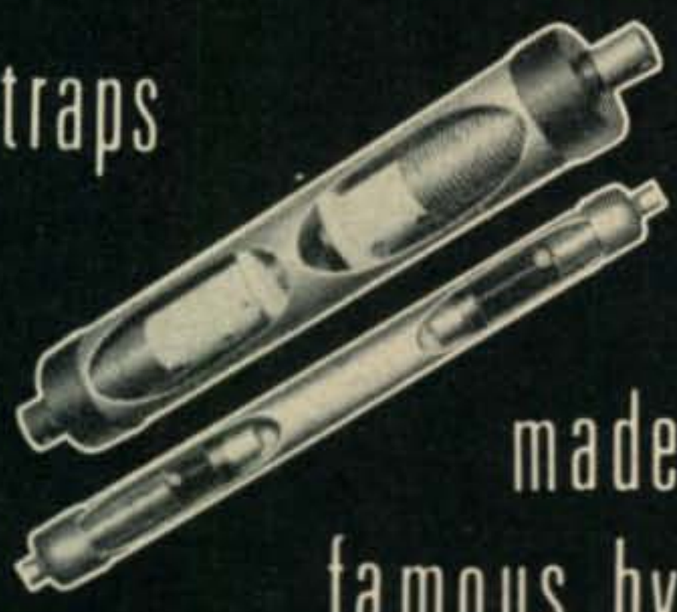

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The Tig-Array is a medium priced antenna rated for medium power, 750 watts on AM and CW or 2 KW PEP (input to the final amplifier), with the same famous Mosley quality construction throughout! Features VSWR – 1.5/1 or better, feed point 50 ohms, forward gain – up to 8 db. and a front-to-back ratio of 20 db.

net price $82.91

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The Tig-Array can be easily modified for operation on 40 without affecting the operation of the MP-33 on 10, 15, and 20. The Conversion Kit, called the TA-40KR, enables the Tig-Array's radiating element to operate as a rotatable dipole. The power rating on 40 meters is 1000 watts AM or CW and 2000 watts P.E.P. on SSB (input to final amplifier).

net price $44.79

Electronics Inc.

4610 N. LINDBERGH BLVD. – BRIDGETON, MO. 63044

For further information, check number 6, no page 110

ZERO BIAS

If you've already read the LETTERS Column this month, you'll know that response to January's ZERO BIAS was far from unanimously favorable. For this reason we will bow to our reader's opinions, and (for the moment) shelve the suggestion that a new Engineers class of license be created. I still feel that the idea has merit, but obviously most of the readers who took the time to write feel that a code requirement of 5 w.p.m. is a generous enough concession to the "laziness" of would-be amateurs. Perhaps our timing was wrong. It does seem likely that when the smoke has cleared from the incentive licensing battlefield, we will be able to bring the matter up again, this time with more favorable response.

OSCAR III

As this is written, amateurs throughout the world are making those last-minute "touch-up" adjustments on their 2-meter gear in anticipation of a launch announcement from the Project OSCAR Association. It is hoped that by the end of March, amateur radio will see the new OSCAR III satellite launched and operating.

The OSCAR III translator satellite has undergone painstaking development and testing over the past few years, and only now can the hundreds of 2-meter enthusiasts who contributed to the store of information on OSCAR's I and II begin to see the results of their efforts. Oscar III is a device many times more complex than either of the early models, and only through traditional amateur enthusiasm and ingenuity has it been made possible.

For what it's worth, let me add my voice to those of the OSCAR Association, the fellows at ARRL and all space-minded amateurs in urging you to participate in the OSCAR III satellite program. It doesn't take elaborate equipment to conduct simple measurements, but, of course, the extent of your station facilities will determine the extent of your participation. The phrase may be trite, but it's true: "This is history in the making." And you can help make it. Please . . . take some time out to read "OSCAR III, An Active Communication Satellite for Radio Amateurs" in October '64 and February '65 *CQ*. For those of you who have been following the OSCAR situation, W3ASK has the latest details and calibration curves in his SPACE Column in this issue (page 68).

Arne Trossman Awards

Back in 1960, when the Certificate Hunters Club was still in its early formative stages, it was considered quite a feat just to qualify for membership. Then, as now, proof of having earned 25 or more legitimate achievement awards was required for CHC membership. It was the rare Hunter who collected 100, and the very idea of one man ever attaining the 200 mark strained the imagination. To add a bit more incentive (ouch!) to the quest for 200, a special "Top Honors" Plaque was offered by *CQ* editor Arne Trossman when W8JIN surprised a lot of people by topping 200 in 1961. But things didn't stop there, and within a year or two, some 50 Hunters had qualified.

The cost of preparing the many plaques began to get out of hand, and the Top Honors Plaque was discontinued with number 56. In fact, even catching up on those 56 plaques put quite a dent in the budget, but we're happy to announce that the remaining winners of the Arne Trossman Award will receive their long-awaited plaques very shortly. Our thanks to the CHC'ers involved for their extreme patience.

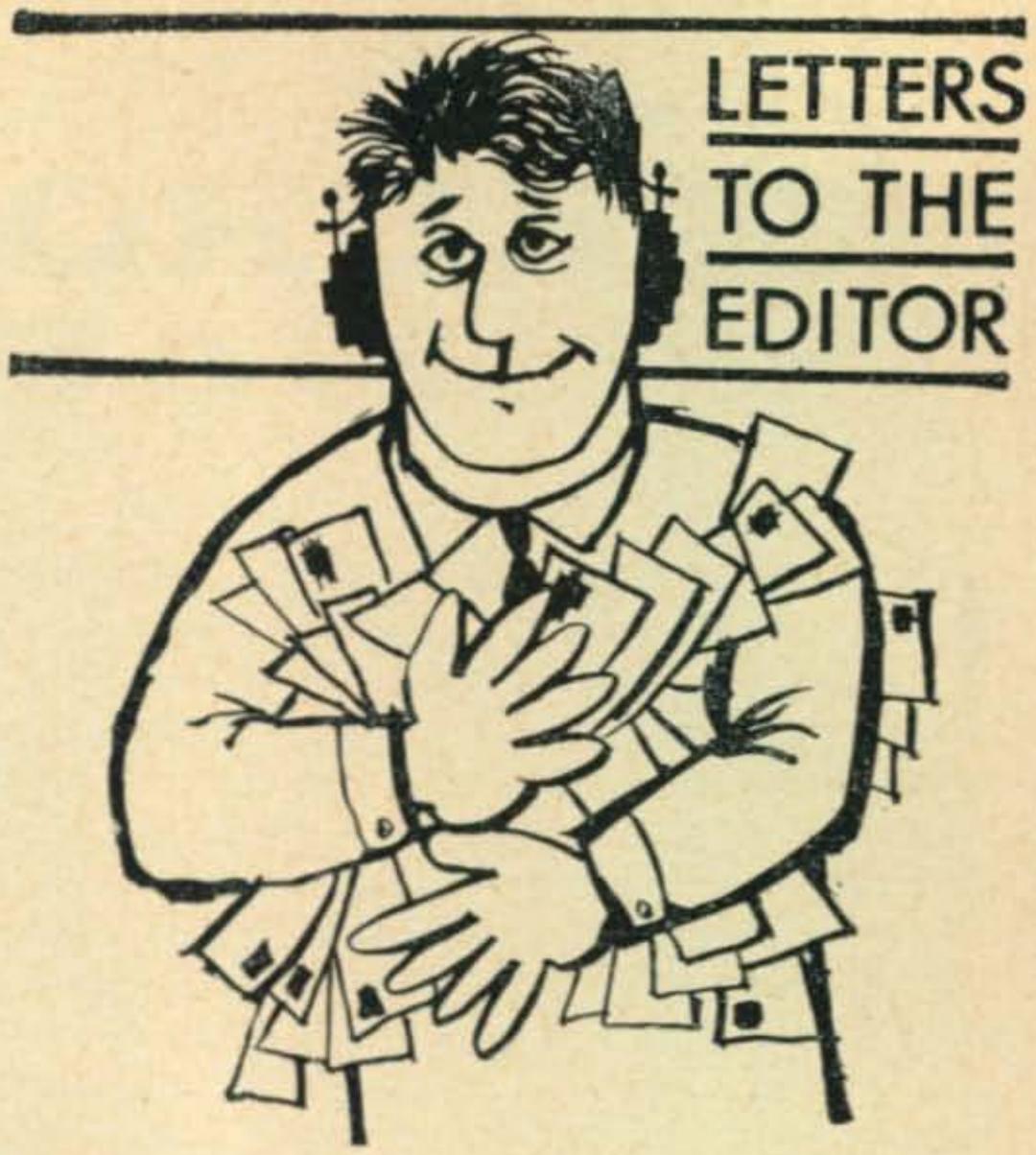
Another Award Fiasco

Speaking of CHC, incidentally, I feel that many members (and potential members) are being done a great injustice as a result of a recent change of policy by Clif, K6BX. With the recent break of relations with *CQ*, Clif has done some "soul-searching" and come to the conclusion that any award sponsored by a commercial organization should not be counted for CHC credit. The awards most affected by the ruling are, of course, those sponsored by *CQ*, among them, WAZ (with over 2,600 winners since WW II alone), WPX (over 900 winners), 2 Way SSB (over 600), and USA-CA (over 500 winners).

Once again it appears that efforts are being made to "obsolete" certain awards for personal spiteful reasons, but we are puzzled by the logic (or lack of it). Along with ARRL's DXCC and WAS, *CQ*'s WAZ, WPX, 2 Way SSB and USA-CA are some of the most coveted of all amateur radio achievement awards. I am quite sure that these awards hold prominent positions on the walls of nearly all of the hundreds of CHC'ers. Is it a logical move for the Executive Secretary of CHC to suddenly say to his followers, "Fellows, I've just decided that the wallpaper you've struggled for years to attain isn't going to count any more because I've got a grudge against the folks who issue it"? No, we don't think it's logical either.

73, Dick, K2MGA

LETTERS TO THE EDITOR



Manners, Manners!

Editor, *CQ:*

Last night I was tuning 40m c.w. for some code practice, when I found a station just a little bit faster than my copying speed. I started trying to copy as much as I could. About 2 minutes later three stations came in over the station I was trying to copy. All of them were calling CQ. Where in the name of heaven has courtesy disappeared to? Hams today act as though they had never heard the words consideration and courtesy to other people. The CB population has more consideration and courtesy to other people on the band than the whole ham population in the U.S. Of course, we have our lids too. Also, I think that if you take any one CBer, he will probably have performed more local public service acts than any 10 hams.

Also, I would like to say that hams have become lazy bums when it comes to QSLing. In the last 3 months I have sent out over 30 QSL's, only one has been answered. I would like to thank Everett, KL7EDH, for that card.

I am looking forward to the day when I get my General Class License, but I hope the ham population will have become more considerate and more courteous to other people on the band by that time.

Wiley Clarkson, III
ex-WN5GQH, KEH3408
129 Williamsburg Lane
Fort Worth 7, Texas

Lost: One OM Porter

Editor, *CQ:*

Can anyone give me the whereabouts or current mailing address of Raymond H. Porter, ex-K4OMR, WØWVS, W5OJH, W7LPD and who held the call DL5DU during the period of 1961 to 1963?

I currently hold DL5DU and have received a dozen or so very interesting DX QSL cards, which belong to Ray. I will be glad to forward them upon receipt of the address.

J. Harvey Chase
USASCC-Europe
APO, New York, New York 09403

Interlopers

Editor, *CQ:*

I am writing *CQ* because a letter directed to the ARRL was never published and I feel that it should have been.

Lately, the ham bands have been invaded by all sorts of strange interferences. Many of these are from foreign broadcast, commercial teletype, press and business type communications just to mention a few. I feel that in the instances where something can be done about these broadcasts, we are certainly being let down by those we have

For further information, check number 8, on page 110

Here is what a Ham thinks about the new 6 meter base station antenna . . .

"I do a lot of 6 meter work since I act as net control for the Michigan, Ohio, Pennsylvania SSB Net and in addition, stations from other midwestern and eastern states check in. My 10 element commercial beam with a 24′ boom has met with several accidents due to high winds."

"Recently, I purchased and installed your new Coveya-6 beam antenna. To make a comparison with my previous 10 element beam I went on the air without revealing the change. You'll be glad to know that the results surpassed the performance of 10 element beam and besides, I obtained these additional advantages:

1. *Better front to back ratio for receiving — at least 25 DB.*
2. *An improved forward pattern.*
3. *Much wider coverage of forward pattern on transmit, thus eliminating moving the antenna often.*
4. *Very low VSWR — 1.1 to 1 across entire band.*
5. *Completely weatherproofed assembly making weatherproofing spray unnecessary."*

"My greatest satisfaction was the ability of the Coveya-6 to reach out and get the long distance ground wave stations. All comparison checks in the log book were very favorable to the Coveya-6."

Elmer D. Sauers, WA8AUZ, Akron, Ohio

this is just one of numerous favorable comments we received about our COVĒYA-"6" see it at your distributors or write for literature

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For further information, check number 9, on page 110

Visit our booth at the **1965 SSB Show.** Statler-Hilton Hotel, Tuesday, March 23rd, 12:00 noon—9:00 P.M.

charged with the responsibility. I realize that by international agreement many amateur frequencies are shared by commercial services. It is also my understanding that many of these commercial services could be removed from the ham bands on the grounds that they cause the amateur harmful interference. Every time another of these services makes its appearance on ham frequencies we lose another 2 to 6 kc of our already trimmed and retrimmed allotments. That however is not my main reason for writing, although it certainly is reason enough.

Take a listen to 20 meters next time you turn on the receiver and are killing a few minutes while the station equipment gets stabilized. Take a good long listen to the goings on between 14.100 and 14.130. You won't listen long, if the band is open for DX, before you'll hear something like "6L6GT, 6L6GT old man how about giving the Americans a break. Listen upstairs awhile please." I feel sure that the VE boys don't run the DX upstairs because they already have worked it. I doubt much if anybody whose license permits s.s.b. operation at 14.100 is going to come on top the DX and ask him to listen for the Americans. These s.s.b. signals are then "Pirate" operations from stations located in some area of the world which prohibits the operation of s.s.b. or Phone below 14.200 mc most presumably the USA. For an American ham to go on Phone anywhere between 14.200 and 14.000 and say so much as "test" is illegal and should be treated as such.

There are also a lot of DX guns who, because the law says no American phone at those frequencies, use instead c.w. to call the DX. These seem to be more frequently WA, WB, and a few V and W stations in that order. They are without doubt, operators of the most impatient category. Anyone who listens to the goings on and still condones that type of operation is a first class lid and should be awarded a certificate of achievement. Paragraph 12 of the DXCC Rules should be invoked against these lids.

By now without a doubt the wrath of every offender is upon me, so I'll explain why many hams in DX locations feel as I do. When a DX ham gets off the American Phone band and calls CQ DX it should be evident to anyone that 1—He has so many US QSL's that the novelty has worn off. 2—His QSL bill is tremendous and his DXCC stands at one. 3—He just has some desire to talk to someone new.

This type of operation not only appears on 20 meters, but can be found on all of the low frequency bands. On 75 meters between 3760 and 3800 kc the DX s.s.b. group also congregates. I am sorry to say that many of the hams who operate c.w. in this segment do so fully knowing that good ethics prohibits it even though the law says it's legal.

What should appear in *CQ* from time to time is a frequency chart based on current operating practices. American s.s.b. 14.350 to 14.250, a.m. 14.250 to 14.200, etc. This would help educate the new hams, that come on every day, that each mode of operation has its place on the band.

Robert G. Wheaton, XE1NNN, K8DIH
Apdo, Postal 588
Cuernavaca, Morelos, Mexico

Editor, *CQ:*

Help! The upper segment of 160 meters is being ruined by AF MARS stations on 2000 kc! Some are even inside our band with their kw carriers as well as audio!

Most any evening for several hours they are ruining operation on the upper segment.

AG1DN and AG1CA are the main base stations with many AFA types.

We can't hear the western states who are restricted to the upper segment thru the QRM created by these #@#%!

Help! We top banders are boiling mad!

Ed Wilson, W8KFY
7960 E. Cedar Lake Drive
Greenbush, Michigan

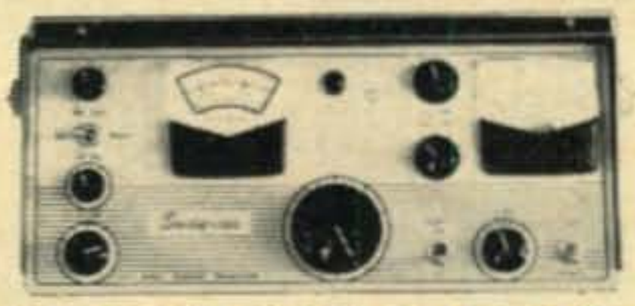
A 1600 Watt PEP Linear

Editor, *CQ:*

Reference the construction article "A 1600 Watt PEP Linear," November 1964, *CQ;* it is stated the antenna relay must operate from low voltage when used with KWM-2 exciter.

For further information, check number 10, on page 110

IT'S THE SAME LITTLE OLD BOX



1962 SWAN SINGLE BANDER —
1 BAND — 180 WATTS — $275

1963 SWAN 240 — 3 BANDS — 240 WATTS — $320

but we've put a LOT MORE *in it!*

NOW THE *SWAN-350* TRANSCEIVER

5 BANDS—400 WATTS AND ONLY $395

- 3.5 - 4.0 mc, 7.0 - 7.5 mc, 13.85 - 14.35 mc, 21.0 - 21.5 mc, 28.5 - 29.0 mc (10 meter full coverage kit available.)
- Transistorized VFO, temperature and voltage stabilized.
- Precision dual-ratio tuning.
- Crystal lattice filter.
- ALC . . . AGC . . . S-Meter.
- 5½ in. high, 13 in. wide, 11 in. deep.
- 400 watts SSB input
  320 watts CW input
  125 watts AM input
- Sideband suppression: 40 db
  Carrier suppression: 50 db
  Third order distortion: 30 db
- Lower sideband on 80M and 40M.
  Upper sideband on 20M, 15M, and 10M.
  (Opposite sideband kit available.)

WITH THE SAME RELIABILITY AND PERFORMANCE WE'VE PUT IN ALL OUR LITTLE BOXES

ACCESSORIES:

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

SEE THE NEW SWAN 350 AT YOUR DEALER'S NOW!

SWAN ELECTRONICS CORP.
Oceanside, California

For further information, check number 11, on page 110

On Pin 6 of the KWM-2 Power Plug 110 v.a.c. is present when in transmit position. Pin 5 has a.c. common applied. Therefore, connecting the coil of a 110 v.a.c. relay to Pins 5 and 6 of the power plug will result in energizing the relay when transmitting and de-energizing when receiving.

Bob Renfro, WA4NXC
Rt. 2 Reepsville Road
Lincolnton, N. C. 28092

January's "Pandora's Box"

In January *CQ*, Zero Bias took a back-of-the-hand slap at a proposal by another magazine to allow no-code/no-license CB-type operators on a portion of the 2 meter ham band. Response indicates the nearly 100% of our readers agree with us that such a proposal has no merit, except to CB operators.

We made the gross error, however, of including in the same editorial another suggestion designed to induce many high-level technicians and engineers into the ranks of amateur radio.

Apparently, many readers mis-interpreted the suggestion to mean that *CQ* advocated CB-type operation in the amateur u.h.f. bands. Others felt that the suggestion was adequately provided for by the Technician class license. But, by far, the most frequent comment indicated that most fellows feel that a limited knowledge of c.w. should be required of all amateurs, and that anyone unable to acquire this knowledge was not worthy of being an amateur.

Below is a wide and varied sampling of the letters received.

Editor, *CQ*:

Concerning your comments in January *CQ*, the eagerness with which the Citizen's band proponents seek to encroach upon the amateur bands appears even more ridiculous when you consider that the Class B Citizens Band is currently almost entirely unoccupied. In fact, most of the CB "Citizens" are quite unaware of its existence, even though it was available long before the "D" band was opened up to its present state of anarchy. There is, indeed, a large amount of illegal operation in the class D band by holders of class B tickets.

To your comments in January Zero Bias, let me add one more. If the citizens banders feel that the 23 channels of the class D service is inadequate, let them make full use of the additional 48 channels of the class B service before they seek to elbow other services out of the spectrum.

William R. Phillips, W4JMB
7957 Thompson
Norfolk, Virginia

Editor, *CQ*:

Reference to your Zero Bias of January and your recommendation to place "CB Hams" on 420 mc. You asked for some thoughts on the subject, so here are mine:

First, your column title Zero Bias is a misnomer.

Next, you also push *S9*, a strictly CB magazine, and it seems to me that a conflict of interest is showing, in favor of CB.

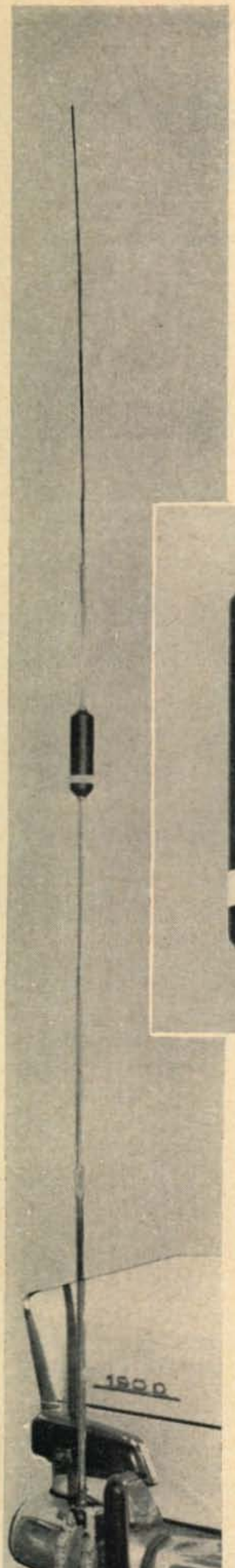
I believe that you are influenced in favor of CB because of the greater potential there—after all, what could a couple hundred thousand hams do against millions of organized CB'ers (and some day they will organize when all the factional squabbles are settled). And won't it be nice for *S9* to have a big foot in the door if and when the time comes? You could then care less about your *CQ*.

As for me—I am for both, each in its place.

Frank J. Case, W3RMI
2000 Kernan Drive
Baltimore 7, Maryland

Frank, your reference to *S9* is interesting, if not very well considered. Cowan Publishing does publish other magazines in other areas of the electronics world, but since I am the editor of *CQ*, and *not* the editor of *S9*, I can assure you that I care more about the future of amateur radio and *CQ* than I care for the futures and editorial policies of all the other magazines *combined*. Great potential in CB? Sure, but there is great potential in dozens of other fields too, and that doesn't mean that I'm greedily eying the potential of the telephone service or CB service or any other service. The statements made in Zero Bias, or anywhere else in *CQ* over my name, re-

[*Continued on page 108*]



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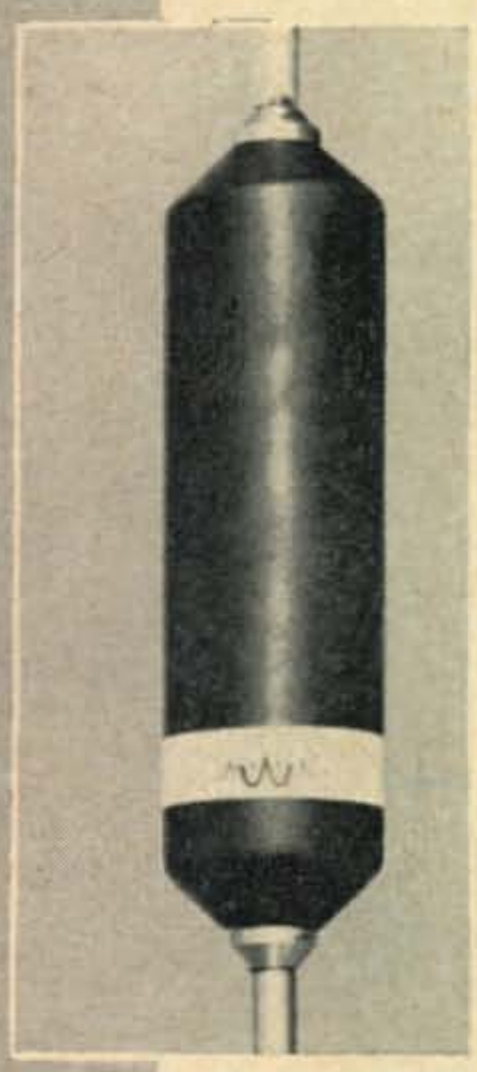
NEW *Waters* AUTO-MATCH

the Stronger Mobile Antenna

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

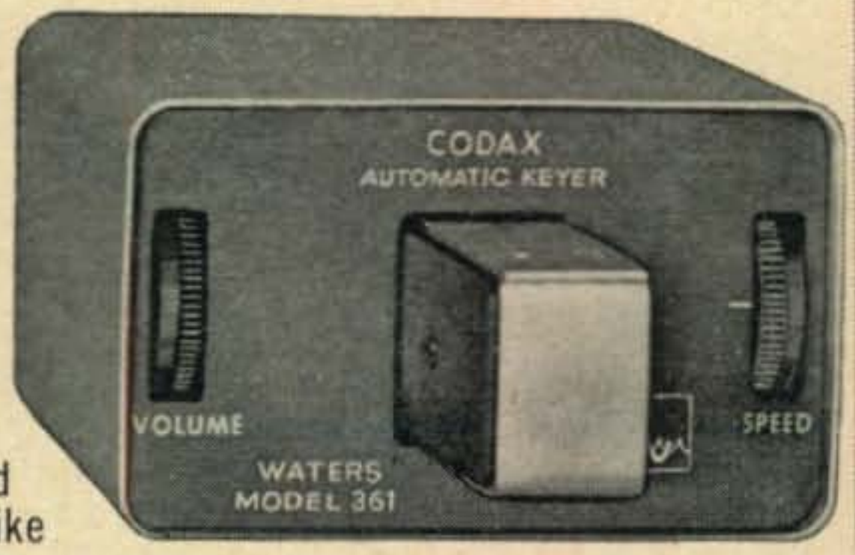
PRICES

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



Waters NEW CODAX™ Automatic Keyer

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



MODEL 361
Price $92.50
(Less batteries)

Introducing.... Waters CLIPREAMP™

to increase your "talk power"

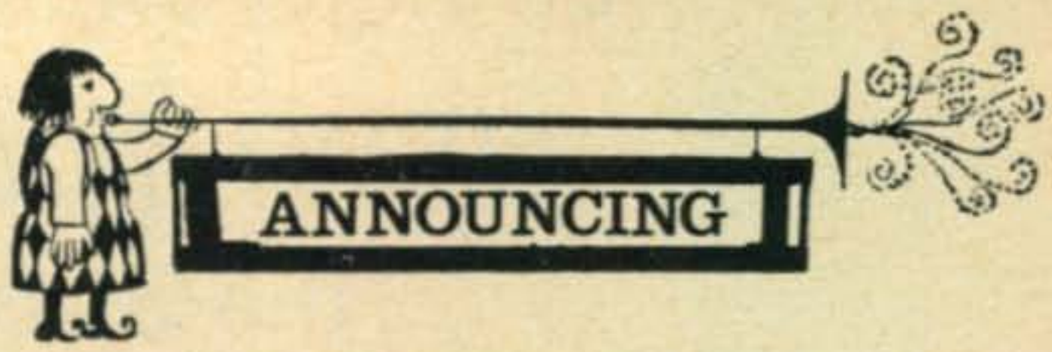
A solid state clipper-preamplifier, the brand new Waters CLIPREAMP will increase your intelligibility and talk-power up to 4 times when band conditions are tough! Self-powered and weighing but 6½ ounces, CLIPREAMP installs externally between microphone and transmitter in a matter of minutes. Front panel controls switch CLIPREAMP IN or OUT, OFF or ON, and permit Compression-Level adjustment to individual requirements. Input: 100K ohms; Output: 50K ohms; Voltage Gain: 10 DB nominal; Power: 9-volt battery.

MODEL 372
Price $21.95
(Less battery)

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

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

For further information, check number 13, on page 110



Sparks, Nevada

April 10, 11 and 12 are the days to be looking for K7UGT from the famous old west, Virginia City, Nevada. The Nevada Amateur Radio Society is sponsoring the rare county expedition. Virginia City is nestled in the old Comstock Lode in Storey County. A Special Expedition QSL will be sent for those who QSL to P.O. Box 37, Virginia City, Nevada. 2, 6, 15, 20, 40 and 75 meter s.s.b. will be operated. For further information write P.O. Box 212, Sparks, Nevada.

Swampscott, Massachusetts

The Federation of Eastern Massachusetts Amateur Radio Associations will present an award to the outstanding New England amateur radio operator. Only amateurs in the first call district are eligible and must meet any one of the following qualifications: 1. Performed a meritorious public service to his community through the medium of amateur radio or, 2. Made a major contribution to the science of amateur radio or, 3. Helped greatly to stimulate interest in amateur radio to others or, 4. Aided other radio amateurs to acquire a greater knowledge and skill in operating or building amateur radio equipment.

This honor will be presented at the New England American Radio Relay League Convention to be held on April 24 and 25, 1965 at the New Ocean House, Swampscott, Mass. The award is known as the John R. Mansfield Memorial Award and is given each year at this convention. The recipient will receive a cash gift of $150 and a plaque commemorating the event.

Nominations are urgently requested from the amateur fraternity which should be complete and accurate. All nominations should be sent to The Federation of Eastern Mass. Amateur Radio Associations, c/o Mr. Eli Nannis, W1HKG, 37 Lowell St., Malden, Mass. The closing date is March 26, 1965.

Urbana, Illinois

There was a delay in the planned maritime mobile trip discussed in last month's ANNOUNCEMENT column.

The Croatan will leave Baltimore on February 15, 1965, (instead of January 25, 1965) transverse the Panama Canal on February 23, operate in the Pacific off Lima, Peru, from March 6 to March 25, then steam to arrive at Valdivia, southern Chile, on April 18. Arrival back at Baltimore will be on May 5.

Labrador, Canada

The Goose Bay Amateur Radio Club is sponsoring a QSO Party from April 1st starting at 0001 GMT through 2359 GMT April 15th. All bands and modes will be used.

A WAG Certificate will be awarded to any Canadian or American Amateur Station working four (4) G.B.A.R.C. members during the QSO party. All others submitting a list showing they have worked three (3) G.B.A.R.C. members will receive a WAG Certificate. QSL Cards may accompany the Application. G.B.A.R.C. Members must have received your QSL to qualify for a Certificate.

Submit your list to: G.B.A.R.C. Box 232, Goose Airport, Labrador, Canada.

Paterson, N. J.

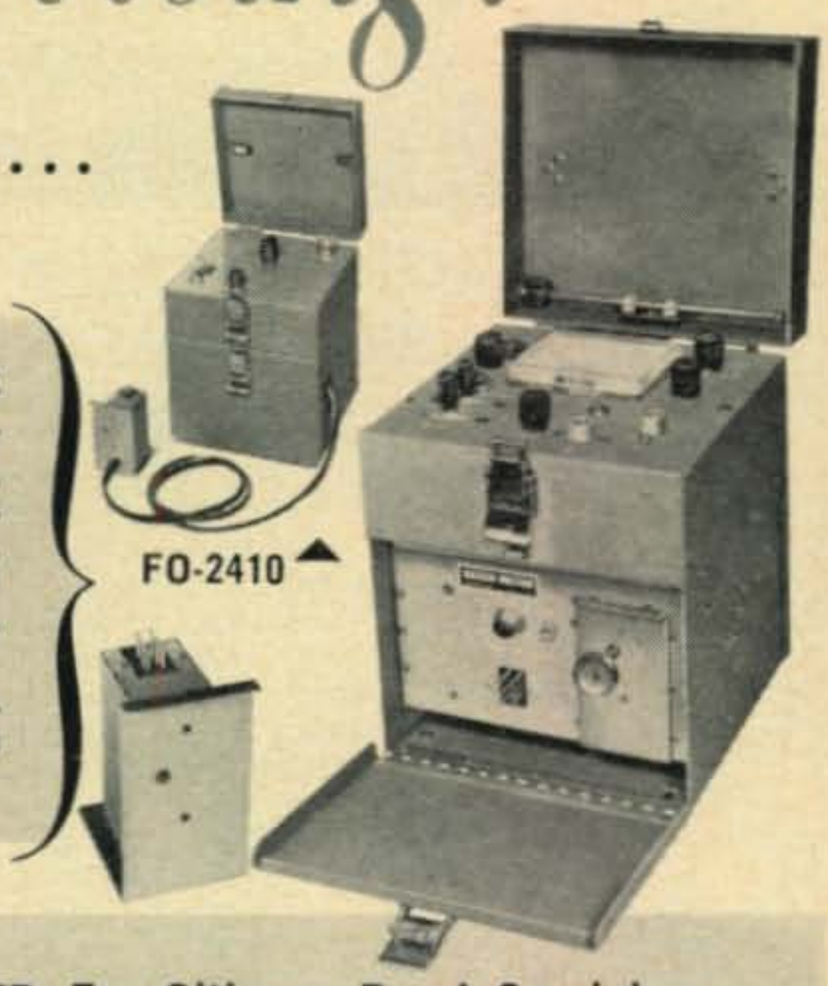
The 7th annual dinner and hamfest sponsored by the East Coast VHF Society will be held at the "Swiss Chalet," Route 17, Ramsey, New Jersey, at 7 pm, Saturday, February 27. Tickets cost $6.00 per person. Write to East Coast VHF Society. P. O. Box 1263, Paterson, N. J. for tickets and more information.

INTERNATIONAL FREQUENCY METERS

designed for servicing!

Equip your lab or service bench with the finest . . .

Discover new operating convenience.



FM-5000 FREQUENCY METER 25 MC to 470 MC

The FM-5000 is a beat frequency measuring device incorporating a transistor counter circuit, low RF output for receiver checking, transmitter keying circuit, audio oscillator, self contained batteries, plug-in oscillators with heating circuits covering frequencies from 100 kc to 60 mc. Stability: ± .00025% +85° to +95°F, ± .0005% +50° to +100°F, ± .001% +32° to +120°F. A separate oscillator (FO-2410) housing 24 crystals and a heater circuit is available. Dimensions: FM-5000, 10" x 8" x 7½".

FM-5000 with batteries, accessories and complete instruction manual, less oscillators, and crystals. Shipping weight: 18 lbs. Cat. No. 620-103 . . . . . $375.00
Plug-in oscillators with crystal $16.00 to $50.00

C-12B FREQUENCY METER For Citizens Band Servicing

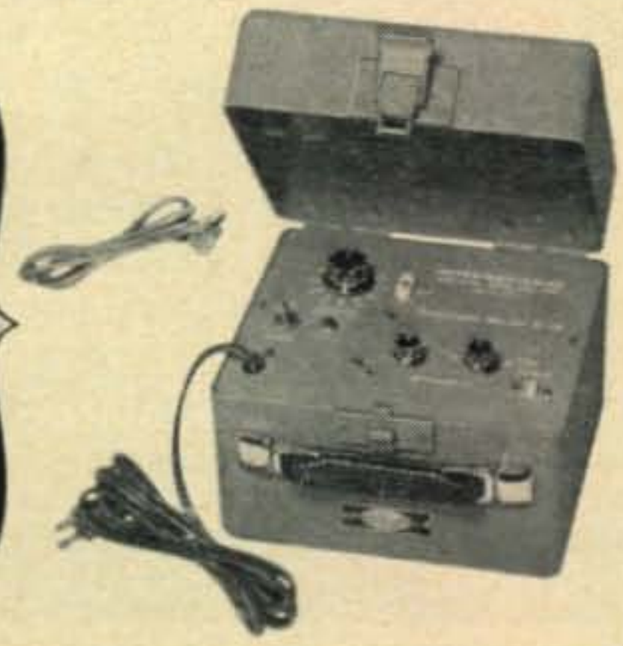
This extremely portable secondary frequency standard is a self contained unit for servicing radio transmitters and receivers used in the 27 mc Citizens Band. The meter is capable of holding 24 crystals and comes with 23 crystals installed. The 23 crystals cover Channel 1 through 23. The frequency stability of the C-12B is ± .0025% 32° to 125°F, .0015% 50° to 100°F. Other features include a transistorized frequency counter circuit, AM percentage modulation checker and power output meter.

C-12B complete with PK (pick-off) box, dummy load and connecting cable, crystals and batteries. Shipping weight: 9 lbs. Cat. No. 620-101 . . . . . $300.00

C-12 CRYSTAL CONTROLLED ALIGNMENT OSCILLATOR

The International C-12 alignment oscillator provides a standard for alignment of IF and RF circuits 200 kc to 60 mc. It makes the 12 most used frequencies instantly available through 12 crystal positions 200 kc to 15,000 kc. Special oscillators are available for use at the higher frequencies to 60 mc. Maximum output .6 volt. Power requirements: 115 vac.

C-12 complete, but less crystals. Shipping weight: 9 lbs. Cat. No. 620-100 . . $69.50



C-12M FREQUENCY METER For Marine Band Servicing

The International C-12M is a portable secondary standard for servicing radio transmitters and receivers used in the 2 mc to 15 mc range. The meter has sockets for 24 crystals. The frequency stability is ± .0025% 32° to 125°F, ± .0015% 50° to 100°F. The C-12M has a built-in transistorized frequency counter circuit, AM percentage modulation checker and modulation carrier and relative percentage field strength.

C-12M complete with PK (pick-off) box and connecting cable, batteries, but less crystals. Shipping weight: 9 lbs. Cat. No. 620-104 . . . . . $235.00
Crystals for C-12M (specify frequency) $5.00 ea.

KEEPING YOU ON FREQUENCY IS OUR BUSINESS...

Write today for our FREE 1965 CATALOG

INTERNATIONAL CRYSTAL MFG. CO., INC.

18 NORTH LEE OKLAHOMA CITY, OKLAHOMA

For further information, check number 15, on page 110

The Amateur Radio

Club Forum

AL SMITH,* WA2TAQ

A PROGRAM in the Amateur Radio Fraternity that could use a decided boost is that of public relations. It's not always easy to secure coverage of amateur radio activities, and the fact that we're falling down in that department is no doubt a direct result of too little effort and failure to realize the importance of such a program.

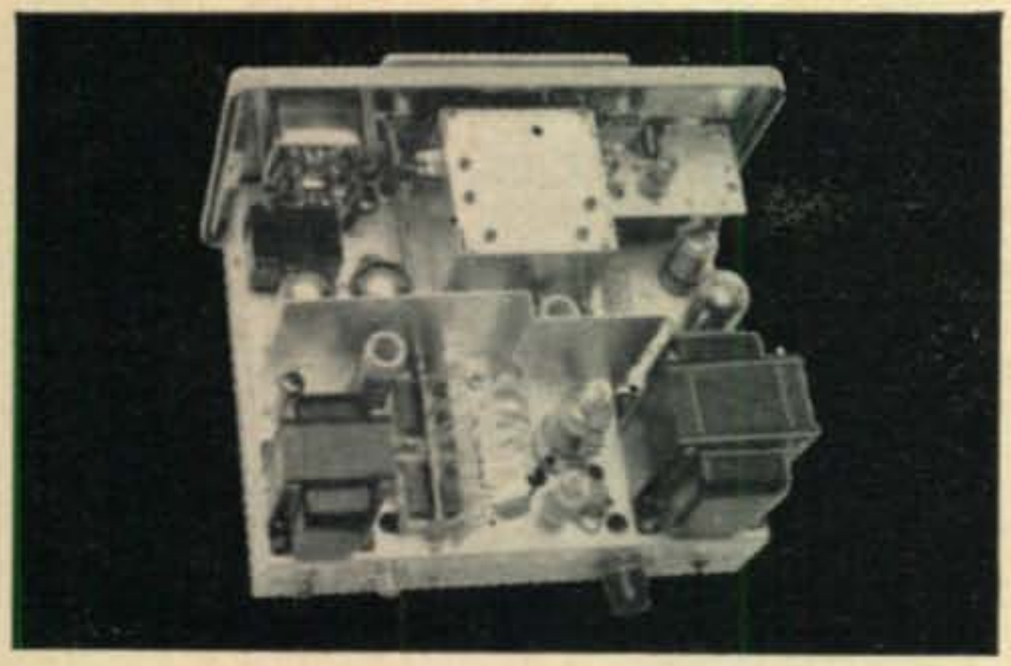
There are hundreds of stories to be told in amateur radio; all it takes is someone to recognize that what seems like usual everyday occurrences to the ham could make a very interesting and informative story to the general public. Every club and club council should have an active publicity committee, that is always ready to promote the good will of amateur radio. The job is not as hard as it sounds and it can bring very gratifying results.

The first line of public relations is in newspaper coverage. The type of story released depends a great deal on whether the newspaper is a small local or a big city daily. The small weekly is usually eager for local news particularly if it effects the community or the people in it. Such events as a fone patch to the parents of a neighborhood son stationed overseas from their offspring is news, particularly if the lad is in some far flung corner of the globe. Other stories could concern, handling a piece of emergency traffic, a coming hamfest, auction, field day, election results, installation of officers and AREC/RACES drills. Other local coverage could include: the handling of sound systems by the club for civic events, parades, and various public ceremonies.

The big city newspapers can be a problem, and the events will usually have to be of note to get coverage. The amount of copy that shows up in print can depend on many variables. World news can have a great effect. If any earth shocking events occur it will not only shorten your story but will take away any glamour from it. We must remember that while the newspapers perform a tremendous service they are also in the business of selling papers and the big events do the attracting.

The commemorative amateur radio stamp issued last December 15th should have had coverage in every newspaper in the country. Though the story was released nationally through both the Post Office Department and the ARRL the amount of attention it received depended a great deal upon the push given it by clubs and councils. If all club publicity chairmen had sent out a release on the stamp, the story would have wound up with better coverage and with a good

*504 Beach 43rd St., Far Rockaway, N. Y. 11691.



Some may call it "ancient modulation", some simply call it AM phone—but whatever you call it, AM still represents a major portion of today's amateur activity—and the "Ranger II" is one of today's most popular AM rigs! For AM or CW operation, for 160 through 6 meters—the "Ranger II" offers the "biggest-little" 75 watts you'll find on the air! Rated at 75 watts CW and 65 watts high-level AM, the "Ranger II" delivers communications quality audio with the necessary punch to break through today's QRM! An excellent "first" transmitter for the Novice or the new General, the "Ranger II" will drive any of the popular kilowatt level tubes and will provide a high quality speech driver system for high powered modulators without modification! What else? The "Ranger II" offers attractive styling in a compact cabinet and is available at a reasonable price.

Cat. No. 240-162-1..."Ranger II" Kit ... **Net $249.50**
Cat. No. 240-162-2..."Ranger II" Wired **Net $359.50**

FEATURES

Built-in temperature compensated, extremely stable VFO—separate, calibrated bandspread dial scales for all 7 bands—highly efficient pi-network tank circuit—flexible, timed sequence keying system—self-contained power supplies—effectively TVI suppressed!

EASY TUNING

Basic tuning controls are located on the VFO dial escutcheon—QSY within the phone or CW portion of a band is usually possible by merely changing the VFO frequency setting.

RANGER II

COMPLETE CATALOG

Drop us a card and we will send you Amateur Catalog 962 which gives the full "Ranger II" story, as well as detailed information on our complete line of amateur transmitters and accessories.

E. F. JOHNSON COMPANY
WASECA, MINNESOTA, U.S.A.

For further information, check number 17, on page 110

chance of requests for more information from the editors.

One may wonder why we have to expend all this energy to bring amateur radio to the public's attention. Our image is what we're concerned with, and we want to be sure it's kept high in the minds of our neighbors.

Here are some tips to help get your news release in print. If you happen to have an "Uncle Charley" at the City Desk, or know a ham on the newspaper staff it will go a long way in securing newspaper space. Otherwise it's up to you to find an "in." If possible, try to visit the paper and get to meet the editor or one of his staff. Tell them of your club, its aims and the things you have done, don't be afraid to blow your own horn, if you don't do it nobody else will. Remember the names of the people you spoke to and if the time comes that you have a story to phone or write in, mention the names of the people you talked to, ask to speak to them reminding them of your previous meeting. If you have a good club publication put the city editor on your mailing list. If you have the opportunity to supply first hand news by all means do so and let them know that you represent the local amateur radio club. Many did just that following the Alaskan quake, in fact amateur radio was a major source of news for many hours. Many amiable relationships have resulted between newspaper staffs and amateur radio clubs as a result of such news.

Remember that the way your story is presented can affect its outcome. Any story will be well received for consideration if it's typewritten, double or triple spaced, with wide margins. An individually typed letter addressed to the newspaper will give it a personal touch. If you must send many copies out, mimeograph or otherwise duplicate them, but have the chairman sign the copy and include his name, address, and telephone number in case further information is required.

Put plenty of sock into the first paragraph so the reader will be aroused enough to read the entire release. Keep your story current, there's nothing worse than old news. Find out the paper's deadline and get your story in as early as possible. Many weekly or semi-weekly publications print up complete pages ahead of time. If your story is submitted in time it stands a good chance of being printed in its entirety.

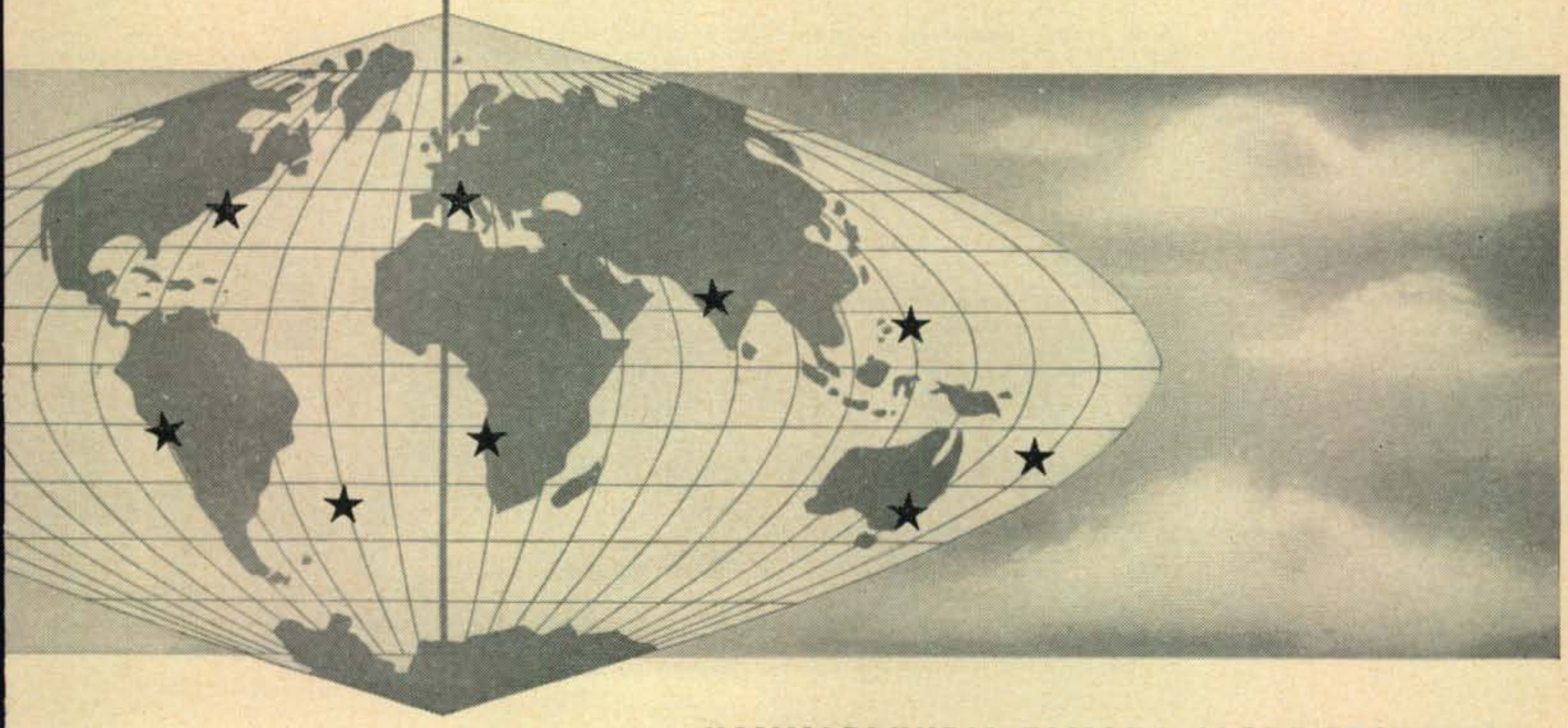
Pictures are the greatest form of publicity and as someone once said "a picture is worth a thousand words." Always try to get a photographer assigned for your story. However, remember it costs the paper money for this, not only for the photographer but for the cut that must be made. If you have a good photographer in the club with the right equipment, why not put him to work and submit your own pictures with all your stories.

Don't forget the radio stations. If you are putting on a dance, hamfest, auction, get together, or what have you, include the "public

[*Continued on page 94*]

Be sure to see us at our booth at the **Single Sideband Show,** Statler Hilton Hotel, New York City—March 23rd.

DX-pedition proved... DX-perfected



HX-50 . . . $449.50

HQ-170A . . . $379.00

HAMMARLUND'S FAMOUS GLOBE-TROTTING PAIR—THE INCOMPARABLE HX-50 AND HQ-170A

Literally thousands of DX-hungry operators throughout the world can attest to the big signal of the HX-50 SSB/CW transmitter from remote, rarely contacted areas of the world.

★ *From Nauru in the Southwest Pacific . . .*
★ *From the Ocean Islands in the Southwest Pacific*
★ *From the island of Corsica*

. . . and from yet-to-be-announced DX-less areas in the Middle East and other parts of the world, Hammarlund's HX-50 and HQ-170A have made, and will continue to make, thousands of DX contacts.

Here is irrefutable proof of outstanding performance—the BIG performance amateurs have come to expect from Hammarlund-quality communications equipment.

See your nearest Hammarlund distributor for up-to-the-minute news of DX-PEDITION OF THE MONTH and a close-up look at Hammarlund's "full-control" equipment.

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Amateur Radio Equipment • Commercial Communications Equipment • Variable Air Capacitors . . . and . . . The Outercom 2-Way Radio

For further information, check number 19, on page 110

HEATHKIT® *Amateur Radio Gear . . .*

"SINGLE-BANDER" SSB TRANSCEIVERS

HW-12
Choose 80, 40, or 20 meters
$119.95

200 watts on the band of your choice with built-in PTT and VOX. Versatile! See line listing below for power supplies. Go mobile or fixed!

Kit HW-12 (80-meter), **Kit HW-32** (20-meter), **Kit HW-22** (40-meter), 16 lbs.....each **$119.95**

BENTON HARBOR LUNCH BOXES . . .

HW-29A
6 & 2 Meter Transceivers
$44.95

Take along one of these handy 5-watt rigs on your next outing. Complete for 117 v. AC operation. Use Heathkit GP-11 power supply for mobile.

Kit HW-29A (6 meter) & **HW-30** (2 meter)...each **$44.95**

"COMBO" FOR THE NOVICE

HR-10
Receiver
$79.95

Heathkit
DX-60A
AM/CW Transmitter
$79.95

Here's inexpensive amateur radio . . . yet the finest quality! HR-10 provides amateur band coverage 80-10 meters with xtal filter, calibrator, BFO, and AVC. DX-60A provides 90 watts AM or CW with low harmonic output from xtal control or external VFO.

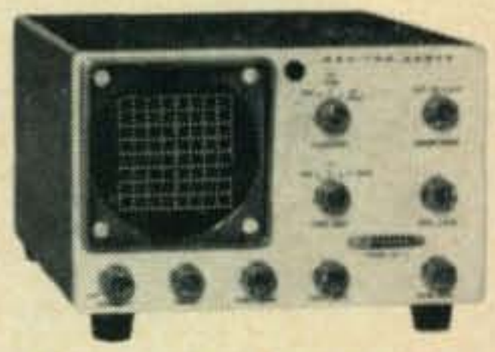
Kit HR-10, 20 lbs.....**$79.95**

Kit DX-60A, 25 lbs.....**$79.95**

HEATHKIT "MONITORS" ADD PROFESSIONAL QUALITY TO THE AMATEUR STATION

HO-13
"Ham-Scan"
Spectrum Monitor
$79.00

HO-10
Signal Monitor
$59.95



"Ham-Scan" shows a panoramic display of radio signals 50 kc's on each side of receiver tuning. Shows band conditions instantly!

Kit HO-13, 12 lbs.....**$79.00**

HO-10 shows actual quality of transmitted and received signals. Displays envelope, AF and RF trapezoid patterns.

Kit HO-10, 12 lbs.....**$59.95**

TUNNEL DIPPER

HM-10A
$34.95

Outperforms the usual grid-dip meter through solid-state circuitry.

Kit HM-10A, 3 lbs.....**$34.95**

HEATHKIT "CANTENNA" TRANSMITTER DUMMY LOAD

HN-31
$9.95

50-ohm impedance. Oil cooled. Allows power measurements with minimum radiated signal. (Oil not included).

Kit HN-31, 3 lbs.....**$9.95**

For Complete Descriptions See Your 1965 Heathkit Catalog

Kit HP-13 DC Power Supply (converts 12 v. DC to power for single-banders), 7 lbs.....**$59.95**

Kit GP-11 Vibrator Power Supply (6 or 12 v. DC to 250 v. DC @ 100 ma.), 6 lbs.....**$16.88**

Kit HP-23 AC Power Supply (converts 120 v. AC to power for single-banders), 19 lbs.....**$39.95**

Kit HS-24 Mobile Speaker, 3 lbs.....**$7.00**

Kit PM-2 RF Power Meter, 2 lbs.....**$12.95**

Kit HD-19 Hybrid Phone Patch, 4 lbs.....**$29.95**

Kit HD-11 "Q" Multiplier, 3 lbs.....**$14.95**

Kit HG-10 VFO, 80-2 meters, provides 5 volts RMS, 12 lbs.....**$34.95**

Kit HD-20 100 kc Crystal Calibrator, 1 lb.....**$14.95**

Kit HM-11 Reflected Power Meter, 3 lbs.....**$15.95**

World's Largest Selection!

YOU CAN SAVE UP TO 50%

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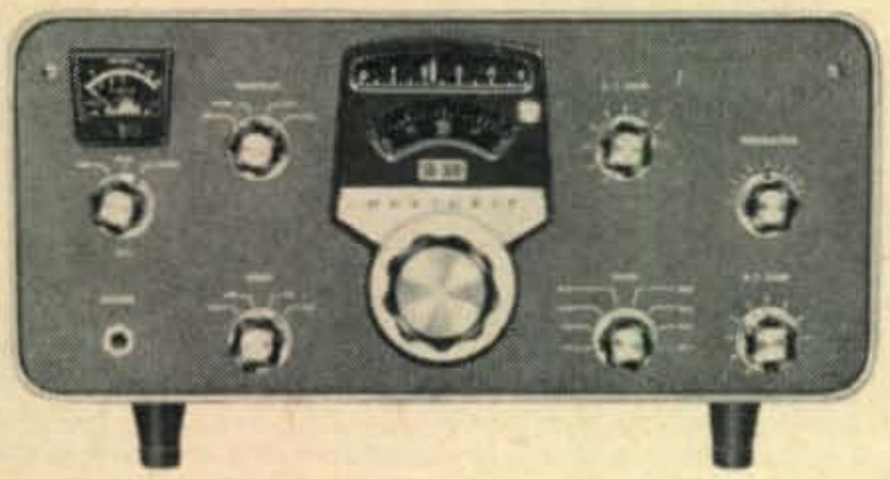
SB-300 SSB RECEIVER . . . $265.00



• A new standard of amateur performance & value • 80-10 meters with provision for VHF converters • Crystal-controlled front-end for same rate tuning on all bands • 1 kc dial calibrations—100 kc per dial revolution • Band-spread equal to 10 feet per megacycle • Provision for transceive operation with matching SB-400 transmitter • Drift less than 100 cps per hour after warmup • 8 ohm audio output matches HS-24 speaker • Compact—weighs only 22 lbs.

SB-400 DELUXE SSB TRANSMITTER . . . $325.00

• Built-in power supply • Complete transceive capability with SB-300 receiver • Linear master oscillator frequency control • Built-in antenna change-over relay • All crystals supplied for complete 80-10 meter coverage • Automatic level control for higher talk power, minimum distortion • 180 watts PEP SSB, 170 watts CW • Crystal filter type SSB generation (upper or lower sideband) • VOX operated CW uses CW sidetone • 1 kc dial calibration—100 kc per dial revolution • 500 kc coverage per bandswitch position • 33 lbs. weight.

SB-200 KW LINEAR AMPLIFIER . . . $200.00

• 1200 watts P.E.P. input SSB—1000 watts CW • 80 through 10 meter band coverage • Built-in SWR meter —Antenna relay—Solid-state power supply • Automatic Level Control (ALC) • Shielded, fan-cooled amplifier compartment • Pre-tuned cathode input circuit for maximum efficiency & low distortion • Circuit-breaker power supply protection—no fuses • Designed for 120/240 volt operation • Weight 42 lbs.

6 & 2 METER PLUG-IN CONVERTERS EXTEND OPERATION OF SB-300

6 meter model extends coverage from 48-54 mc (50-52 mc crystal supplied). 2 meter model extends coverage from 142-150 mc (144-146 mc crystal supplied). Designed to plug-in to SB-300, but work with any receiver having proper voltages and 10 meter coverage. 2 lbs. **SBA-300-3** (6 meter), **SBA-300-4** (2 meter), 2 lbs. . . . . **$19.95** each

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FREE 1965 HEATHKIT CATALOG

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Please send model (s)_____
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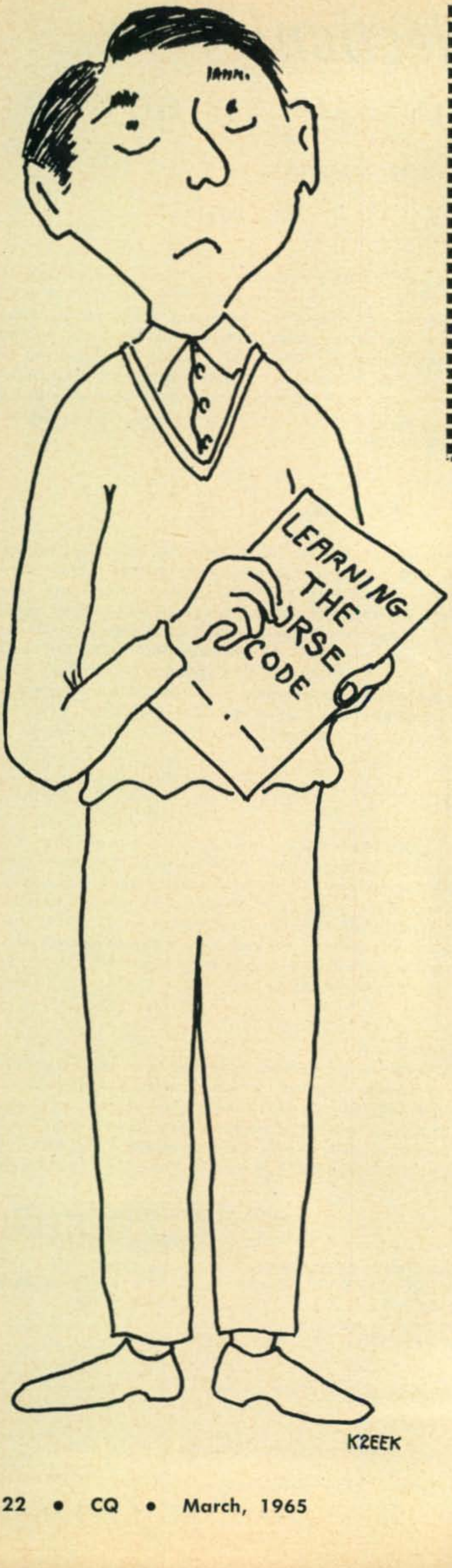
Name_____
(Please Print)
Address_____
City_____ State_____ Zip_____
Prices & specifications subject to change without notice. AM-153

For further information, check number 21, on page 110



TEACHING MORSE CODE

BY CHESTER E. GLEIT,* WB6FJS

One of the more pleasant duties of the experienced operator is assisting newcomers to amateur radio prepare for their license examinations. Recent advances in educational methods suggest that several minor changes in the method of teaching code can greatly increase learning rate and avoid the commonly experienced learning plateaus. Most educators now reject the concept of crude repetition or "frequency theory of learning" in favor of programs which are intentionally arranged to strengthen suitable mental associations. In light of this, structured program of code instruction is recommended. Specifically, careful attention should be given to the order in which the letters are presented so that proper associations between sounds and symbols are naturally acquired.

The first phase of code instruction includes memorizing the combinations of DITs and DAHs which represent the letters and numerals and recognizing their sounds. There is little agreement as to the order in which these symbols should be taught. Some texts present the letters in alphabetical sequence,[1] and some employ a nearly random order.[2] The current Navy system starts with the short sounds (E, T, A, I, M, N) and then proceeds to progressively longer letters.[3] Many instructors teach the series E, I, S, and H first, followed by T, M, and O[4]. This system allows most of the letters to be memorized quickly; but, unfortunately, results in combinations such as F and L or Q and Y being learned

*Department of Chemistry, North Carolina State University, University of North Carolina, Raleigh, North Carolina.

[1]Robbins, L., and Harris, R., "Rider Sound-n-Sight Code Course," J. Rider Inc.

[2]Huntoon, J., "Learning the Radiotelegraph Code," A.R.R.L. Inc., West Hartford, Conn. (1942).

[3]U. S. Bureau of Naval Personnel "Radioman 3 and 2," (1963).

[4]Nilson, A. H., "Radio Code Manual," McGraw-Hill, New York (1942).

or

Why Johnny Can't Reach 13 W.P.M.

together in a later lesson. The rhythm of these pairs of letters is quite different. The commonly experienced confusion between them arises only from their being taught together.

After the combinations have been memorized, speed usually rises rapidly with practice to the 10 to 12 w.p.m. level. The student has now reached the point at which his ear correctly picks up the rhythm of the complete combination and then, during the pause between letters, mentally flips through a catalog of letter sounds, generally starting with the most familiar or first learned, until he locates the correct symbol. This is then recorded.

At these speeds the student often encounters a "learning plateau" and suffers through a long period of tiring practice with little apparent progress. The principal reason for this plateau is that the inefficient and slow mental process used at lower speeds has been pushed to its limit and an entirely new pattern of associations is required. (If you believe that coordination can be speeded up indefinitely by practice, see how fast you can apply the brakes on a car. At 35 m.p.h. a good driver will travel 38 feet between the time he sees danger and "automatically" hits the brakes.) What the experienced c.w. operator does, and the student must now learn, is to select subconsciously the group of symbols containing the possible combinations before the pattern is completed. That is, by the time the student has heard the partial combination *diDAHDAH* he should have narrowed down the possibilities to the symbols W, P, J, and 1.

If the letters are taught in a proper sequence, the student will naturally acquire the correct pattern of associations. Such a pattern leads him towards the correct combination. An appropriate order is shown in Figures 1 and 2. If only the letters are to be taught, the last column of these diagrams can be omitted. A sixth column can be added for punctuation marks.

Six or seven letters are introduced in each of the first four lessons. For ease in presentation, we generally start with the lower half of Figure 1, the *diDAH* group (E, A, R, L; W, P, J, 1) and in the next lesson continue with the *didi* group (I, U, F, 2; S, V, 3; H, 4, 5). The starting point is mostly one of personal preference. However, the *diDAH* group contains enough common letters to form many practice words,[5] and the symbols 1, 4, J, and L provide good keying practice. WE ARE AWARE that only a few phrases, such as LEAP A JEEP and WEAR A JEWEL, can be made from this group.

Although our experience with this structured system is limited, comparatively rapid and smooth increases in speed to beyond 18 w.p.m. have been observed. The problem of anticipation, in which a shorter, more familiar letter is erroneously substituted for the correct one, is

[5]We found sixty-six words, please send longer lists.

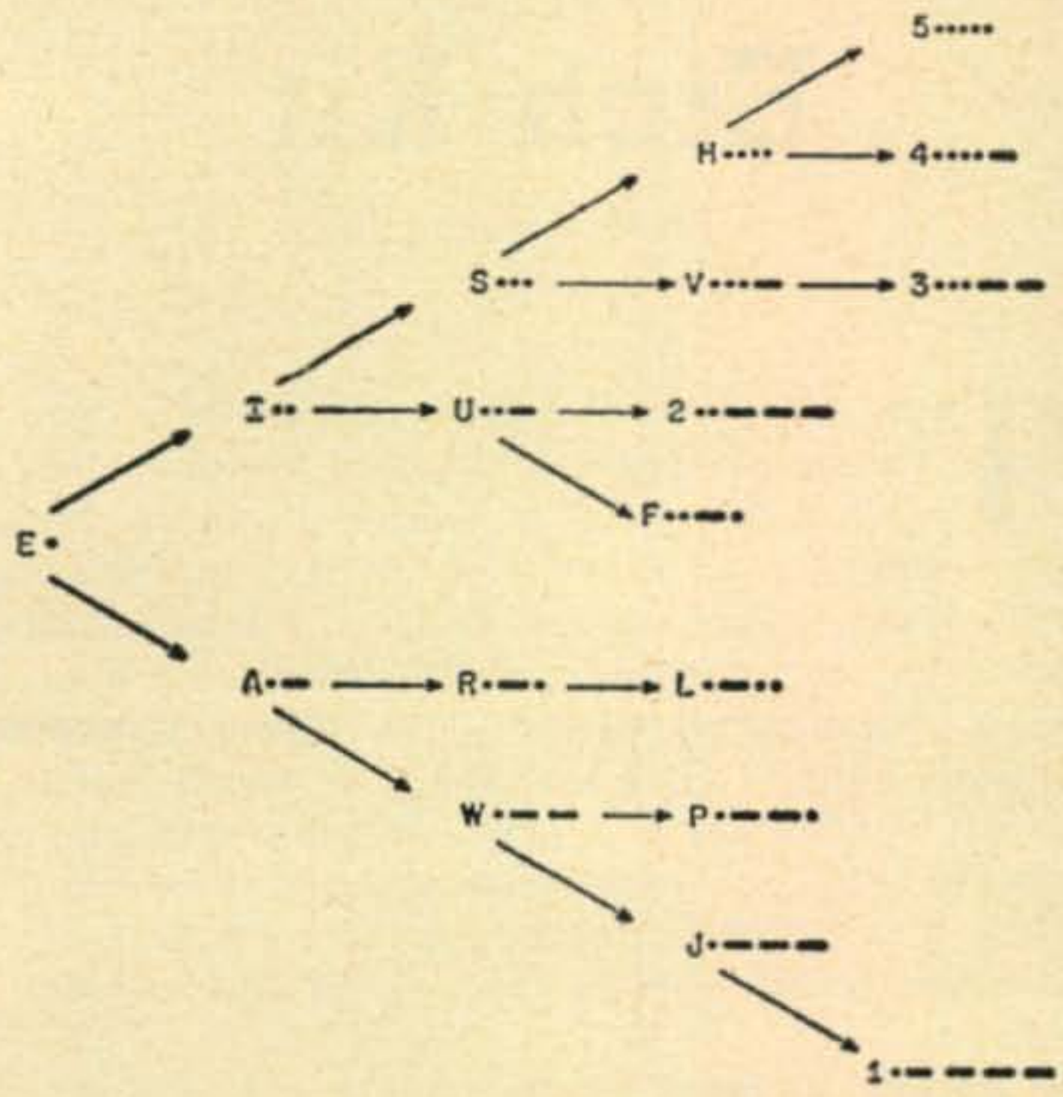


Fig. 1—Learning the code starting with DITs.

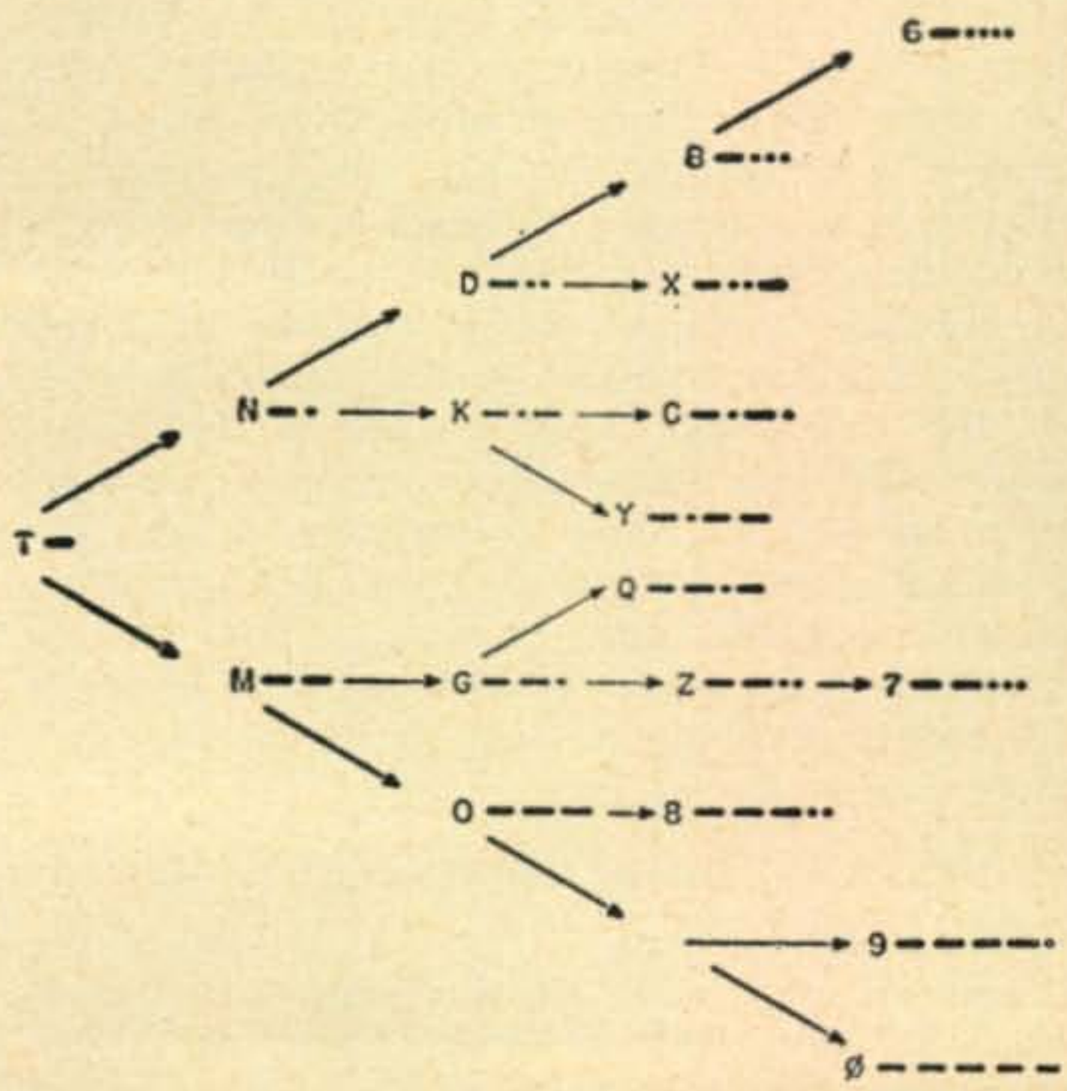


Fig. 2—A continuation of Figure 1, starting with DAHs.

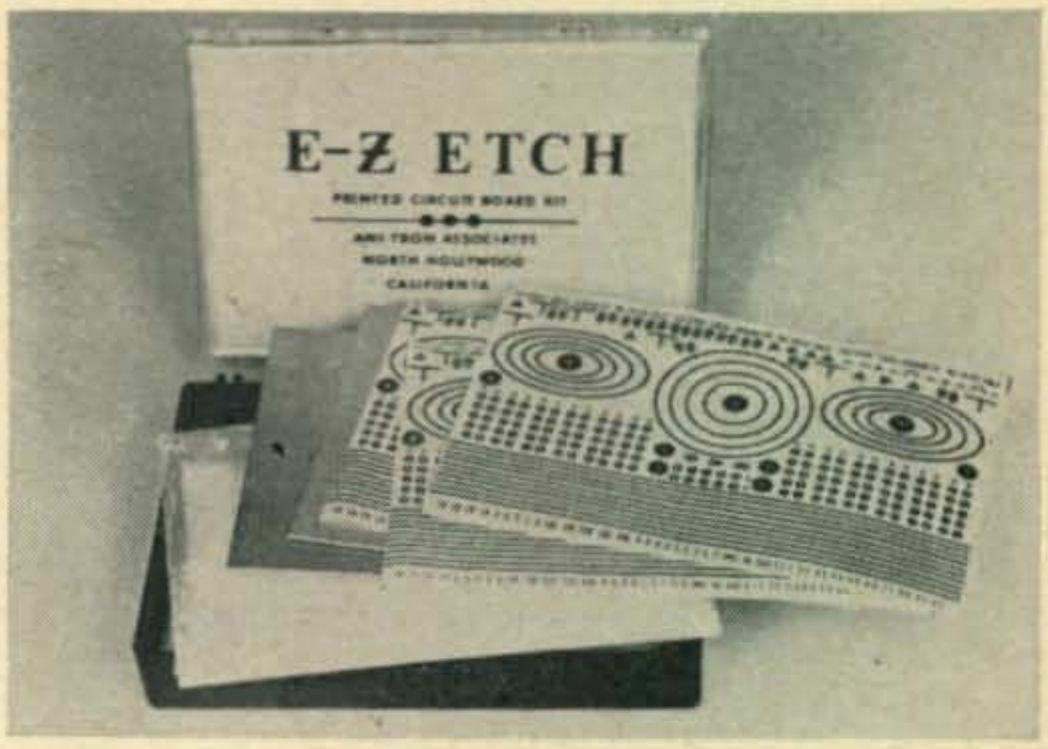
virtually eliminated by the nature of this system.

Another change in teaching methods is recommended. Most instruction guides suggest daily practice and imply that a break of several days is fatal. Recent studies have demonstrated that this is not correct. Experiments in learning of both academic subjects and athletic skills have shown that an improvement may actually occur during a properly spaced rest period. During the break the material already learned "sinks in." This allows more rapid progress in subsequent study periods.[6] In practice, we suggest that each student prepare a graph of his daily progress. When the rate of progress begins to slow down a rest period of two days to a week may be taken.

Figures 1 and 2 were prepared by Jim Beaudry (WA6CLW), who assisted in the development of this system. We will be happy to supply 8½ × 11 copies of these figures. ■

[6]For an expianation of this phenomenon based on electrical principles see "Man's Mysterious Memory Machine" *Harper's Mag.*, June 1963.

Ami-Tron E-Z Etch Kit



The Ami-Tron E-Z Etch Kit

THE Ami-Tron E-Z Etch is a kit developed for simply and quickly fabricating printed-circuit boards of professional quality. The resist-application method is used with which etch-resist images are applied from a dry-transfer sheet placed upon the copper surface of a fiberglass copper-clad board. This board is then immersed in a chemical solution which etches away the exposed copper, leaving only that covered by the etch-resist images to remain, thus producing a printed circuit designed according to the layout made with the transfer images.

As may be seen in the photograph, the dry-transfer sheets include linear patterns for representing straight conductor runs, T-sections for junctions, and ellipses, sections of which may be used in the manner of a "French Curve" for producing difficult or various type of circuit "twists". Teardrops and lozenges, designed to fit the wire size of a ½-watt resistor using a hole made with a #60 drill, are included for component connections. A number of small arrows can be employed to create diode symbols or for indicating signal or power directions, while pulse-like marks can be used for "Omega" or to show pulse-signal connections or flow. In addition, there are images for common component symbols and numerals. The etching chemical is supplied in the form of crystals contained in a plastic bag in which they are later dissolved.

Doing the Work

The work is easy to do by following the simple instructions. First, the copper-clad board must be thoroughly cleaned. Then the circuit layout is pencil-sketched directly on the copper side of the board. This serves as a guide when the etch-resist transfers are to be applied. After a paper backing is removed from the transfer sheet, the selected image is transferred to the board at the desired place by applying pressure on the top of the image with the point of a soft lead pencil rubbed over it. The transfer sheet is then removed, leaving the image on the board. These steps are continued until the entire circuit is completed. In the event a 'break' or an 'open' in the circuit continuity is found, it can be repaired by the application of a new resist-image section over the original one. In the event of a short or an incorrect run, the image may be removed from the copper by lightly scraping with the finger nail or similar object.

The etching solution is then prepared by adding one pint of very hot water to the crystals in the plastic bag. After the solution has cleared, the copper board is immersed in the bag where it is left for 45 to 60 minutes. Agitation is required every five minutes or so. When the etching has been completed, the board is removed, rinsed with cold water and cleaned with lacquer thinner or fine steel wool. The finished printed-circuit board may be punched, drilled or sheared. The dialectric properties of the fiberglass/copper laminates are such that the boards can be used at U.H.F.

Ami-Tron E-Z Etch kits are available with one 4" x 6" board for $3.49, or with two boards for $5.95 complete with transfer sheets and plastic bag with crystals for making etching solution. Extra transfer sheets are $2.00 per set of three. Special custom kits are available for research and development laboratories. The producer is Ami-Tron Associates, 12033 Otsego Street, North Hollywood, California.—*W2AEF*

An RTTY Tuning Indicator and Squelch

BY C. H. COMBS*

The RTTY tuning meter described below is simple and can be added to the TU quite easily. It can replace the scope presently used for tuning and free it for other uses in the shack. Also part of the tuning unit is a simple squelch that can prevent the printer from running wide open when the signal fails.

TUNING meters are not new in f.s.k. terminal units. They have been used on many government units such as the CV116. They always take the form of a zero-centered balance meter that is deflected one way for signal in the *mark* channel and the other way for signal in the *space* channel. Tuning was accomplished by adjusting the receiver until the needle was vibrating around zero, indicating equal tones in both channels. This was ambiguous because the same "correct" reading was also obtained when the signal was too far off in frequency to appear in either channel, and also when there was no signal, just noise. A supplementary meter for signal level was no real help, because it read noise just as well as signal.

This state of affairs has made the scope popular as a tuning unit. The practice, as used in military equipment, probably reached perfection in the CV57. The display, on a two inch scope tube, consisted of two horizontal lines, one above the other, one for *mark* the other for *space*. This device was actually quite good, and it was possible to tell in a comparative way the approximate amount of shift, the signal-to-noise ratio, and the keying speed, by a practiced observation of the scope tube.

However, it was also capable of highly confusing readings, and to use accurately, required a calibration that involved considerable understanding of the equipment. It also had the prime objection of all scopes; the added expense, complication, and unreliability of having the unit in the equipment.

Tuning Meter

The circuit described here uses one conventional meter with zero on the left side of the scale. In operation it sums the signal levels in the *mark* and *space* channels and produces a steady high reading on the scale when the right kind of signal is correctly tuned in, and either a very low reading, or wild lashing of the needle under almost any other conditions it is possible to imagine. This clear cut indication is obtained with only one cheap meter, one dual triode and 5 resistors. When used with headphones, it is an absolutely foolproof tuning guide even in the hands of a rank newcomer to the equipment.

As an added feature, the addition of a plate relay to this circuit and nothing more, will provide a very efficient and accurate squelch action for the TU.

In ordinary operation, if the signal to which you are listening goes off the air, or fades out, the machine runs wild, making noise and wasting paper. This also happens if the receiver drifts completely off the signal. But with this squelch circuit installed, the terminal unit's output is locked up, holding the machine in steady *mark* condition whenever the signal drops too low. While a fading signal may trip this off once in a while, the relay can be adjusted to do so only when it was going to misprint anyway. In diversity reception, with two terminal units, the contacts of these squelch relays can be connected in series so that the machine is not locked up until both channels are faded out.

Circuit Operation

The circuit is shown in fig. 1. The two grids, through C_1 and C_2, are each connected into one of the channels in the TU circuit at a point where at least 3 volts r.m.s. of signal is available. In an audio type of TU the connection is made after the filters but before the rectifiers. Any grid, plate or driver transformer primary is suitable. The connection to the less popular f.m. type of TU, operating as an extension of the receiver's i.f. strip, is usually more difficult. If the output of the detector gives two positive

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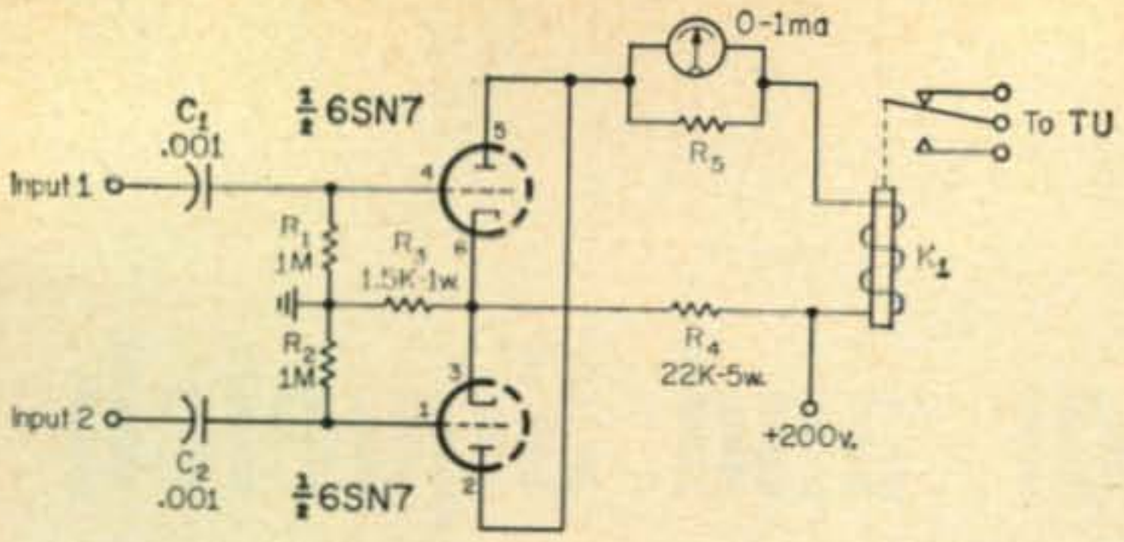


Fig. 1—Circuit of the RTTY tuning indicator. All resistors are ½ watt except as noted. The exact values of R_3 and R_5 must be determined as explained in the text.

voltages referenced to ground, one for *mark* and *one* for space, then the meter circuit can be connected there, omitting the capacitors C_1 and C_2, for d.c. coupling. In all other cases, it will be necessary to add a second discriminator transformer in parallel to the original one and follow it with a rectifier circuit that will give the two positive d.c. voltages. An arrangement of this nature is shown in fig. 2.

In the meter circuit, we now have one triode getting an a.c. signal when the *mark* channel has a signal in it, and the other triode getting a signal when the *space* channel has a signal. The tubes are held to cut off bias by the voltage divider R_3 and R_4. With no signals coming in, practically no current flows through the meter and it reads close to zero. As the signals come in, the tubes act like rectifiers and begin to conduct on half cycles of the a.c. and the meter, which is too sluggish to follow the a.c. variations, gives a smooth indication of amplitude.

In f.s.k. operation, there is always a signal on one grid, but never a signal on both at the same time, so a steady reading of the meter develops at some point up the scale, depending on the incoming signal level. As long as the signal is perfect, this reading will be steady, whether the signal is keying or not, but if conditions go wrong so that there is a signal in only one channel, (tuned half out of position, wrong shift, or a c.w. signal and not f.s.k.) then the meter will follow the keying and lash back and forth across the dial. If the signal is way off frequency or absent, the meter will give a low jumpy reading of the background noise that cannot be mistaken for anything else.

Construction and Adjustment

Any usual receiving dual triode tube will work, although a 6SN7 was used in this case. Both halves must be the same, however. The plate voltage here is 200 volts, but any average value will work after the resistors R_4 and R_5 have been adjusted to compensate for it. Experience has shown that the meter should *not* be very well damped, but should respond fairly quickly to changes of level. This leaves the field wide open for an inexpensive meter, though it should be good enough in quality so as not to hang up or wear out, as it will be in almost constant motion. Also it should be large enough to be read easily from across the room. A one ma meter should be used if maximum sensitivity is wanted, that is, if only about 3 v.r.m.s. is available to drive the circuit. However up to a 5 ma meter may be used by suitably increasing R_5 and working with input signals on the order of 9 v.r.m.s. The construction is not critical mechanically, but observe the meter polarity carefully.

Squelch

If the squelch feature is desired, the plate circuit relay should be added, and be of high quality for good results, having at least the 5000 ohms coil resistance specified. The Sigma 5F used here is very highly recommended for its durability and extreme ease of adjustment, a sore spot with many relays. The object of the relay is to have it cause a steady *mark* condition in the teleprinter loop circuit when the relay is open, or has no current flow through it. This can be accomplished in several ways depending on the circuit of the TU being modified. For all TU's that use a polar relay to drive the printer, perhaps the simplest method is to connect the normally closed contacts on the squelch relay to short out the active contacts in the polar relay, cutting it out of the loop. Make this connection out in the loop, however, not *right* across the polar relay; you may spoil your hash suppression.

If a keying tube output is being used, some connection can usually be worked out at the grid of the keying tube, to short the grid to ground; connect it to a bias source tapped from somewhere, or else create a steady current flow in the tube with the relay contacts.

If a *mark* hold, or steady *mark* switch is incorporated anywhere in the TU's design, simply connect the relay to duplicate its function.

Testing

When all is wired up and checked, it is time to test the circuit.

Turn on the TU and allow a couple of minutes for warm up. Don't be alarmed if the meter slams against the top pin; it won't be doing that after the adjustments are complete, and it won't be hurt if it is wired up right.

1. Make very sure there is no signal input to the TU.

2. Adjust the value of R_3, until the meter just reads barely above zero. This means a little current is left flowing through the meter at all times, and that even the weakest signals will register. There is no need for this or any other

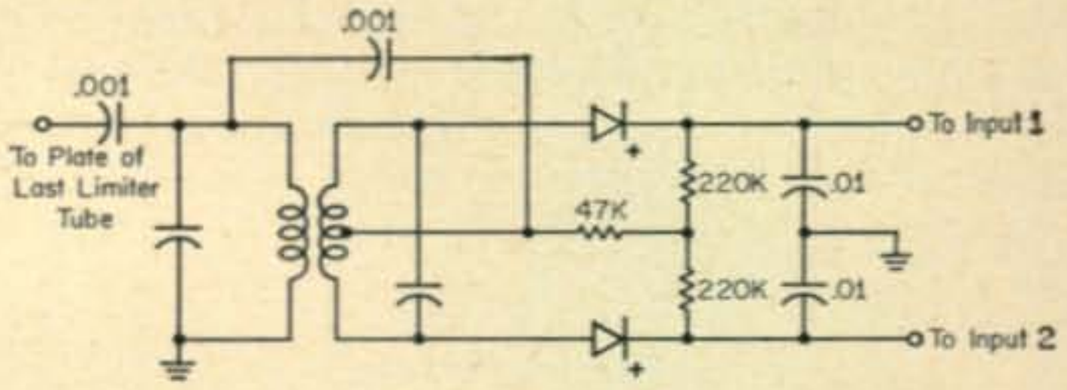


Fig. 2—The discriminator circuit above must be used with the indicator circuit when attached to the f.m. type of TU if there are no positive output voltages. The capacitors C_1 and C_2 of fig. 1 are omitted when used with the above circuit. The i.f. transformer should be of the correct frequency for the equipment used.

adjustment to be variable, and the selected resistor or resistors can be soldered in.

3. Feed one tone into the TU, either by tuning in a single steady carrier on the receiver or using a signal generator, and center this tone very carefully in one channel filter, using a scope or a v.t.v.m. on the filter circuit to check. Adjust the amplitude of this input signal to normal for the TU, or high enough to catch in the limiters, whichever is applicable.

4. Adjust R_5 until the meter reads about ¾ of the way up the scale. When the tone is turned off the meter should resume its former reading near zero.

5. Move the one tone in frequency so that it is centered in the other channel filter. The meter should read ¾ again, when the tone's amplitude is the same as before.

6. If the normal reverse switch that interchanges the signal channel paths is *before* the meter circuit take off points, throw this into the other position, and repeat the tests. The same results should be achieved if signal levels are the same in all corresponding parts of the circuits.

7. Either by making adjustments on the relay to change its sensitivity, or if too sensitive, using a loading resistor across the coils, arrange it so that the relay trips on and off when a signal strong enough to make the meter read ¼ of the way up the scale is coming in from the test source. This will be very close to the best squelch point in most cases. Finer adjustment can be made later, in service, if it becomes apparent that it is shutting off too soon, or letting noise through.

It should be stressed that to obtain the best squelch operation, the signal level coming in should not drive the limiters in the TU very hard. In actual reality, limiters do little good in a TU regardless of type, and in this case, if the signal level is too high, it will be replaced by a high noise level when it is absent and both tuning and squelch action will be impaired. Extreme distortion in the receiver, a possibility in old a.m. receivers especially, can make tuning difficult, and should be corrected, as it will seriously impair the operation of any TU.

Operation

With headphones or loudspeaker on, find an f.s.k. signal of the shift you are using, and tune so the sound of it indicates it is in the general range of the TU. Watch the meter as you tune, and when the right place is reached, the meter will stop jumping around and settle on a high steady reading. The machine should now print, after the usual normal-reverse corrections have been made. Fading of the signal will be shown by a drop back in the meter reading followed by a recovery of the former position when the fade is over. A persistent lowering of the reading accompanied by a jiggling that follows the keying usually means the receiver is drifting off frequency. A sudden violent lashing in the midst of good signal reception can mean interference from voice or c.w. stations.

Failure of the meter to achieve a high reading at any receiver setting means the receiver gain is too low, or much too high (excessive distortion in the limiters), a wrong shift, or a poor signal to noise ratio. A tendency to jiggle and read higher than usual, if accompanied by a peculiar bell-like ringing sort of sound in the signal means multipath reception, and this will not copy well regardless of signal strength without diversity reception, and not too well even with it.

This circuit has no calibration problems, and the meter requires no close observation, or reading, once the signal is tuned in. If a glance at the panel shows a high, steady reading, then everything is okay. ■

New Amateur Product

Gonset Linear Amplifiers

Two new r.f. amplifiers are now being produced by Gonset, Inc.

Models, 903A 2-Meter and 913A 6-Meter bands, are designed to operate as Class AB 1 linear amplifiers providing 200 watts output, or as non linear Class C units handling 280 watts output. Under Class AB 1 operation the units may be employed for SSB, AM, CW, MCW, FM and FSK service, and in Class C operation for FM, PM, and CW service.

Both amplifiers have been designed as companion units for the Communicator series and any other exciter capable of producing at least 5 watts. Attenuator pads in 5, 10, and 15 db steps are available to facilitate compatibility. The unit has a built-in power supply, and costs $299.00.

For more detailed information write to: Gonset, Inc., 1515 S. Manchester Avenue, Anaheim, California, or circle 65 on page 110.

Improving Power Supply Regulation

BY KEN JUDGE GLANZER,* K7GCO

Here is the means to improve the regulation characteristics of those power supplies by careful selection of the filter inductance value and bleeder placement.

GOOD power supply regulation for an s.s.b. linear, c.w. amplifier or Class B modulator should be just as important to the amateur as a well regulated bias supply. The choke used in the power supply filter circuit can be a very important factor in the regulation characteristics of a power supply.

The swinging choke, capable of a wide variance in load handling capabilities, was specifically designed for class B loads and offers an excellent means of achieving good power supply regulation if used properly.

Swinging Choke Operation

It is generally common knowledge that a choke input power supply filter circuit produces a better regulated output voltage than a capacitor input filter circuit.[1] However, also well known is that the capacitor input filter produces a higher output voltage.[2] See fig. 1.

In an attempt to get improved regulation characteristics from their power supplies, many amateurs employ choke input filters but do not get the desired results. This is because a choke input filter will act just like a capacitor input filter if the choke does not have a minimum inductance value. This minimum value is called the critical value.[3] Now, if the inductance of the choke is at least the critical value the output voltage will be low as it is a choke input filter. If the inductance of the choke drops too low, below the critical value, the filter can begin to behave as a capacitor input type of circuit with a higher voltage output but with poorer regulation.

Figure 1 shows the characteristics of a power supply with either a choke or a capacitor input filter. If, with an 80 ma load, the inductance of the filter is at least the critical value the output

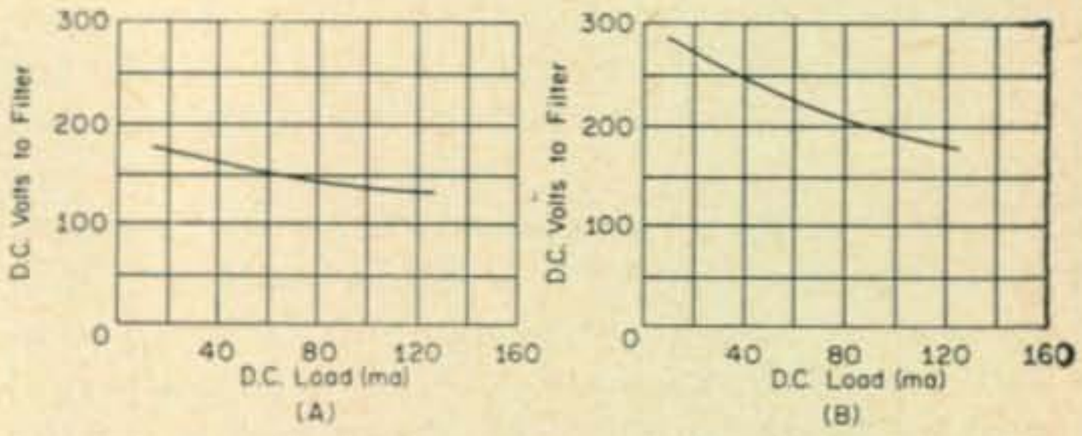


Fig. 1—(A) shows the operating characteristics of a power supply with a choke input filter. (B) shows the characteristics of the same power supply with a capacitor input filter but all other factors equal.

will be 145 volts, based on graph (A). If the current drain is raised to 120 ma the output will fall to 130 volts. If the filter circuit were capacitor input as shown in fig. 1 (B), for a 120 ma load we could provide an output of 180 volts.

If the inductance value of the choke in the choke input circuit could be dropped so that the filter changes to capacitor input we could raise the output voltage. The swinging choke lowers its inductance as the load current increases and the first filter capacitor tends more and more to charge to the peak of the input ripple thus raising the output voltage to compensate for the voltage drops. Ideally, the choke should vary its inductance from optimum ($L_o = 2L_c$) to critical ($L_c = E/I$).[4] Of course, this is an oversimplification of the actual operation on the swinging choke. A more detailed understanding can be gotten from one of several texts.[5]

Practical Applications

A typical high power swinging choke rating is, for example, 5-30 hy at 600 to 50 ma. The low value of the inductance under heavy current load is quite ample since a high degree of filtering is not as necessary for final stages as compared to lower level stages such as a v.f.o. or buffer.

*202 South 124, Seattle 68, Washington.

[1]Slurzberg and Osterheld, *"Essentials of Radio—Electronics,"* Second Edition, McGraw Hill Book Co., Inc., p. 349.

[2]Slurzberg and Osterheld, p. 349.

[3]Slurzberg and Osterheld, p. 348.

[4]Slurzberg and Osterheld, p. 348.

[5]Slurzberg and Osterheld Terman, F.E., *"Radio Engineers' Handbook,"* McGraw Hill Book Co., Inc. pp. 597-601.

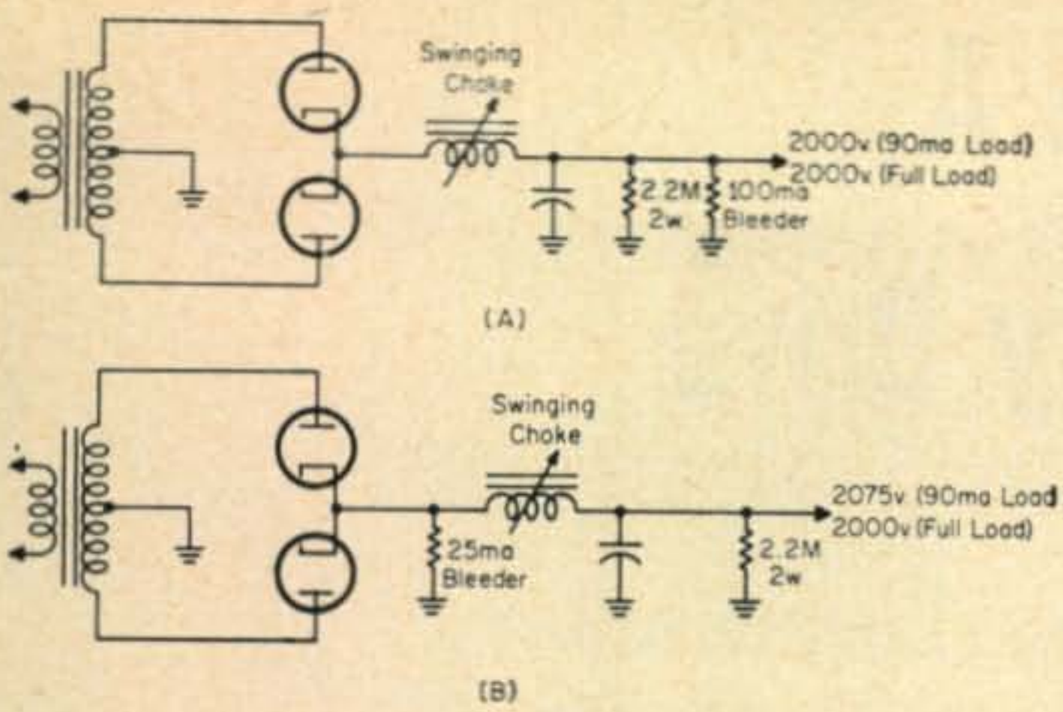


Fig. 2—Circuit (A) is the conventional configuration and the 100 ma bleeder current, drawn through the swinging choke produces less than optimum choke action The circuit in (B) prevents the bleeder current from flowing through the choke, improving the swinging choke action. The bleeder current need no longer be at the 100 ma level as explained in the text. (25 ma suggested)

Another important item in the power supply filter is the filter capacitor. When the load takes large instantaneous current surges, the capacitor must supply the energy or the output voltage will drop. Common practice has been to use a minimum of 20 mf or more if available.

In the Ultra Modulation system[6] application at K7GCO, a smoothing choke and a 25 mf filter capacitor was used. Regulation was found to be poor with the choke input configuration. The output voltage varied from 2550 volts at no-load to 2000 volts full load. The bias voltage, therefore, had to be set higher than normal and since the voltage changed the shape of the tube's characteristic curve, additional distortion resulted.

Installation of a swinging choke rated at 5-30 hy at 600-50 ma improved the regulation from 2300 volts no-load to 2000 volts full load. This improvement permitted a lower bias voltage but it was felt that further benefits could be obtained. Figure 2 (A) shows the basic circuit but while the load idling current is 90 ma, the bleeder current is 100 ma. This lowers the swinging choke inductance and prevents the choke from working under ideal conditions. By moving the bleeder to the other side of the choke, as shown in fig. 2 (B), the current through the choke is reduced considerably. The no-load voltage was then 2075 volts with a full-load voltage of 2000 volts, certainly an acceptable figure.

[6]Glanzer, K.J., "Ultra Modulation For The A.M. Transmitter," *CQ*, November, 1964 p. 50.

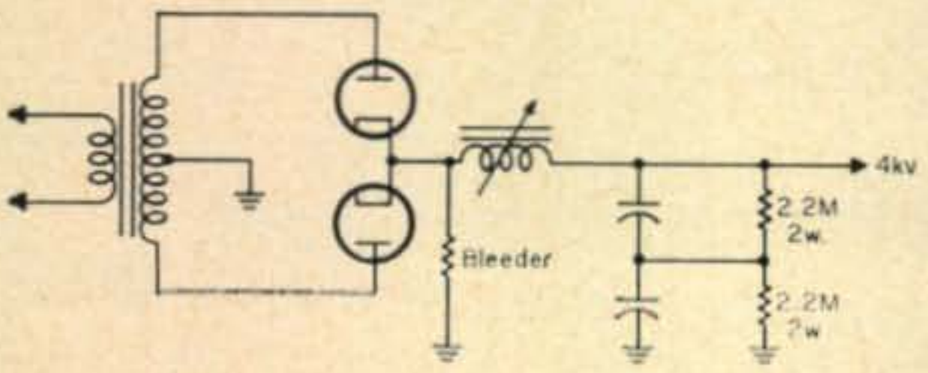


Fig. 3—The safety bleeders can serve to discharge the capacitors if main bleeder or choke opens and when the capacitors are in series the 2.2 meg resistors also serve to equalize the voltage distribution.

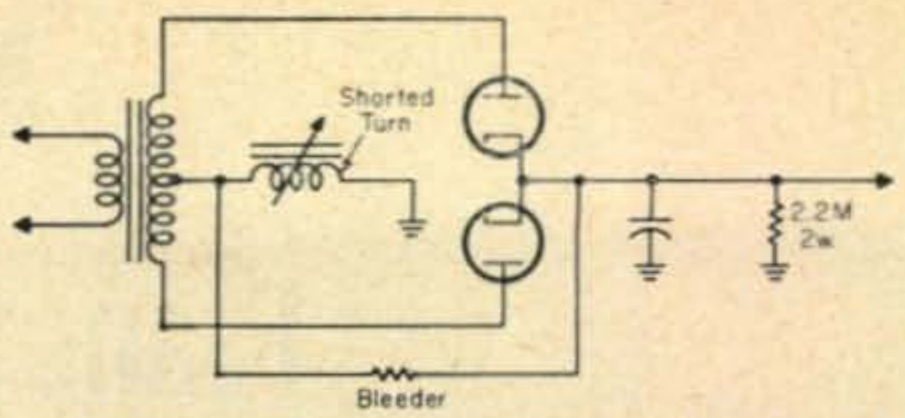


Fig. 4—Modified filter circuit showing how the choke with the winding shorted to the frame was used. A good technique in a high voltage supply even when not shorted. Note bleeder connection.

Bleeder Resistors

Bleeder resistors tend to improve the regulation of a power supply when the filter choke is of the smoothing variety as the bleeder provides a more constant load and limits the maximum voltage swing. The use of a heavy bleeder current with a smoothing choke to obtain improved regulation is inefficient and limits the current output of the power supply, but its use is almost a necessity.

A bleeder resistor used with a swinging choke as shown in fig. 2 need not draw as much current as when it is used with a smoothing choke since its function is not to regulate but discharge the capacitors. For a capacitor operated at 2000 volts a resistor of 2.2 megohms, 2 watts, may be used. For 4000 volts, should 2 capacitors, 2000 volts each, be placed in series, the 2.2 meg resistors would serve to both discharge the capacitors and equalize the voltage drops as shown in fig. 3.

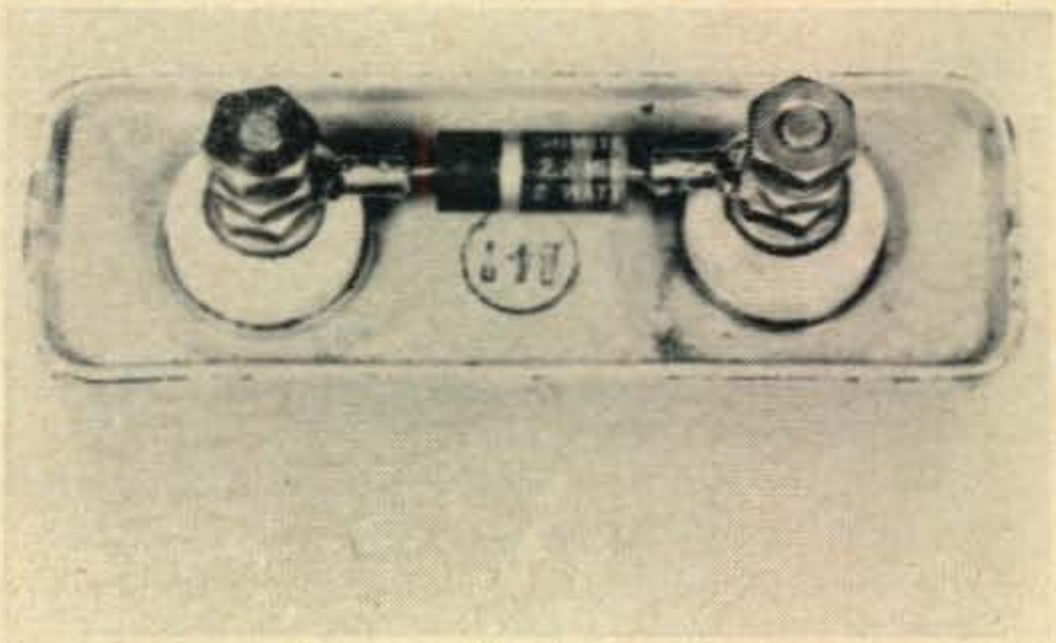
Choke Failure

After operating a period of time with the circuit of fig. 2, the swinging choke winding shorted to the case, not an uncommon happening in high voltage power supplies. Not wishing to discard the choke, it was transferred to the center tap lead as shown in fig. 4. Be sure the shorted side is at ground as shown. If a bleeder is used, be sure it is connected so as not to draw current through the choke as shown.

Resonant Chokes

If a swinging choke is not available a smoothing choke can be used to improve the regulation characteristics of a power supply. This may be

[*Continued on page 92*]



A permanent 2 watt bleeder resistor is connected across the terminals of a 2,000 volt capacitor for additional protection. There should always be a voltmeter connected to the high voltage that can be observed from the operating position.

Add A Planetary Drive

BY HARRY LOWENSTEIN,* W2HWH

This added planetary drive changed the tuning ratio from 30 kc to 6 kc per turn and still permitted the quick tuning. A handy device for s.s.b. operation.

IN a previous published article[1] I mentioned the addition of a planetary drive system to my TMC GPR-90 receiver. Since then I have received many inquiries about this particular phase of the modification. The method need not be confined to this receiver only but can properly be adapted to many others.

The planetary drive unit is a British made job with a 6:1 ratio. As shown in fig. 1A, the low speed end receives a ¼" shaft and the drive or tuning end takes a ¼" knob. The indicator hub also rotates but at the reduced speed. Thus, if you secure a knob to the indicator hub you may drive the tuning mechanism at a 1:1 rate and with the knob on the ¼" shaft you can drive at a 6:1 rate; a two speed drive system for $1.50.

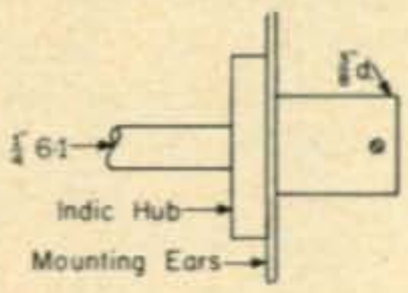


Fig. 1—This six to one planetary drive unit is a British import, made by Jackson Brothers.

Mechanical Details

Actually, it takes longer to explain what to do than to perform the modification. The first step is to acquire a large knob with a skirt as shown in the illustration. Drill the ¼" hole all the way through the knob and slip it over the drive shaft of the planetary drive assemble. Spot and drill the holes in the skirt to fasten it to the indicator hub. If the knob is shallow enough to remain on and still leave room for the 6:1 drive knob, then ream it out so that it does not drag on the ¼" shaft.

Remove the existing receiver tuning knob and slip back the tuning shaft. (See fig. 2.) Ream out the hole in the panel for ample clearance of the ⅜" coupler portion of the planetary drive. Slip the drive through the enlarged hole and

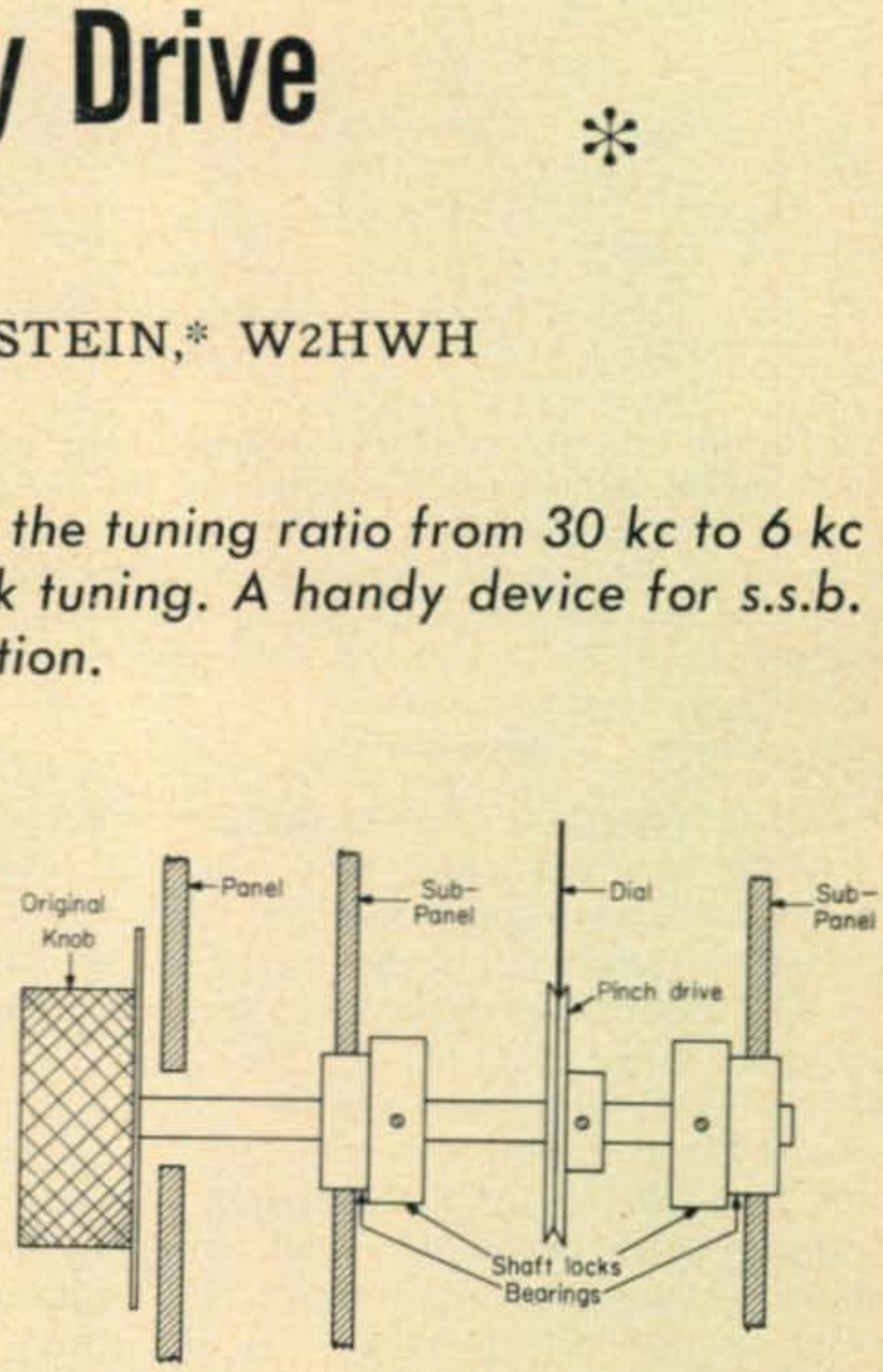


Fig. 2—Dial drive system of the TMC GPR-90 receiver. The tuning shaft is supported and aligned by the shaft lock bearings and the pinch drive turns the dial.

on to the tuning shaft. Fasten the drive to the panel by drilling two holes for the mounting ears. Make sure the ⅜" coupler clears the enlarged hole edges.

Lock the tuning shaft to the coupler with the set screw and tighten the set screws in the shaft lock bearings. Tighten the pinch drive pully last.

Now fasten the large knob to the indicator hub and a smaller knob to the driving shaft. The large knob drives the tuning shaft at 1:1 and the small knob at 6:1. ■

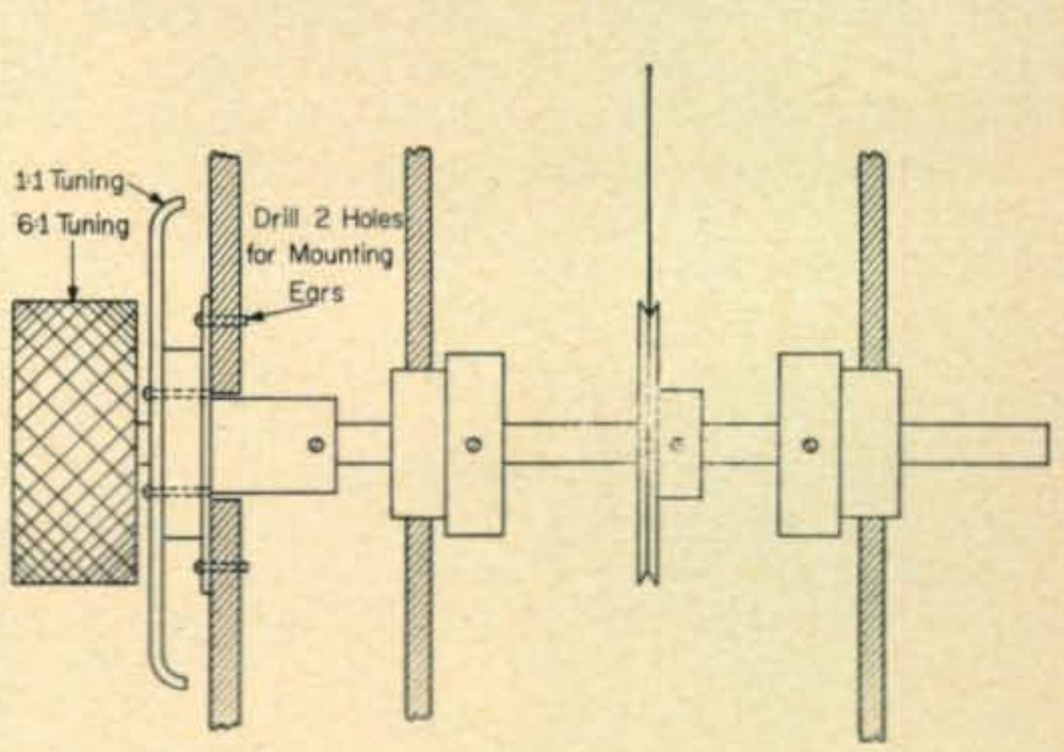


Fig. 3—Modified drive assembly with the 6:1 planetary drive added. The set screws on the shaft lock bearings are loosened to move the shaft back.

*12 Maplewood Avenue, Maplewood, New Jersey.

[1]Lowenstein, H., "A Station Package," *CQ*, September 1964, page 56.

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

Part VIII

Part VII covered an introduction to converters in general, with the latter part covering basic information on two early types. This article continues with a more detailed discussion of these two specific converters.

It will be noticed that, for the greater part, both the W2PAT and the W2JAV converters, discussed in Part VII, or any converter for that matter, are dual channel devices. The two RTTY signals enter the amateur's receiver, pass through and leave the receiver together (except that they are not both on at the same time!) and enter the converter together. Both signals, *(mark* and *space)* are first clipped, limited and amplified as previously described. At this point, the two signals are separated and the dual facilities of design of converters comes into being.

The two RTTY signals are identical when leaving the transmitter except for frequency and coded sequence, so it is desirable that they keep their same related status on to the teletype printer mechanism at the receiving end. This is necessary in order that the transmitted message be received without errors. In practice, the interrelationship of the two signals may start changing the moment they leave the transmitter. Actually, this can even happen in the transmitting process if all is not in order at the transmitter end. In traversing the distance from the transmitting point to the receiver location, the signals may be changed in time and/or amplitude relationship with respect to each other.

The purpose of the clipping and limiting, as previously described, is to restore the original signal amplitude relationships shifted by changes that may have taken place in transit from the transmitter to the receiver. The function of clipping and limiting is necessary for proper action in the detectors that follow. More on this later.

Mark And Space Filters

The RTTY signals have been traced from the transmitter, through space, through the receiver, into the converter, through the clipping-limiting and amplifier stages of the converter to the filters that separate the two tone signals. Each tone filter consists of an inductor and capacitor connected in parallel. The two tone frequencies used in these two converter designs are 2125 cycles *(mark)* and 2975 cycles *(space)*. In fig. 46 inductance L_1 and capacitance C_1 resonate at the *space* frequency of 2975 cycles, placing this *space* signal voltage on the grid of V_{2A}. This same filter rejects the *mark* frequency of 2125 cycles. Likewise, inductance L_2 and capacitance C_2 resonate at the *mark* frequency of 2125 cycles and reject the *space* signal so only the *mark* signal appears on the grid of V_{2B}.

Pulse Modulation

The detector tube for the *space* signal is V_{2A} and V_{2B} is the detector tube for the *mark* signal. From our past experience, the word *detector* suggests the separation of *intelligence* from a carrier. A detector is a device whose output is not exactly proportional to its input. Such a device is *nonlinear*. This is not to be confused with *detector linearity* which is a measure of a detector's ability to reproduce, at its output, an exact replica of the modulation that is present on the carrier signal fed into the input of the detector. In this case, the *space* signal carrier is 2975 cycles and the *mark* signal carrier is 2175 cycles. The intelligence is certainly not in the amplitude of either signal as all amplitude variations were effectively taken out of both signals before either reached their respective detectors. This was done in the clipper-limiter stages. Obviously, then the intelligence is in the *presence* and *absence* of each signal. Some call this system *code modulation* while others call it *pulse modulation*. At this point it might be advisable to return to the beginning and review both figs. 1 and 2 and the associated text.

From our knowledge and experience with modulated carriers, we know that detector circuits remove the carrier leaving only the modulation envelope which, in this case, is a square wave whose frequency is approximately the *baud*[2] *rate* divided by two. In amateur radio teletype with a code speed of 60 w.p.m. this means 45.45/2 = 22.775 or 23 cycles for all practical purposes. Figure 47 shows the time relationship between the *mark* signal (A) and *space* signal

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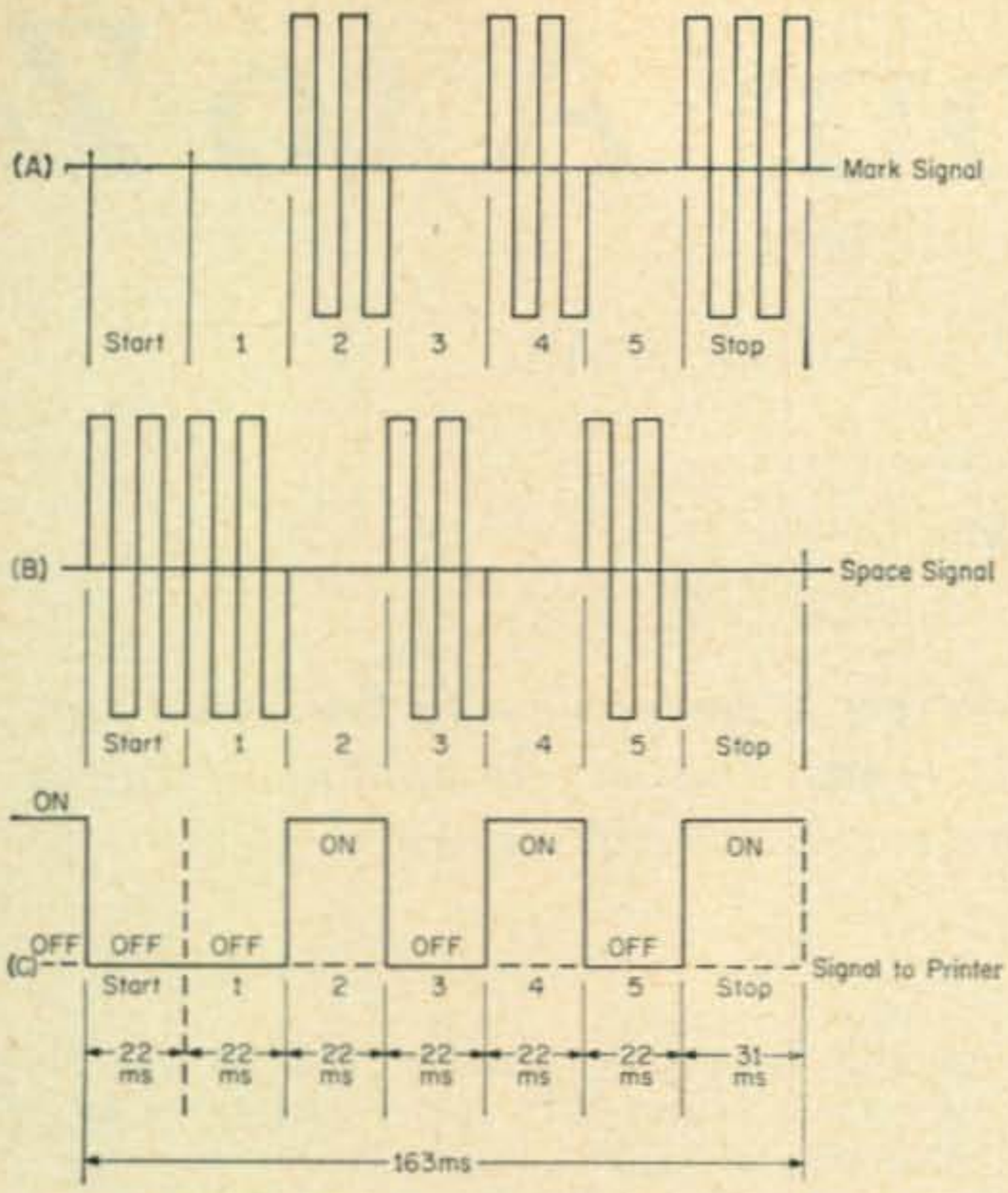


Fig. 47-(A) *Mark* signal at the input circuit of detector tube V_{1A} and (B) *space* signal at the input circuit of detector tube V_{1B}. (C) Signal to teletype printer at the output of V_5 and V_6 forming the teletype code for letter "R". (See figs. 1 and 46.)

(B) at the input circuit of their respective detector tubes and the resultant signal (C) at the output of the converter forming the teletype code for letter "R".

Detectors

The dual detectors in both the W2PAT and W2JAV converters are of the *grid rectifying* type. To some, this detection process may be better known by another name, grid leak detection, which was very popular in the early days of radio. Detection is based on the grid leak resistor and capacitor as shown in the grid circuit of V_{2A} and V_{2B} of fig. 46. The V_{2A} detector circuit of fig. 46 is reproduced for convenience and instant reference in fig. 48. As an r.f. detector in the early days of radio, the capacitor C_d was in the order of 0.00025 mf and the grid resistor R_d, across it, ranged from 1 to 3 megohms. The linearity of such a detector improves as the grid resistor is reduced and the amplitude of the signal being detected is increased. Under such circumstances the detector acts as though it were a diode followed by an amplifier stage. The detector grid resistor in both converters is only 47K.

A word now as to how the circuit detects. The positive halves of the input signal make the grid positive, thereby attracting electrons to the grid from the cathode. The electrons charge the capacitor C_d which then discharges through R_d on the negative half of the cycle. If the time constant is correct the voltage across R_d can be equal to the peak of the input signal. The polarity of the voltage drop across R_d makes the grid negative with respect to the cathode.

The presence of the grid resistor, as well as its selected value, and the strength of the signal makes it possible to control the plate current cut-off of the tube. It will be recalled that all amplitude variations of our RTTY signals were eliminated by the clipper-limiter stages that precede the detectors and our signals to be detected are simply pulses of 2125 cycles and 2975 cycles as determined by the teletype code sequences being transmitted. (Assuming no interference!) It can be seen that, on the negative half cycles of our RTTY signal pulses, that no grid current flows nor is the plate circuit particular affected because of the action of the grid capacitor and grid resistor.

W2PAT Detector

The presence of a *mark* signal on the grid of the *mark* detector tube of the W2PAT converter will cause a flow of grid current (caused by the positive half cycles) resulting in a negative grid bias sufficient to cause plate current cut-off. This, in turn, causes a rise in plate voltage sufficient to cause the associated neon lamp to fire. As a result, the half of the 6SN7 keyer tube connected to this neon bulb has about 25 volts of positive bias applied to its grid, causing this triode half to operate a polar relay and at the same time biasing (through a common 1000 ohm cathode resistor) the other half of the 6SN7 tube (space channel) to cut-off. The rest of the circuit can be very simple. The selector magnet of your machine and a voltage source in series with the polar relay contact and a current limiting resistor can complete the circuit. See fig. 24. The *space* signal and its associated channel (duplicate of the *mark* channel) operates similarly on the other winding of the polar relay, pulling its armature in the opposite direction opening the relay contact. More on the polar relay later.

W2JAV Converter

The *grid rectifying* detector tubes V_{2A} and V_{2B} of the W2JAV converter work the same as the grid rectifying detector tubes of the W2PAT converter. From here on the W2JAV converter functions somewhat differently. As pointed out earlier, the W2JAV converter detectors are followed by a dual inverter stage which is, in turn, followed by a dual trigger and clamp stage driving two 6AQ5 keyer tubes. The *mark* channel feeds into the grid of one of the 6AQ5's and the *space* channel feeds into the grid of the other 6AQ5. The cathode of each 6AQ5 has a 180 ohm resistor with the bottom end of the two resistors joined. A 2K variable current limiting resistor, R_3, is connected from this point to ground as shown in fig. 46. The purpose of this resistor is to set the teletypewriter magnet coil and/or polar relay coil current to its proper value. The teleprinter magnet coils plug into jack J_3, and the polar relay plugs into jack J_2 using only the two tips of J_2 as illustrated in fig. 49.

As has been observed, one may operate a teletypewriter selector magnet coil directly by plugging into jack J_3 or indirectly by relay control by plugging into jack J_2. When jack J_3 is

used, the plate current of the two keyer tubes V_5 and V_6 properly control or operate the selector magnet coils while resistor R_3 is used to adjust the selector magnet coil current to its proper value.

Inverter Stage And Trigger-Clamp Stage

In the coverage of detector action (same for both converters) it was pointed out that the positive half cycles of either the *mark* or *space* signals on the grid of their respective detector tubes created a negative bias causing the voltage at the plate to rise. This fired the neon lamp coupling the detector tube plate to the keyer tube grid. This puts positive voltage on the grid of the keyer tube causing it to draw plate current to operate a polar relay or a printer magnet directly. In the case of the W2PAT converter, the 6SL7 double triode tube was the detector tube (two detectors—½ as the *mark* signal detector and the other half as the *space* signal detector).

A *mark* signal on the grid of detector tube V_{2B} of the W2JAV converter gives it negative bias, causing the voltage at plate of V_{2B} to rise to the value required to fire neon lamp I_1 (NE51). This puts a positive bias on the *mark* keyer tube V_5 (6AQ5) causing it to draw plate current to operate a polar relay (jack J_2) or printer magnet (jack J_3). The plate and screen voltage of both keyer tubes *(mark* and *space)* are selected so that the tubes are at approximately plate current cutoff when no signal is present at the grid of either tube. Likewise, a *space* signal on the grid of its detector tube V_{2A} gives it negative bias causing voltage at plate of V_{2A} to rise to the voltage required to fire neon lamp I_2. This puts positive bias on the *space* keyer tube V_6 (6AQ5) causing it to draw plate current. This does not cause the printer magnet to function since it is in the cathode circuit of the *mark* keyer tube V_5. This does, however, cause the polar relay to operate. See fig. 49.

It will be noted from fig. 46 that the grid of the *mark* detector tube V_{2B} is tied directly to the grid of *mark* inverter tube V_{3B}. This may appear to form some sort of a dual detector situation so let us follow the action, step-by-step. The positive half cycles of the *mark* signal to the grid circuit of detector tube V_{2B} causes grid current to flow placing a negative bias on V_{2B} as covered in the description of the tube as a detector. One might argue that the identical thing happens to V_{3B} except that V_{3B} has a 1K bias resistor and its plate voltage is much higher (note the value of plate resistors for each tube) so the two tubes are not operating under the same conditions. Suffice to say that the negative bias present at the grid of V_{2B} is also present at the grid of V_{3B}. This means that the plate of V_{3B} is made positive (inverted). This is a pulse signal *(mark)* which through the action of the 0.01 mf coupling capacitor, associated resistors, and 0.1 mf capacitor appears on the grid of V_{4B} which is the *space* trigger tube. This positive signal on the grid of V_{4B} would tend to cause the

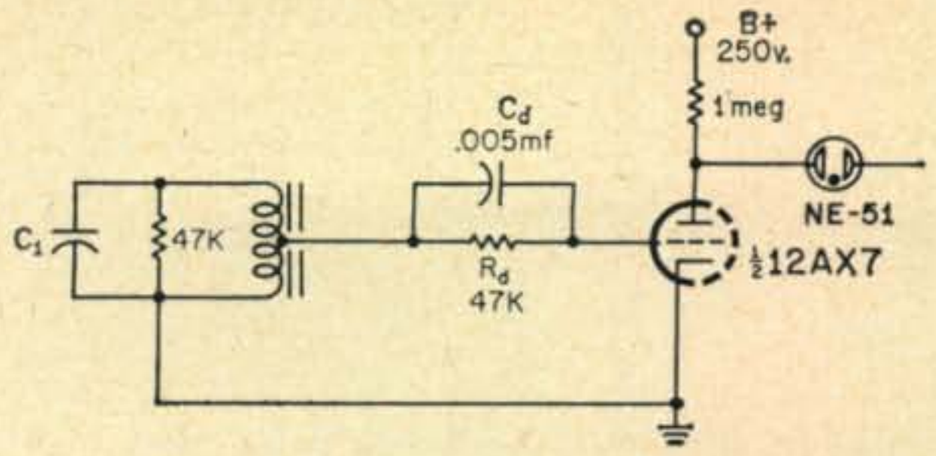


Fig. 48—Grid-rectifying (grid leak) type detector as used in W2JAV converter (also W2PAT).

tube to draw current lowering the voltage at its plate below the voltage required to fire neon lamp I_3 (NE51). An inspection of the circuit of V_{4B} makes it obvious that the tube must have already been drawing sufficient plate current so that the voltage at its plate was already below the voltage required to fire neon lamp I_3. All of this simply sums up to the fact that the *mark* pulse had no effect upon *space* trigger tube V_{4B}.

Copying On One Tone

Now let us see what happens when there is no *mark* signal at the grid of *mark* signal detector V_{2B} or *mark* inverter tube V_{3B}. This is during the time that there is or supposed to be a *space* signal at the grid of *space* signal detector V_{2A} and *space* inverter tube V_{3A}. Since the negative bias (caused by a *mark* signal) is no longer present to heavily bias or cut off the plate current of V_{2B}, the voltage at its plate does not rise to fire neon lamp I_1. Neither does the voltage at the plate of the mark inverter tube V_{3B} rise. To the contrary, in the absence of heavy bias on the grid of V_{3B} its plate current goes up and the voltage at its plate goes down instead of up, thereby placing a negative charge or pulse on the grid of space trigger tube V_{4B}. This causes the voltage at the plate of V_{4B} to increase to a value that will fire neon lamp I_3. This, in turn, places a high positive voltage on the grid of the space keyer tube V_6 causing it to draw plate current. From the above, it has been shown that even if the *space* signal does not show up at V_{2A} and cause I_2 to fire when the *mark* signal ends at V_{2B}, that the space keyer tube V_6 will be keyed just the same but by I_3 because of the *lack of a mark signal* at V_{2B}.

The action of V_{2A} and V_{3A}, in the presence of a *space* signal, and their effect on keyer tubes V_5 and V_6 is similar to the action of V_{2B} and V_{3B}, in the presence of a *mark* signal, just described in detail. Obviously, when both the *mark* and *space* signals are present and of sufficient strength to properly operate their respective detectors, the inverter and trigger stages are somewhat superfluous. The presence of a *space* signal at the *space* detector tube V_{2A} will cause neon bulb I_2 to fire, keying *space* keyer tube V_6. The presence of a *mark* signal at the *mark* detector tube V_{2B} will, in turn, cause neon lamp I_1 to fire, keying *mark* keyer tube V_5. The firing of neon lamp I_1 results in a positive voltage being developed and applied to the grid of *mark* keyer tube V_5 which causes its plate circuit to conduct (key). The instant the *space* signal (preceding

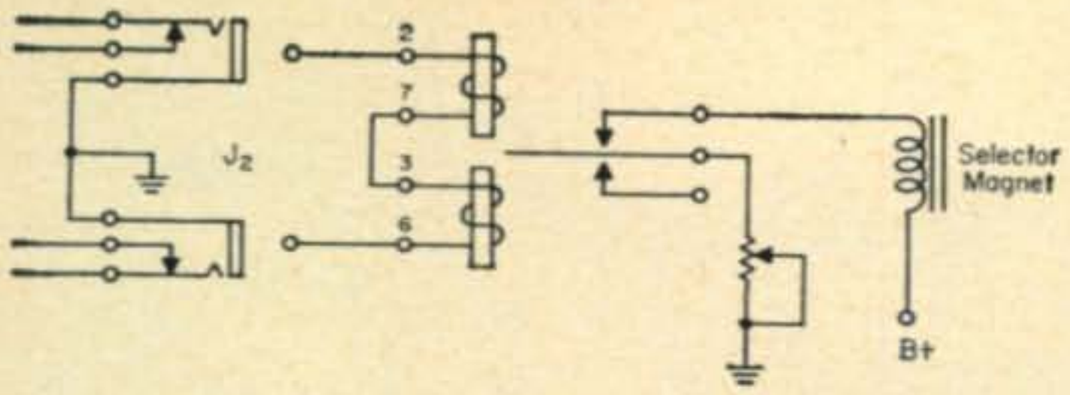


Fig. 49. Illustration showing how a polar relay such as a Western Electric type 255A may be plugged into jack J_2 of the W2JAV Converter and operate a teletypewriter selector magnet coil.

the *mark* signal) ends at the grid of V_{2A}, the plate current of space inverter tube V_{3A} goes up and the voltage at its plate goes down (as described for V_{3B} when *mark* signal ended) placing a negative charge or pulse on the grid of mark trigger tube V_{4A}. This causes the voltage at the plate of V_{4A} to increase to a value that will fire neon lamp I_4. The firing of neon lamp I_4 places a positive voltage on the grid of *mark* keyer tube V_5 the same as the firing of neon lamp I_1 as above outlined. This then results in a duplication of action at the grid of keyer tube V_5 when there is a *space* signal present and followed by a *mark* signal. If the *mark* signal failed to appear, following a *space* signal, then V_5 would be keyed just the same producing a *mark* signal to operate the printer. This is, in effect, a back up of the *mark* signal by the *space* signal. Likewise, you have a back up of the *space* signal by the *mark* signal.

Discussion Of One Tone Copying

When one first reviews this scheme of printing, this printing of characters correctly even though all of the signals representing the five elements are not actually present, it may appear that we have some form of near perpetual motion; well, not quite. So long as you have one signal or the other *(mark* or *space)* the converter has the faculty to keep copying on the one signal keying both the *mark* and *space* keyer tubes. Let us assume that we have perfect conditions with no annoying atmospheric noise, man-made noise or interfering signals—just the two tones that we desire to copy. If one tone fades away, the converter will continue to operate the teletype printer so long as the other tone remains. If both tones fade out, it can be seen that the charges on the various grids start dissipating since all grids have a return path to ground through a resistor. With a dissipation of these charges, the teletype machine connected to the converter will run "open" as previously described. In the description of the operations of the machines and the teletype code, it will be recalled that it stated that each teletype character ended with a *mark* pulse as graphically illustrated in fig. 2. Under normal conditions, when the *mark* tone is being received, there is no problem of the machine running open with this converter. The grid of the *mark* trigger tube V_{3A} has a 3.3 megohm resistor which provides for a longer time constant. This keeps the printer from running open during short intervals of no signals or a temporary absence of a *mark* signal during periods when no characters are being transmitted. This *mark*-hold feature is certainly one to be desired in any converter.

As stated earlier, to be able to copy alone on one tone or the other, is also a very desirable feature for a converter to have. However, such a feature does not necessarily solve all of ones RTTY problems. Just a bit back it was stated that this converter "has the faculty" to keep copying on one RTTY tone. It was not said that it would actually copy, under all circumstances, from one tone. It just has the faculty to copy on one tone alone. Whether it actually does so or not depends upon a number of other factors. In effect, copying on one tone alone reverts back to an On-Off system with all of its problems as covered earlier. One should go back and review the discussion of On-Off signaling or keying and frequency shift keying as a means of signaling.

With the desired tone gone the channel is now susceptible to any signal (man-made or otherwise) that may come along. Wouldn't it be wonderful if the converter channel would also disappear when its signal disappeared? Then it wouldn't be around to clobber what's left of the system. Oh yes, the channel must also reappear just as fast as it vanished when and if the signal reappears. Unfortunately, that takes a lot more doing and this converter doesn't solve this problem. More than one RTTY'er has gotten gray hairs trying to solve this problem. If you want to make a noteworthy contribution to the RTTY art, then here is a good place for you to start.

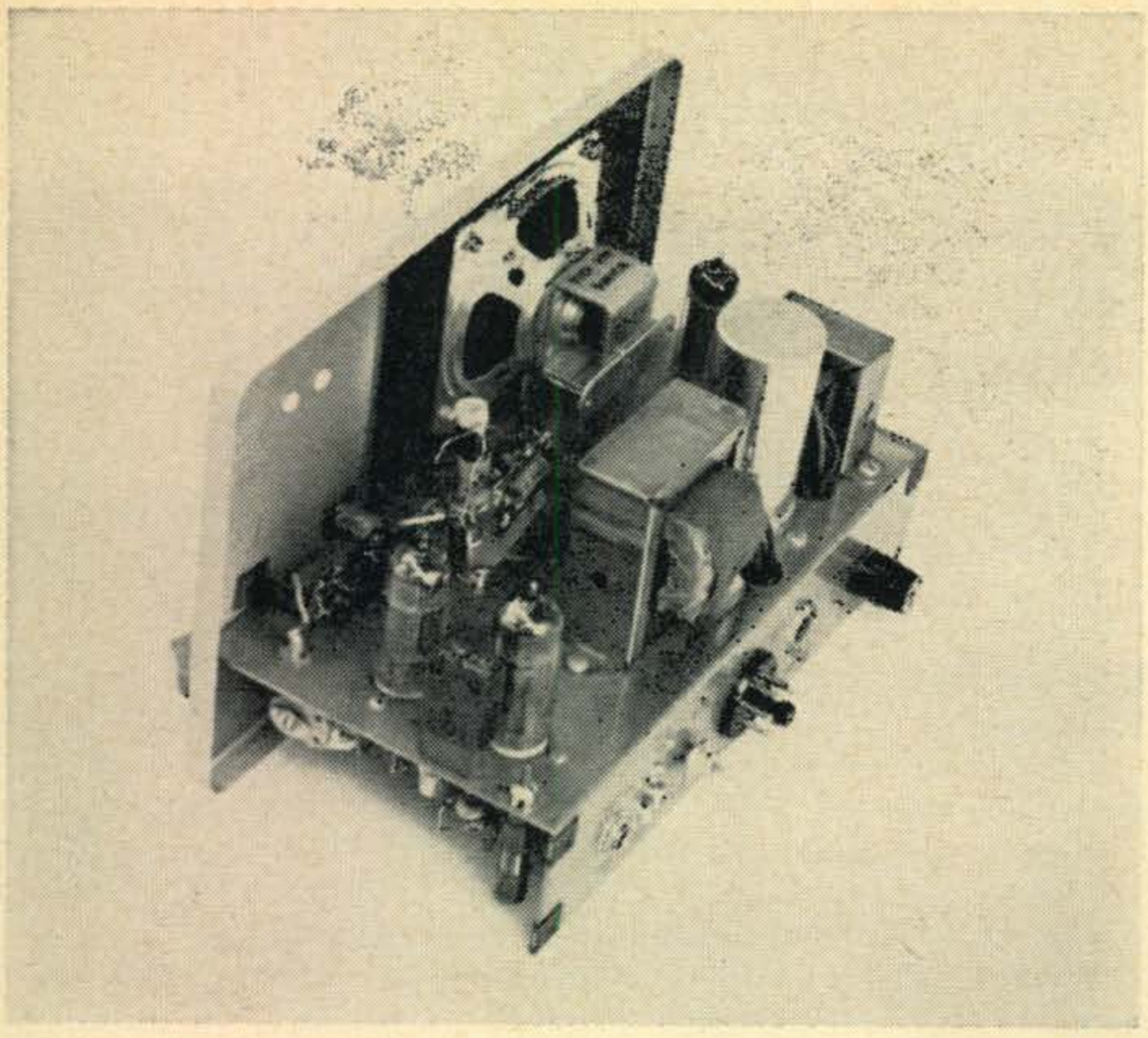
The operator does have a choice of manually selecting either the *mark* or *space* channel (or both) by use of the balance control R_1. In its mid, or balanced position, the converter is set to copy both signals. Turning the control all the way to the right favors the *mark* signal and all of the way to the left favors the *space* signal.

At this point other manually operated aids or semi-manual aids may suggest themselves to the reader. Chances are that ninety nine out of a hundred have already been tried or at least thought of by some enterprising RTTY'er. That may be one reason that there have been so many different or near different converters down through the years.

Summary

From the preceding discussion it becomes apparent that this converter doesn't always copy on one tone alone when the other tone disappears. Whether it does so depends not only on the condition of the tone remaining but also on what goes on in the channel of the missing tone. If one tone only partially goes away then you have a much better chance that the converter will continue to function properly. If one tone disappears altogether and the other tone becomes weak, then there is a possibility that the limiters will be captured by any heavy noise or interference to cause printing errors up to one

[*Continued on page 92*]



Top view of the modified Twoer shows the super regenerative second detector circuitry to the left of the power transformer.

Souping Up The Twoer

BY FREDERICK W. BROWN,* W6HPH

Here is a simple "no holes" modification that will more than double the transmitter output of the Heath Twoer and greatly improve the receiver performance.

As it stands, the Heathkit "Twoer" provides one of the most convenient and inexpensive means of getting started on two meters. There are some relatively minor changes, however, that will improve the performance of this very popular rig. The final, for instance, typically runs around 10 to 15% efficiency—not exactly high even for two meters.

Transmitter

The main reason for low plate efficiency in the final is lack of grid drive. Primarily this is the result of undersized coupling capacitors used for C_8 and C_{11} as shown in fig. 1. These 10 mmf units should be replaced or shunted with 56 mmf disc ceramics or similar physically small capacitors. It will then be necessary to reduce L_3 to 2 turns to re-establish resonance at 144 mc. Notice that C_{12} and C_{13} were both reduced from 0.001 mf to 120 mmf to improve their bypassing effectiveness at 144 mc. These capacitors should have the shortest possible leads.

The changes made to the oscillator circuit indicated in the diagram resulted in about 50% more output—not a tremendous improvement but worth the effort. The r.f. chokes are 100 microhenry video peaking coils. Insertion of r.f. chokes in series with R_3 and R_4 would probably be helpful but was not done in this unit for lack of space.

The r.f. choke in series with R_6 was materially helpful in improving drive to the final. It also increased the grid circuit Q to the point that the final must be neutralized to avoid instability. Neutralization is accomplished by removing C_{14} (the screen bypass) and soldering a ½" length of solid insulated wire to pin 8 and bringing it close to the plate lead (C_n in fig. 1).

The capacity is adjusted for minimum rectified output at the antenna line detector with plate and screen voltage removed from the final. Properly neutralized, this output will be less than 2.5 volts with all exciter stages and C_{16} peaked. With B plus on the final, stability is so good that removing the crystal from its socket will drop the output to zero.

The wire feeding B plus to the final should be replaced with a longer piece and can be run through the grommet just above the send-receive switch so that it may be connected to the end of C_{15} above the chassis.

Capacitor C_{17} was replaced with a trimmer for optimum coupling to the antenna. The tap point on L_4 was moved up to two turns.

The long bus running between the send-receive switch and the antenna connector was

*Pine Cove, Idyllwild, California.

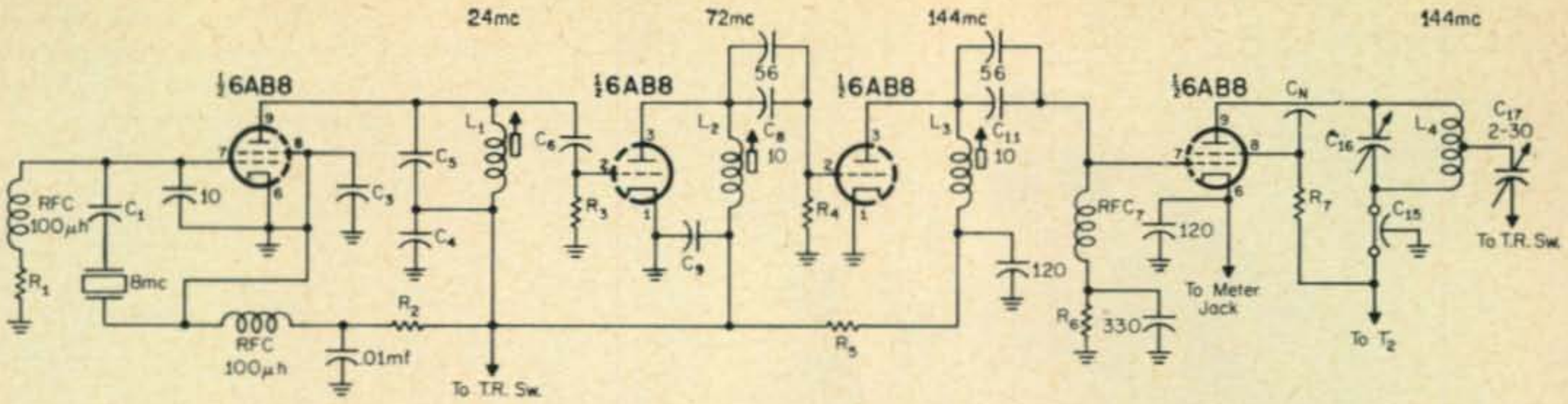


Fig. 1—Circuit of the modified Twoer transmitter. Values of unchanged components are not given. RFC_7 is 35 turns #32 close wound on a 5/32" diameter form. See text for explanation of C_n and modifications of L_3 and L_4. All capacitor values in pf except as noted.

replaced with 4 inches of RG-59/U. The braid should be grounded at both ends, to the ground lug on the antenna jack terminal strip at one end, and to the frame of the send-receive switch at the other end.

When all these changes are made, drive to the final will be increased from 4 volts to 14 volts measured across R_6, about 10 times as much driving power. Output of the final is only slightly more than double the original ½ to ⅔ watt, indicating the final is near saturation to begin with. This 3 to 4 db improvement won't be noticeable to the locals across town, but when the signal is weak there are times when 3 db can make the difference between copy and no-copy.

Receiver

The most obvious deficiency of the receiver is its broad tuning. Unmodified, the receiver is about 1.5 mc broad on a 10 microvolt signal. This leaves room for, at most, three 10 microvolt signals in the two meter band at any one time.

The simplest remedy for the broad receiver tuning is to increase the detector tuned circuit C to L ratio as in fig. 2. It is necessary to replace the original tuning capacitor with a two-plate, shaft-mounting APC size unit having a capacity range of about 1.5 to 7 mmf. The original detector coil is removed and replaced with a ½ to 8 mmf plastic tubular trimmer, C_{53}, which will just fit in the hole. After modification the detector circuit must be realigned by setting C_{53} so that a 144 mc signal will fall at 144 on the "dial." Bandspread may be adjusted by bending the rotor plate of the tuning capacitor. If trouble is experienced in getting the detector to super-regenerate, try removing C_{22}. Sensitivity does not seem to be adversly affected.

These modifications will reduce the bandwidth of a 10 microvolt signal from 1500 kc to about 600 kc—a worthwhile improvement, but still not exactly sharp tuning.

Superhet Modification

A modification superior to the above is to change the receiver to a super-regenerative superhet as shown in fig. 3. A 6CW4 nuvistor is used as a super-regenerative second detector operating at about 18 mc. The original dual triode r.f. stage-detector combination is changed to an oscillator-mixer with little trouble. Substitution of a 12AT7 for the 6BS8 saves 100 ma of heater drain which is nearly sufficient to light the 6CW4 (135 ma). If the Twoer is to be used on 12 volts the 150 ohm resistor on the power socket should be omitted in order to balance the heater currents.

Very few changes are required on the 6BS8 socket when the 12AT7 is substituted. The heater connections are slightly different as indicated in the diagram. The RFC_2 in the mixer circuit (formerly r.f. stage) is replaced with a 100 microhenry video peaking coil. The tap on L_5 is moved up to one and ⅔ turns from ground and C_{20} is increased to 56 mmf.

Assuming the 144 mc super-regenerative detector was modified as in fig. 2, only a couple of changes are required to make it a local oscillator. The grid leak, R_{10}, should be reduced to 10K placing it across C_{26} as shown. Capacitor C_{51} (fig. 2) should be replaced with the C_{27} (22 mmf) that was removed from the original circuit. This capacitor is soldered across C_{52} with the shortest possible leads. The oscillator should then tune from about 126 to 130 mc.

The 6CW4 tube and associated detector circuitry are mounted on a small sheet metal bracket fastened to the top side of the chassis. The circuit layout is not critical. The bracket can be bolted down with the screw that holds terminal strip "S" below the chassis. Three leads are necessary for connecting the detector circuit to the rest of the transceiver. In order to avoid

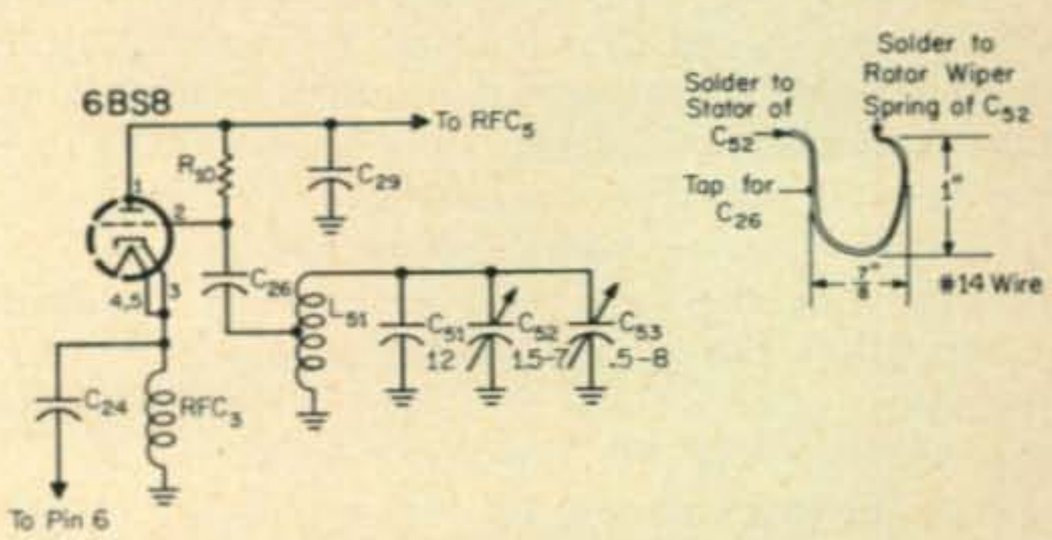


Fig. 2—Modification of the detector circuit is shown above. Increasing the C to L ratio of the original detector tank circuit will improve selectivity of the receiver. Components with parts numbers greater than 50 are new. Inductor L_{51} is shown at the right with new dimensions.

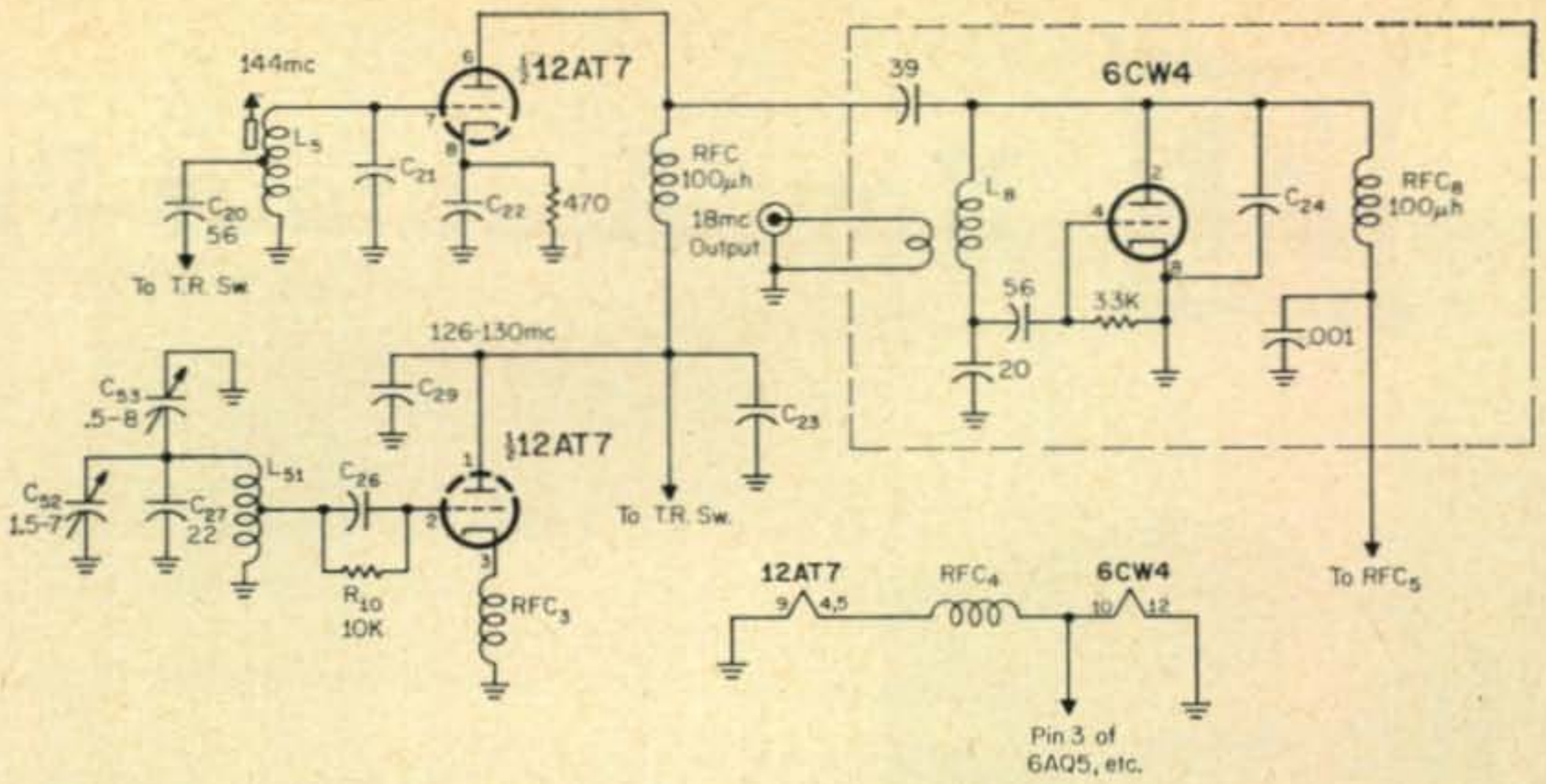


Fig. 3—Circuit for the super-regenerative superhet/2 meter converter. The part of the circuit inside the dotted line is mounted above the chassis. Inductor L_8 is 32 turns of #28 e. close wound on a 5/16" diameter form. The link is 2 turns. Inductor L_{51} is the same as in fig. 2.

drilling holes in the chassis, these three wires are brought up through the locating slots on the coil form holes. The wire from the mixer plate (pin 6) is brought through the slot of L_5 and the audio wire from RFC_8 is brought through the slot of RFC_5. The heater wire is brought through the slot associated with L_6 which subsequently has been replaced with C_{53}. It may be necessary to slightly bend the locating ear on the coil form mounting clips to make room for these wires.

Alignment

Alignment of the receiver is not difficult. Advance R_{11} just above the point where the detector starts to hiss. It will super-regenerate with only about 9 volts on the plate. Set the dial to 144 and tune C_{52} until a 144 mc signal source is heard in the pass band. Bandspread can be adjusted by bending the rotor plate of C_{52}. Adjust the slug in L_5 for maximum sensitivity. There is some pulling between the local oscillator and mixer tuning so C_{52} should be rocked back and forth while L_5 is being tuned. A modulated signal generator on 145 mc with attenuator set to where the signal is just audible is desirable for this adjustment.

Image

The i.f. frequency chosen (18 mc) puts the image band at 108 to 112 mc—a portion of the spectrum that seems fairly free of signals, at least in this part of the country. If images prove to be a problem, the image band can be moved higher by adding more turns to L_8. Alternatively, an image trap could be placed in series with the antenna input.

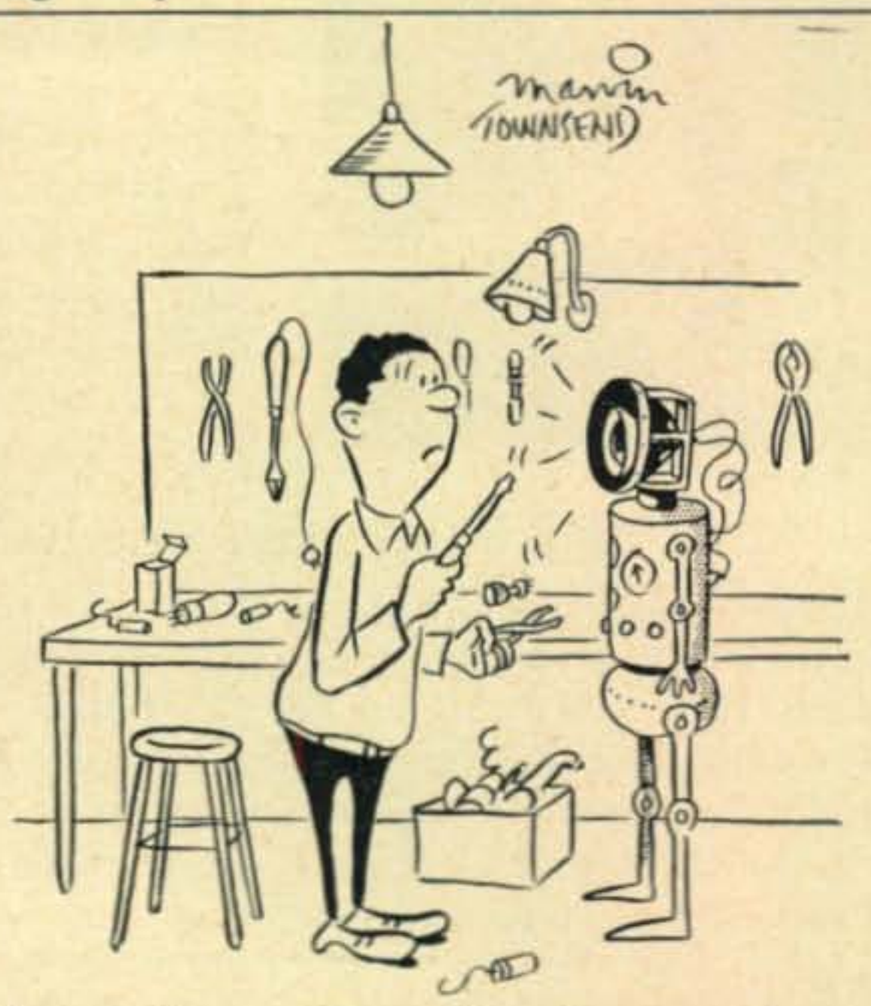
Converter

When the receiver is modified to a superhet as above, the bandwidth is reduced to about 300 kc. The receiver works smoother, there are no antenna loading effects, and two meter "hash" radiation is eliminated. But probably the most attractive feature of this modification is that the receiver can now be used as a converter simply by placing a 2 turn link around the center of L_8 and coupling into a communications receiver tuned to 18 mc. A broad receiver is preferable since the bandspread of C_{52} makes tuning difficult on a regular 6 kc bandwidth communications receiver, although it is possible, particularly if the small tuning knob is replaced with a large one.

When using the receiver as a converter, the regeneration control, R_{11}, is turned all the way down (counter-clockwise) so the detector will not oscillate. The communications receiver is then tuned to the point near 18 mc where the noise peaks. If more gain is needed, R_{11} may be carefully advanced so that the 6CW4 contributes regenerative gain Q-multiplier fashion. As much as 2 S-units of gain can be picked up in this manner. Of course, if R_{11} is advanced too far, the detector will go into oscillation.

Audio

Only two changes were made to the audio portion of the rig. The ground on the volume control, R_{13}, was moved from the nearby terminal strip to the ground lug that serves RFC_3. This change materially reduced the high receiver hum level in this particular unit. Capacitor C_{35} was changed to .001 mf which further reduced receiver hum and also restricted low frequency response on transmit, improving weak signal intelligibility. ■



"Ibackwards in amplifier and oscillator my have you, Stupid"

CQ New Amateur Products

Lafayette Deluxe Self-Powered VFO

Lafayette Radio Electronics Corporation, 111 Jericho Turnpike, Syosset, L.I., N.Y., has introduced a self-powered v.f.o. covering the 80 through 10 meter bands. The price is $34.50.

The v.f.o. uses a high *Q* series tuned Clapp oscillator. It also incorporates a v.r. tube to eliminate frequency shift due to line voltage fluctuation, output is sufficient to drive most transmitters. It features a large slide rule dial which is illuminated. Tubes: 6AW6, 6AQ5, OA2. Dimensions: 6½ W × 5¼ H × 7½ D. For 117 volts 50/60 cycles AC. For more information circle 61 on page 110.

VIQ Display Pages

The Plastic Sealing Corporation of 1507 North Gardner Street, Los Angeles, California designers and manufacturers of vinyl plastic products are now marketing a new item. The VIQ stands for Very Important QSL cards. Instead of tacking your cards to the wall or taping them in a book, they can be displayed and filed in the VIQ display pages. The VIQ display pages fit the standard three ring binder and are made of window clear heavy guage vinyl plastic. Each display page sells for $.35 and holds 8 (3½ × 5½) QSL cards. For more information circle 62 on page 110.

Eitel-McCullough, Space Age Cans

Though strictly not for immediate amateur use, this packaging method should be a common sight in the near future. Space Age Cans, easy-open cans produced by the American Can Company are now being used in San Carlos, California by Eitel-McCullough, Inc. to protect electron tubes against corrosion and breakage. The tubes are used for radar and radio transmission systems, on the ground and in missiles. The peel-top cans assure that each tube will reach its destination ready for quick use. Anti-shock material surrounding each tube is polyurethane foam. For more information, circle 63 on page 110.

I.E.H. Mfg. Solid State Vibrator Replacement

I.E.H. Mfg. Co. announces the availability of a new solid state vibrator eliminator for mobile equipment using mechanical vibrators. The new unit, called "Vi-Tran," plugs into the vibrator socket with no additional wiring or tools required. The advantages over conventional vibrators are: reduced noise, conserves power, and provides cooler operation. In a dust-free aluminum case, the Vi-Tran is blister-packed with complete installation data on the card. The user net is $5.95. For more information circle 64 on page 110.

V.H.F./U.H.F. Output Circuitry

BY M. F. DOUG DE MAW,* W8HHS

The article below attempts to solve some of the missing links in the textbook treatment of coupling from the v.h.f./u.h.f. final to the antenna. A thorough understanding of what happens, why and how to achieve correct results will result in greater v.h.f. efficiency for you plus a smoother running transmitter.

TRANSFERRING energy from the p.a. tank circuit, to the transmission line feeding the v.h.f./u.h.f. antenna, may seem like the least difficult task involving operation of the station equipment. Yet, very few amateurs I have encountered have a thorough understanding of proper coupling methods, how to secure maximum efficiency and maintain minimum s.w.r. in the coupling circuit. The handbooks describe a variety of methods by which to transfer r.f. energy from the final tank circuit of transmitters, to either balanced or unbalanced transmission lines. A simple explanation of what actually takes place seems to be required however, since few seem to understand the facts relating to output links, how they should respond and what degree of coupling is required for maximum efficiency.

Figure 1A illustrates a common output coupling configuration used in most single ended v.h.f. transmitters. Figure 1B shows the output circuit of the usual push-pull v.h.f. p.a. stage. Normally, these circuits work satisfactorily if properly engineered. In home built equipment however, lack of knowledge results in inefficiency, loading problems and at times, complete failure. Capacitor C_1, in both cases, tunes L_1 to resonance at the operating frequency. Capacitor C_2 is adjusted for maximum energy transfer from L_2 to the transmission line. The reactance of the link L_2 must be "tuned out" thus bringing the link circuit into resonance. At this point, maximum transfer of r.f. energy takes place.

Often, the home builder does not know what physical dimension is required to fabricate a suitable L_2. The correct value of C_2 is often unknown. I have seen a vast number of transmitters in which C_2 was not used at all, or if it was included in the circuit, had little or no effect on the tuning. This condition of course is unsatisfactory. The usual cause of this problem lies in the inability of C_2 to tune L_2 to resonance. Often times, with C_2 at maximum capacity, L_2 is still resonant above the particular operating frequency. Fortunately, a certain degree of mutual coupling exists, regardless of the effect of C_2, and *some* power reaches the antenna. The latter often creates the illusion that everything's working O.K.

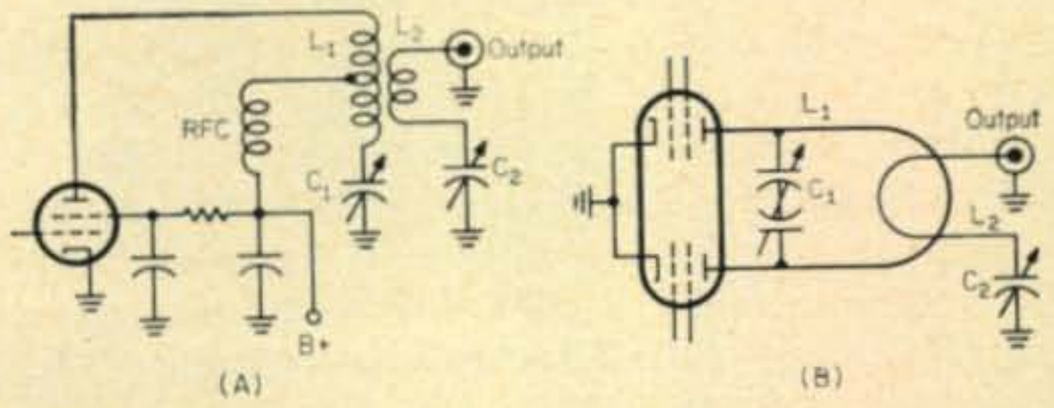


Fig. 1A—Conventional circuit of the final stage of a single ended v.h.f./u.h.f. transmitter. B is the circuit of a push pull final.

Preliminary Checking

After wiring is completed on the new rig, assuming the dimensions given in your pet schematic diagram have been duplicated, you should make an investigation regarding the resonance of all of the transmitter's tuned circuits (exciter stages included). With all tubes inserted into their respective sockets, a grid dip meter should be employed to insure that all circuits are capable of being tuned to their required frequencies. Unfortunately, most amateurs stop at the final tank circuit L_1. No attention is given to the much neglected L_2 and C_2 combination.

A practical rule of thumb for the value of C_2 follows: 6 meters-100 mmf, maximum. 2 meters-50 mmf, maximum. 220 and 432 mc-25

*10598 Peninsula Drive, Traverse City, Michigan.

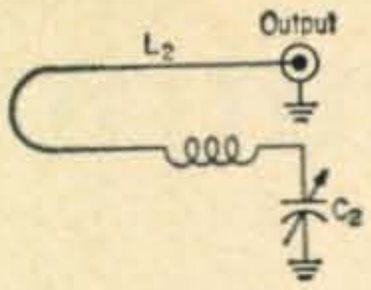


Fig. 2—The resonant frequency of the L_2-C_2 combination can be lowered by adding the series inductance shown above.

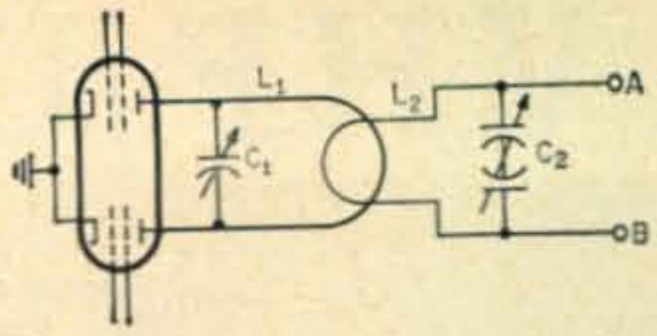


Fig. 3—Balancing L_2 permits even loading of the push pull tubes as explained in the text.

mmf. To permit flexibility, which will be required when matching L_2 to loads of various impedances, L_2 should be made to resonate at the operating frequency with C_2 set at mid-range. This should be done with a non-reactive 50 ohm termination attached to the transmitter's output terminal. In addition, L_2 should be constructed in such a manner that it can easily be adjusted for various degrees of coupling with respect to L_1. Where L_1 is a coil, L_2 should be capable of being inserted into, or pulled out of it. Where horse shoe linear tank circuits are used, L_2 is usually a hairpin type link and should be arranged so that it can be moved closer to, or further away from L_1.

In order to investigate the frequency range of L_2, a grid dip meter will again be required. It will be necessary to short across L_1 at the tube end of the line, prior to making this check. If this is not done, the resonance of L_1 and L_2 will interact, thus making it impossible to tell which inductor is responding. If L_2 is too high in frequency, add a turn to it (circuits using coils for L_1). If it is too low in frequency, remove ½ or 1 turn. With hairpin links for L_2, reducing the length will raise the frequency. If it will not tune low enough in frequency, add 2 or 3 turns, ¼" in diameter, in series with one leg of L_2. This can be an actual part of the balance of the wire used in forming L_2. (See fig. 2.) With a little experimenting, L_2 and C_2 will reach the desired frequency with C_2 at a near mid-range setting. After removing the short across L_1, you are ready to fire up.

Amount of Coupling

With a 50 ohm load attached to the transmitter's output, and assuming all stages of the equipment are operating properly, C_2 should show a definite increase in transmitter output (noted on an s.w.r. Bridge) as the resonant plate current of the p.a. stage increases. Once this point is reached by adjusting C_1 and C_2 alternately, the transmitter should be turned off and the spacing (or coupling) between L_1 and L_2 increased or decreased in gradual steps, followed by re-adjustment of C_1 and C_2 until no further increase in output power can be noted on the s.w.r. bridge. This then, is the optimum setting for best output efficiency. Too much coupling between L_1 and L_2 can result in deterioration of performance due to the Q of L_1 being lowered. Too little coupling of course, prevents maximum energy transfer to the feedline.

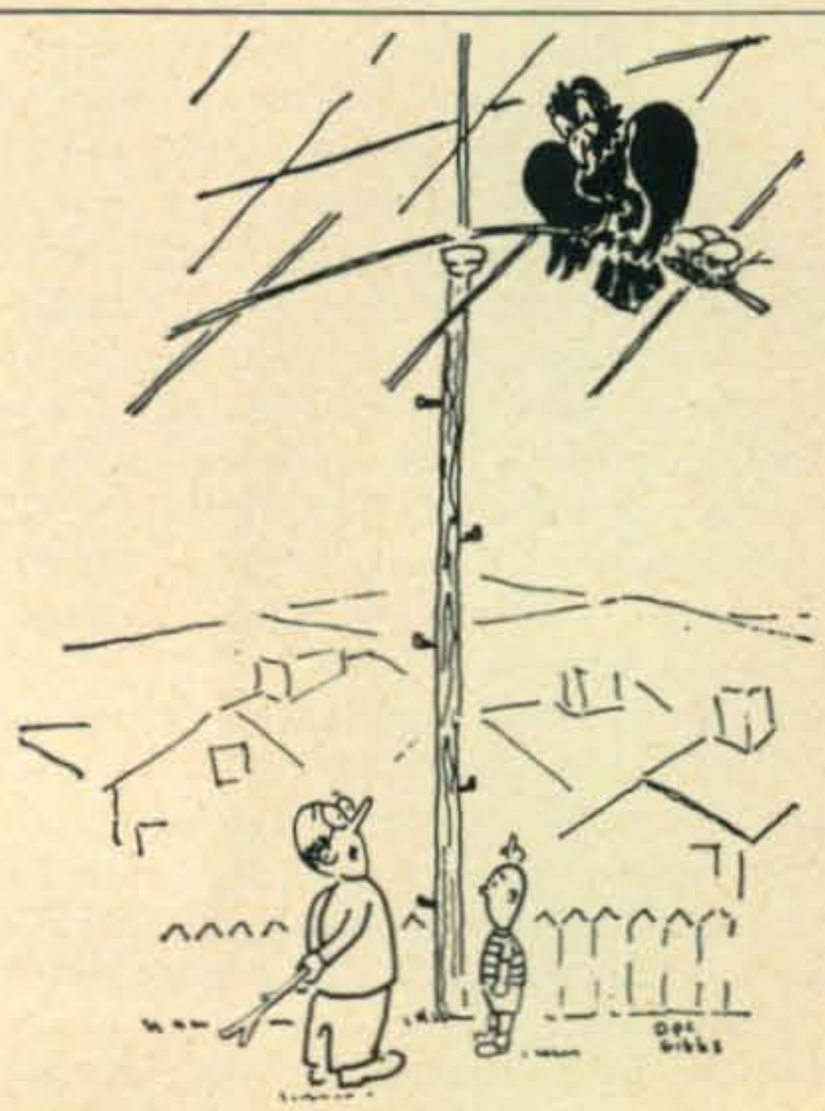
Capacitor C_2 should *never* be used to adjust transmitter loading to the antenna circuit. It should be tuned for peak response in output and L_2 should be adjusted for the desired amount of coupling needed.

Coaxial cable should be used between the output terminal of L_2 and the coax receptacle at the rear of the transmitter's chassis. The shield braid should be properly grounded to the chassis at each end. If this is not done, the interconnecting lead becomes an electrical part of L_2 and resonance usually cannot be achieved.

The balanced L_2 configuration illustrated in fig. 3 should be used in push-pull u.h.f. applications. A coaxial balun transformer or similar matching device is then connected between points A and B and the coax line to the antenna relay. Using the more popular link circuit shown in fig. 1-B will seriously unbalance L_1 at u.h.f., and cause one tube to "run" hotter than the other. Symmetry is vital when working with u.h.f. tank circuits. Capacitor C_2 in this case can be a split stator or butterfly unit having 15 mmf per section. The rotor is not grounded. If direct connection to balanced feedline is desired, the balun transformer can be eliminated at A and B.

Large diameter wire such as #10 copper, should be used for L_2 when power in excess of 50 watts is being used. This further contributes to greater efficiency.

A properly engineered and adjusted output coupling circuit at v.h.f. and u.h.f., can result in several decibels of signal increase. Don't overlook proper design and application in this important part of your circuit. ■



"Actually it seems to improve the loading . . ."

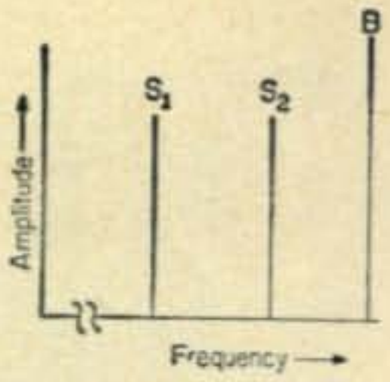


Fig. 1—Simplified spectrum display of the type that might be encountered in an i.f. passband. Signals s_1 and s_2 are those received and B is the b.f.o. signal. An ordinary detector would mix together s_1, s_2, and B, producing three audio frequencies. A good product detector would mix only s_1 with B and s_2 with B without mixing s_1 and s_2.

The Tubeless Product Detector

BY FREDERICK W. BROWN,* W6HPH

Here is a surprisingly simple but highly effective product detector using no tubes. Nothing is sacrificed for this simplicity; it out performs the more complex circuit arrangements.

PRODUCT detectors are essentially frequency converters that convert signals in the receiver i.f. passband to audio frequencies. Figure 1 is an example of the type of spectrum the product detector must handle. Signal components in the i.f. passband are denoted by s_1 and s_2 and the beat oscillator signal by B. The product detector must beat together s_1 and B as well as s_2 and B, and deliver the corresponding difference frequencies to the audio stages. As a matter of fact, this requirement is easily met by any ordinary detector. However, an ordinary detector will also produce a beat between s_1 and s_2, and will pass this unwanted frequency on along with the desired beats.

A properly designed product detector will not beat together the signal components. This is equivalent to saying that it will not respond to amplitude (or phase) modulation.

An ordinary rectifier type a.m. detector is often pressed into service as an s.s.b. detector and will give passable performance if the signal level is weak compared to the b.f.o. injection. A receiver adjusted to meet this requirement (a.f. gain all the way up; r.f. gain down) will make the beat between signal components weak relative to the beat with the b.f.o.

Some product detector circuits require as many as three tubes. The circuit of fig. 2 has the advantage of requiring *no* tubes and is further superior to other circuits in that:

(1) It will handle all the signal the last i.f. stage can deliver without overloading.

(2) It is very easily changed to an excellent a.m. detector by means of the switch S_1.

*Pine Cove, Idyllwild, California.

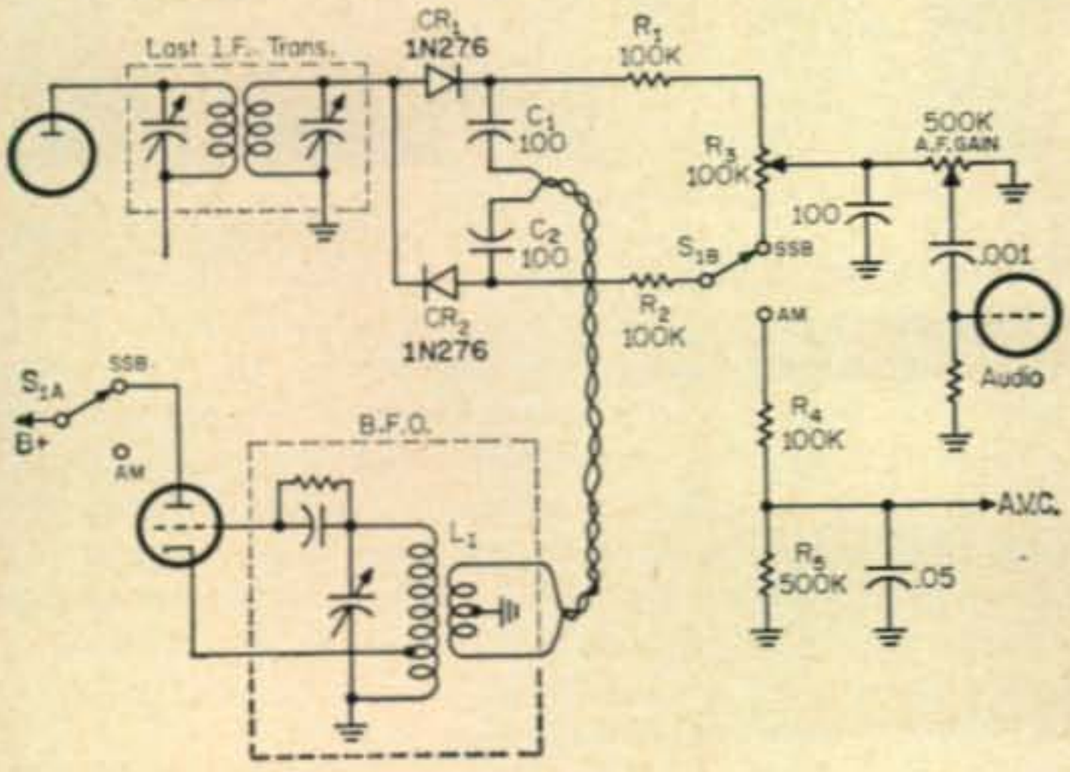


Fig. 2—Circuit of the tubeless product detector. Although shown here for a tube type receiver, the circuit should be equally adaptable to a transistor superhet. The link, L_1, is 20 turns each side of center tap scramble wound over the existing b.f.o. coil.

Operation

The operation of this detector is very easily understood. Notice that the two diodes are connected as a.m. detectors but with opposite polarity. Assume an a.m. signal is present with S_1 in the position shown and the b.f.o. disabled. The two diodes will produce audio voltages of opposite phase that will cancel each other at the center arm of R_3. Consequently the detector will not respond to a.m. However, since the b.f.o. voltage is fed to the two diodes in push-pull, beats between the signal and b.f.o. will not cancel, and in fact will actually add in phase at R_3.

With S_1 in the a.m. position, CR_1 operates as an ordinary diode detector and CR_2 acts as the a.v.c. rectifier. Since the diodes are connected with opposite polarities, i.f. transformer loading is equalized on both halves of the r.f. cycle—a condition that aids low distortion a.m. detection. Notice that a.v.c. is automatically switched off with S_1 in the S.S.B./C.W. position.

Practice

Circuit layout is not critical. In my old HRO S_1 is on the front panel and connects to the

[*Continued on page 93*]

First Award of Kohlman (K2BVC) Memorial was made by the Communications Club of New Rochelle (NY) at its recent Annual Dinner. Award, specifying contributions to the amateur service or to the Club, cited Rob Escallon, WB2FXB, center left, for ARPSC services, helpfulness to other amateurs and general operating proficiency and was awarded by vote of CCNR's Directors. Shown l to r during presentation are K2SJN, CCNR charter member; WA2TEQ, Club President; WB2FXB and Mr. and Mrs. Lawrence Kohlman, parents of the late K2BVC.

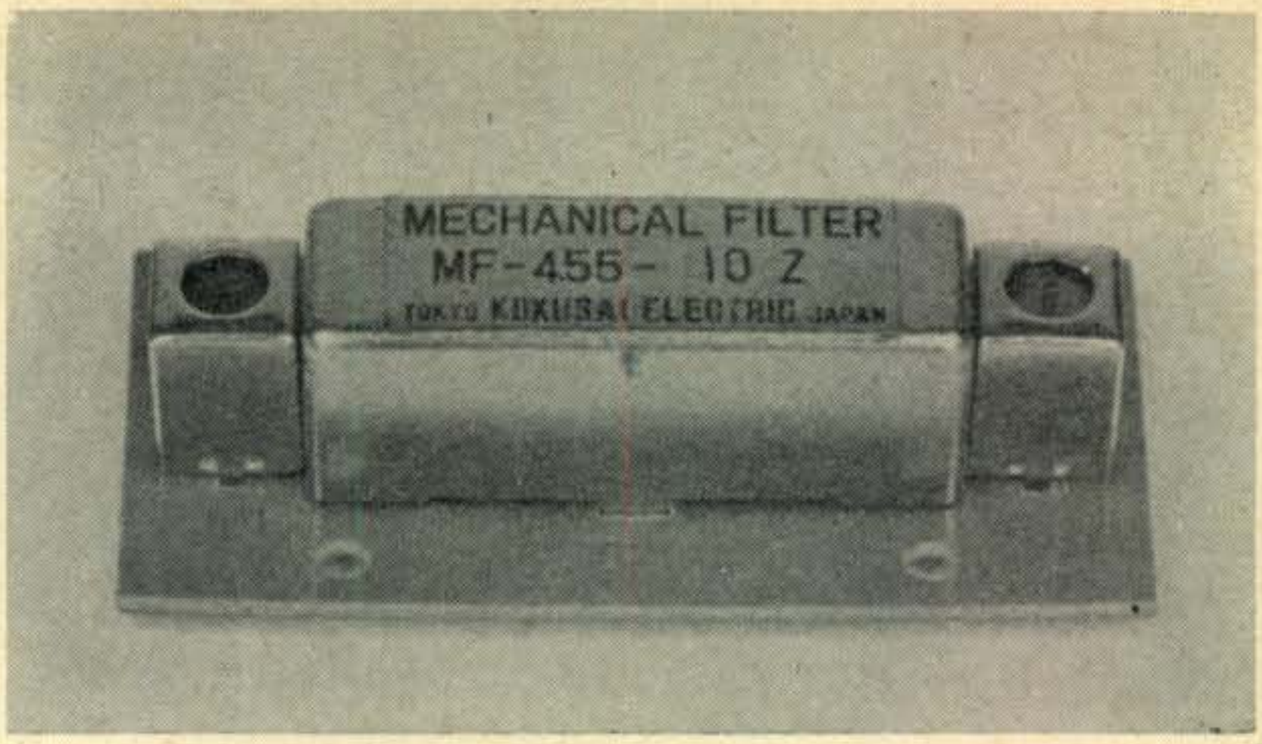
PEOPLE AND PLACES

Richard Feldman, K8HGY, (left), a senior at Youngstown University, receives plaque from Dudley Dowell, president of New York Life Insurance Company, at the firm's home office in New York City recently.

The plaque relates how Richie helped the company's policy owners during the tragic Alaskan earthquake by handling traffic.

For the seventh year, the Old Pueblo Radio Club of Tucson completed phone patches for some sixty children at the National Foundation for Asthmatic Children in Tucson and their parents throughout the United States over the long Christmas weekend. This was accomplished through the efforts of the many Hams throughout the U.S. who QSL'd schedules weeks beforehand and both stood by to help complete patches and assisted with relays. The OPRC wishes to extend many thanks for all the assistance in making this Christmas as in years past a much happier one for the children and their parents.

➤ A quick look at a corner of the CQ lab.



The Lafayette MF-455-10Z mechanical filter. It is mounted on a circuit board with a matching transformer at each end.

CQ Reviews:

The Lafayette Mechanical Filter

BY WILFRED M. SCHERER,* W2AEF

The equipment reviewed on these pages is usually limited to manufactured units or kits such as receivers, transmitters, special test instruments, accessories, etc., for the amateur who goes in for "bought" gear. Although the various circuit arrangements, new technical ideas and mechanical construction usually described may be of interest to the home-constructor/designer also, technical data regarding special components which can help him in his branch of the hobby should also be welcome. With this in mind, we hope to present, from time to time, information on various components which may be of such interest.

In the review of the Lafayette HA-350 amateur receiver last month, we promised to furnish details on its low-cost mechanical filter which is available as a separate component, so here they are.

The Lafayette MF-455-10Z mechanical filter is designed for use at 455 kc. It is supplied mounted on a small printed-circuit board along with tiny input and output matching transformers. The overall dimensions of the entire assembly are: 2¾" L. × 1⅜" W. × ⅝" H., making it especially suitable where compactness is desired (the filter alone is ⅝" × ⅝" × 1¾").

The manufacturer's specifications for the filter assembly are as follows:

Center Frequency	455 kc
Bandwidth at 6 db	2 kc min.
Bandwidth at 60 db	6 kc max.
Input Terminal Impedance	10,000 ohms
Output Terminal Impedance	10,000 ohms
Insertion Loss	1.5—3 db
Spurious-response attenuation (435 to 475 kc)	40 db min.
Carrier Frequency (S.S.B.)	453.5 kc or 456.5 kc

Recommended Operating Parameters

Signal Input Voltage	0 to 15 v. r.m.s.
Direct Current	10 ma max.
D.C. Voltage	250 v. max.

*Technical Director, *CQ*.

Operation and Construction

The operation of mechanical filters has been covered in other literature; but briefly, this is how the MF-455-10Z works. It consists of three sections; an input transducer, a mechanically-resonant filter section and an output transducer. The input transducer converts the applied electrical r.f. signal into a mechanical vibration and transfers this vibration to the resonant mechanical section through which it travels to the output transducer where it is reconverted back to an electrical r.f. signal. The mechanical filter section is resonant only to frequencies in the desired passband, so all other frequencies are rejected or attenuated at the output.

The transducers, instead of employing the magnetostriction principle as is normally done, provide the electrical-to-mechanical and the mechanical-to-electrical transfer by piezoelectric means such as is used in crystal microphones, phonograph pickups and headphones. Each transducer consists of a thin resonant crystal which is plated on each side. This is where the electrical r.f. connections are made. During operation the mechanical vibration is exhibited at the crystal edges, so an edge of one crystal is connected to an edge of the other by a thin metal rod which is made mechanically resonant by seven metal discs mounted on and coupled together by it. Each disc, which is made of ferro-nickel-chromium alloy for extreme hardness and complete resistance to corrosion, is precisely machined to resonate at the exact frequency required.

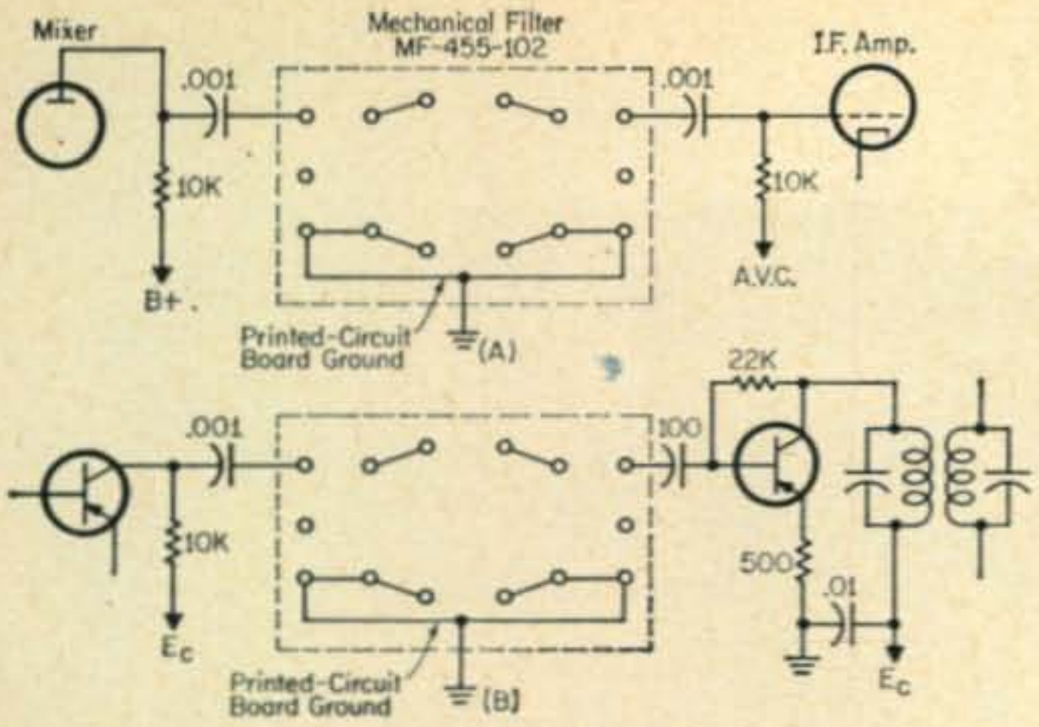


Fig. 1—(A) Suggested circuitry using the MC-455-10Z mechanical filter with vacuum tubes, and (B) with transistors. Note that no bypass is used across the emitter resistor of the second transistor.

The transformers are supplied on the assembly to match the tranducers to source and load impedances of 10,000 ohms. The transformers are tunable for proper peaking under conditions of different tube and stray circuit capacitances. Suggested tube and transistor circuitry is shown at figures 1A and 1B. As installed on the printed-circuit assmbly, the affair is an unbalanced system with one side of the filter and the transformers grounded. If balanced input or output circuitry is desired, the grounds may be lifted as required and, if needed, an artificial center tap may be obtained by the usual methods.

Performance

Each filter is supplied with its own individual data sheet showing the characteristics measured at the time of manufacture. The figures given for the unit tested in the *CQ* Lab are as follows:

Center Frequency	+0.04 kc
Bandwidth at 3 db	+0.84 kc
	−1.00 kc
Bandwidth at 6 db	+1.04 kc
	−1.12 kc
Bandwidth at 60 db	+3.55 kc
	−2.31 kc
Carrier Frequency (S.S.B.)	456.5 kc
	or 453.5 kc
Insertion Loss	3 db

Since we also were interested in knowing the amount of ripple in the passband as well as in

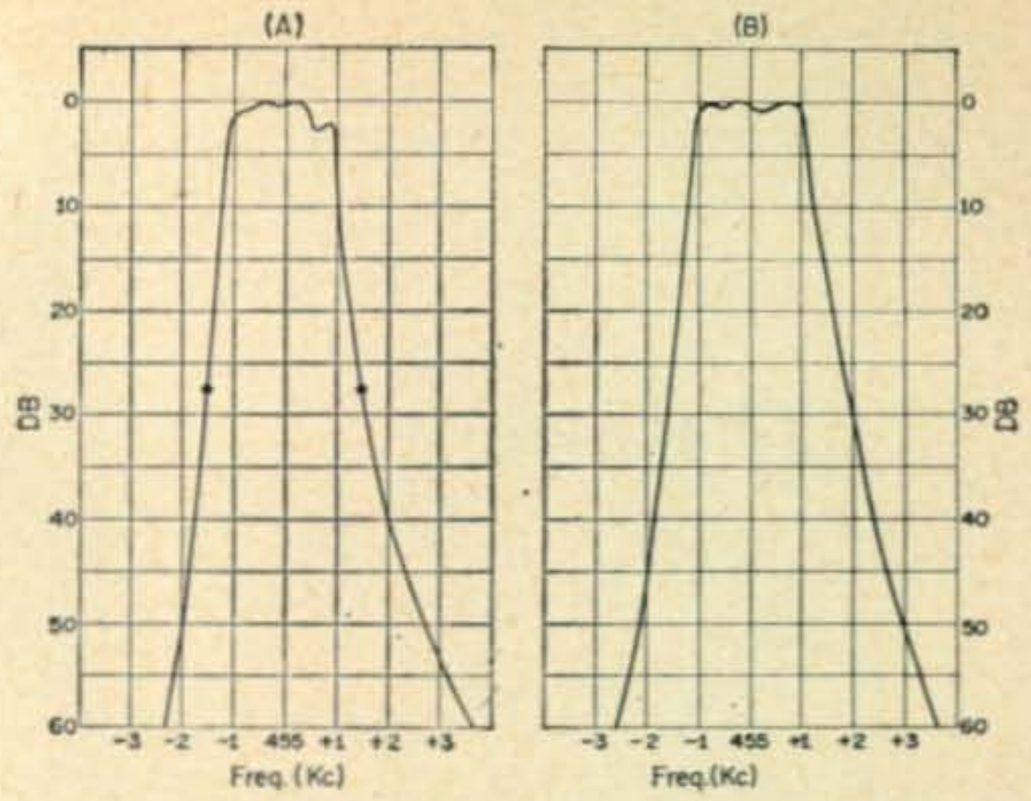


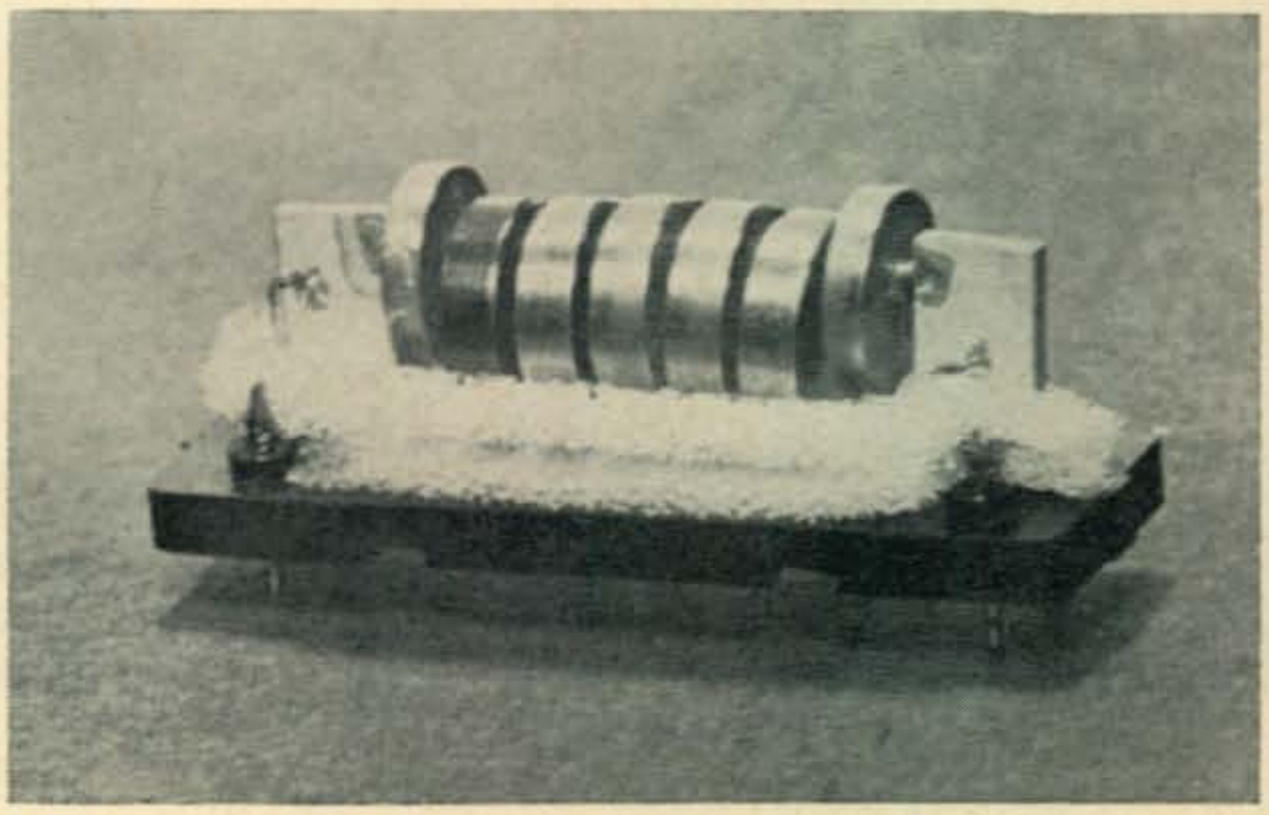
Fig. 2—(A) Measured characteristics of the MC-455-10Z mechanical filter. The dot on each skirt represents the position of the specified carrier frequencies for s.s.b. (B) Overall characteristics with the filter in an i.f. strip aligned for minimum passband ripple. The skirt shape also has changed.

checking the above figures, the filter characteristics were observed using a sweep generator with an oscilloscope display and by point-to-point measurement using a BC-221 frequency meter. The results are shown at fig. 2A. These tally closely to the supplied figures. It will be noted, both from the given figures and the measured results, that there is some dissymmetry at the skirts where the high-frequency side is not as steep as the other side at points below about −30 db; however, this is not an unusual characteristic, judging from our experiences with other filters which have similarly been observed. The same goes for the passband ripple and unsymmetry.

Not indicated at fig. 2A is a spurious response which was found 25 db down at 433 kc, 2 kc outside of the limits given in the specifications. This was a narrow peak with a base only 200 cycles wide at 40 db down. With the filter installed in an i.f. strip where it was followed by two 455 kc transformers, this spurious peak was down at least 60 db and thus would be of no great concern under similar circumstances.

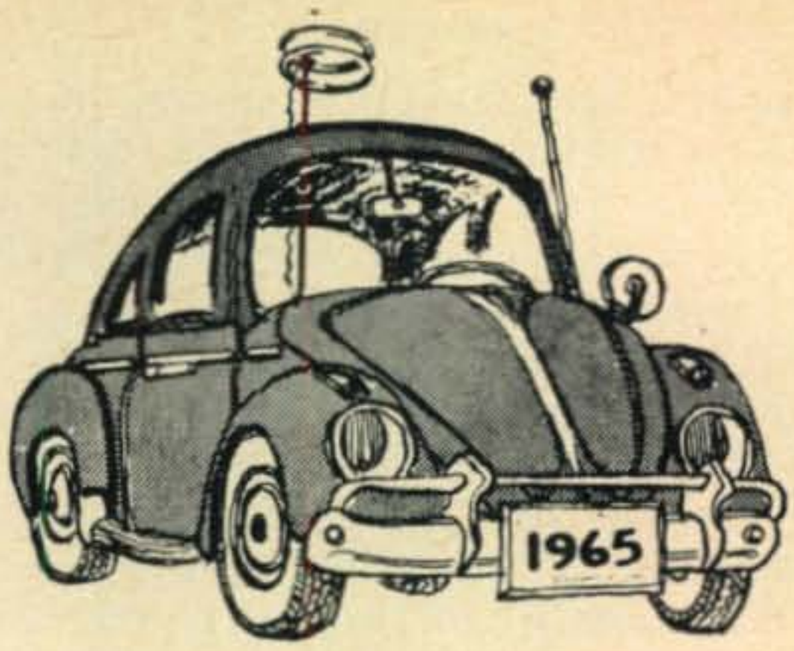
The insertion loss with the filter was found to be 3 db. When installed in a receiver, there was no indication of filter overload or ringing, even with exceptionally strong signals.

[*Continued on page 93*]



Interior view of the Lafayette mechanical filter. The square-shaped elements at the ends are the crystal transducers. The mechanically-resonant section is made up of seven metal discs mounted on a thin rod connected between the transducers. Several layers of poly-foam padding are used to minimize external shock-exitation of the filter elements. Two of the layers are shown.

Volkswagen V.H.F. Mobile



BY MERVIN W. CURRELL,* K6UHZ

Repackaging the Gonset Communicator IIB permits it to be installed in the Volkswagen.

For those amateurs who are proud owners of the Volkswagen sedan, the problems of mounting a transmitter or a receiver or both are almost prohibitive. Being an owner-driver myself, I know.

Sitting in the driveway one day, I tried to figure a way to mount my "Gonset Communicator IIB", which consisted of the communicator and a companion unit, a v.f.o. with an audio preamplifier and its associated power supply. The unit, when mounted so it would not be in the driver's way, extends into the other front seat far enough to irritate the passenger.

It became apparent at this time that I would have to do one of two things. Either repackage the unit, or purchase a larger vehicle. Needless to say, the decision was to repackage the communicator.

Repackaging

The next thing to be decided was the configuration. Should the components be laid side by side like the GC-105, or should they be mounted in the vertical plane? While debating the situation, my son-in-law, Perry (WB6IPD), suggested removal of the v.f.o. and its power supply from the companion unit, and putting the receiver-transmitter into the v.f.o. case. This would reduce the width of the unit by 50% and would clear both compartments completely. The height of the new unit would remain the same.

The remodeling of the v.f.o. case is quite simple and straightforward.

(1)—The shelf in the v.f.o. case is spot-welded and will have to be broken loose. I found the easiest way to do this is to drill through the spot-welds. After removal the shelf has to be lowered ⅛" (plus or minus 1/16") and either spot-welded, or bolted back into place.

(2)—Using the measurements from the original communicator case, (the transmitter and receiver portion only) measure the holes, mark and drill. The center section, where the main v.f.o. controls were, is cut out and a metal plate with the new dimensions is put in its place.

(3)—The addition of an On-Off switch, inserted into the top portion of the front panel, parallels the On-Off switch in the power supply.

After the holes have been cut, the receiver is inserted for a trial fitting. Care must be taken not to damage the components under the chassis. At the same time check the holes in the bottom of the case. See that they correspond with the holes in the bottom of the receiver. This will speed up the process of assembly later on. After fitting, the receiver is removed and set to one side. There is nothing more to be done to it.

Next, check to see that the transmitter fits. The only change to be made in the transmitter section is the audio lead to the speaker. This is the lead to the front of the chassis just under the tuning eye. It is removed from the wafer switch and replaced with a longer lead. The longer lead extends to the rear panel where it is connected to a chassis jack.

View of the repackaged Gonset IIB snugly hung under the dashboard of the VW. It does not interfere with the driver or passenger.

*1368 Suffolk Drive, San Jose, California.

Mounting

Make up a template for mounting the case in the car. A sketch of the template used on my car is shown in fig. 1. Tape the template to the top of the case and mark it plainly. Drill pilot holes. Use a 1/16" drill. Next, drill the holes for a 10/32" bolt. Use a reaming tool and clean the burrs from around the holes. Next, using 10/32" nuts and bolts, put the bolts through with the heads on the inside. The bolts should extend at least an inch in length. Be sure to use lock washers on both sides. The lock washer and nut on the outside leaves a ventilation space between the top of the case and the under-side of the instrument panel.

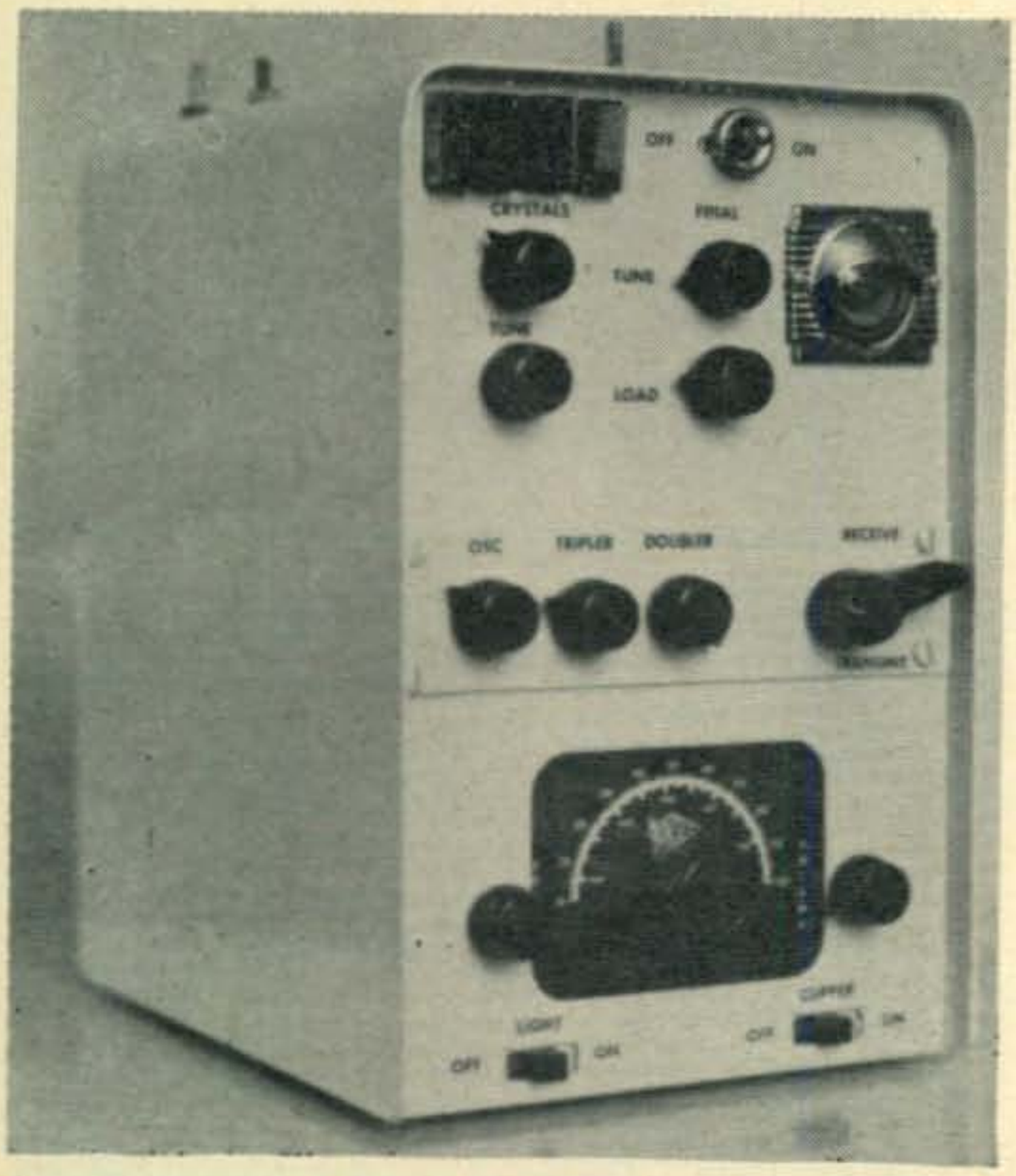
Use the same template and go through the same procedure to drill the car.

After the holes have been drilled and dressed, take the case and mount it securely into place. On the under-side of the instrument panel behind the case, measure back about 3 to 4 inches and drill a ⅜ inch hole. This hole is for the speaker jack that goes to the car speaker.

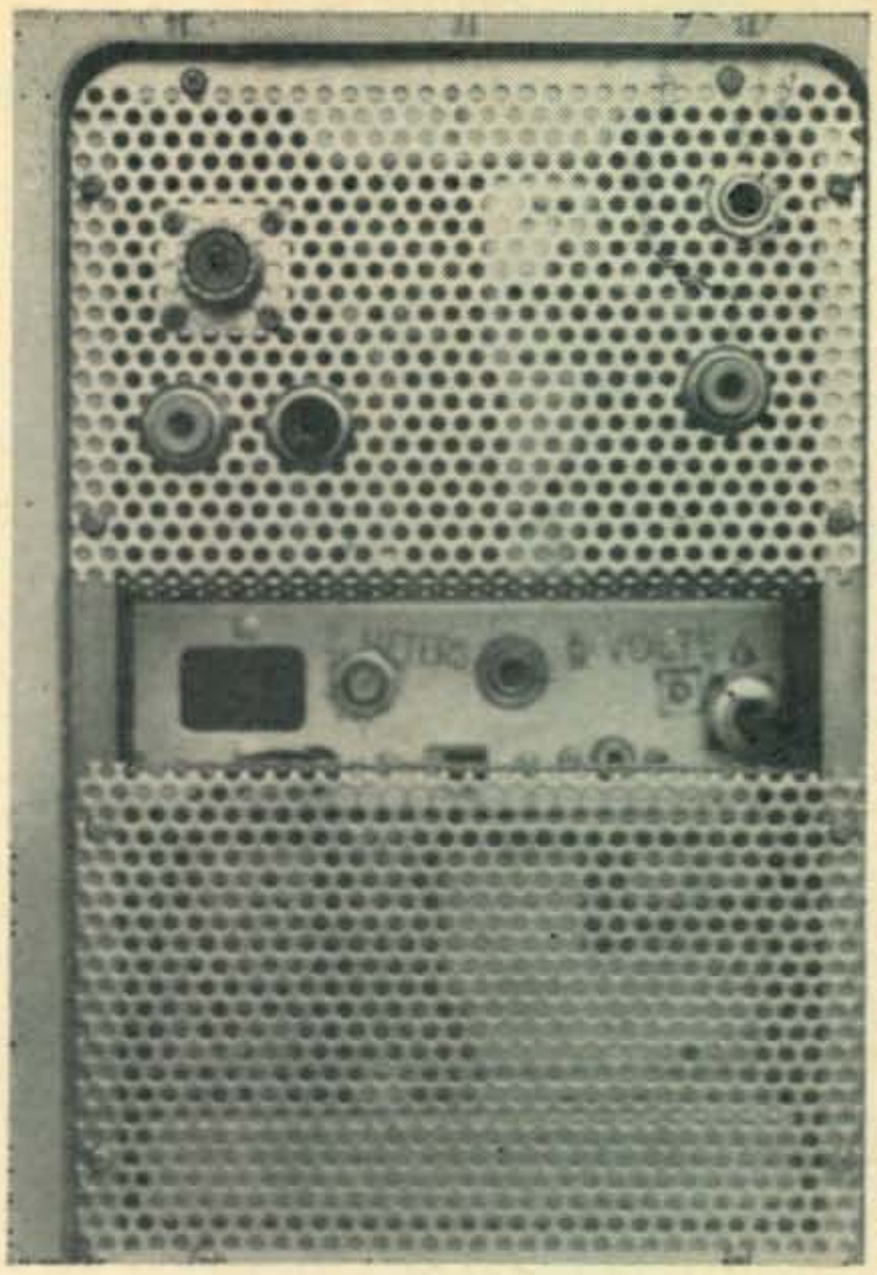
Finishing

You are now ready to finish the case. Fill in the remaining holes in the sides. This can be done with either solder, body putty, or with liquid solder. After the holes are filled the whole case is gone over carefully with fine sand paper. After it has been sanded it is ready to be primed and painted. Any color is acceptable but the color that was used I purchased from the local Volkswagen Body Shop. The paint was the same as that used on the car. The paint number can be obtained from the car. It is located under the hood next to the spare tire.

The case is then painted and allowed to harden.



Front view of the Gonset 11B repackaged in the V.F.O. case. The power supply is located behind the rear seat and the car speaker is used for the receiver. The ON-OFF switch that was added is at the right of the crystals.



Rear view of the Gonset 11B shows the added jacks described in text.

While waiting I went to the local electronic parts supply house and bought a set of decals. I chose the decals made by Walsco, part number 2108. The color was black and the type was for a transmitter.

The next procedure is to decal the front panel. Duplicating as closely as possible the original letters. Allow the decals to set up and dry overnight. After drying apply 4 to 5 coats of clear plastic spray. The plastic spray used was made by Krylon (number 1303 Graphic Arts Spray). The case proper is now completed. Set it aside and let it dry.

Rear Panel

The back panel now has to be modified. The sections are made of perforated metal. Using the top section, measure for the coaxial connector, the phone jack (which was taken from the old case), the two jacks for the switch leads and the jack for the audio output. A ⅝" Greenlee chassis

[*Continued on page 93*]

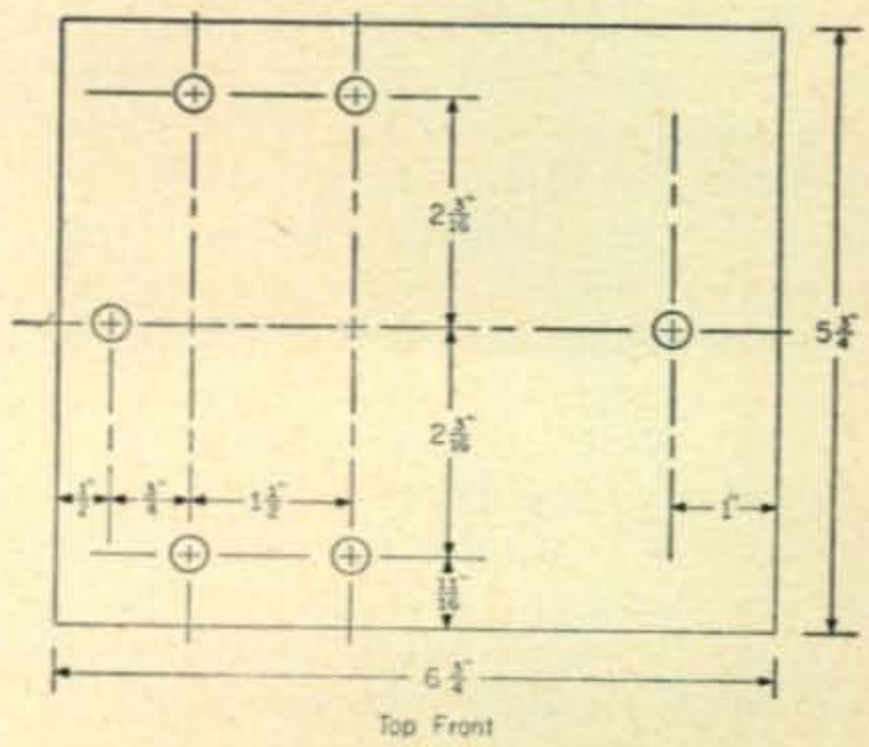


Fig. 1—Dimensions for the transmitter mounting template used for the VW.

Announcing

THE *CQ* WORLD WIDE SSB CONTEST

April 10-11, 1965

I Contest Period: 1200 GMT Saturday, April 10th to 2400 GMT Sunday, April 11th, 1965. Only 24 hours out of the 36 hours permitted for Single Operator stations. The 12 hours of non-operation can be taken in two periods, at the beginning, end, or during the contest. It need not be in two equal periods, but must total a minimum of twelve hours and be clearly indicated on the log.

Multi-operator stations are not required to show a rest period and may operate the full 36 hour contest period.

II Bands and Participation: All bands 3.5, 7.0, 14.0, 21.0, and 28.0 mc can be used but operation is confined to two-way sideband emission only.

III Type of Competition: 1. Single Operator (a) All Band (b) Single Band. 2. Multi-Operator (a) All Band Only.

IV Equipment: Only one transmitter may be operated at any one time, and competitors may use the maximum power permitted under the terms of their license. (Multi-transmitter operation is *not* permitted in this contest.)

V Serial Numbers: The contest exchange will be the usual five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact.

VI Points: 1. Contacts between stations on different continents will count three (3) points.

2. Contacts between stations on the same continent but not in the same country will count one (1) point.

3. Contact between stations in the same country will be permitted for the purpose of obtaining a Prefix multiplier, but will have no QSO point value.

VII Multiplier: The multiplier in this contest will be determined by the number of different prefixes worked. A "prefix" is considered to be the two or three letter/numeral combination which forms the first part of an amateur station call. (W1, WA2, DJ2, DL4, GB2, 4X4, 5AI). Each different prefix may be counted only *once* during the contest.

VIII Scoring: 1. The score for a single band entry will be the total contact points on that band multiplied by the number of different prefixes worked on that band.

2. The score for an all band entry will be the total contact points from *all* bands multiplied by the total number of different prefixes worked on *all* bands.

3. A station can be worked once on each band for QSO point credit; however, prefix credit can be taken only once regardless of the band.

4. Those sending in a log for a single band will be eligible for a single band award only. If a log shows more than one band, it will be judged as an all band entry unless indicated otherwise.

5. A station will not be eligible for more than one award.

IX Awards: Certificates will be awarded to the highest scoring Single Operator station in each country and each call area of the United States, Canada, and Australia.

1. For the highest score on each Single band.
2. And for the highest score on all bands.

Certificates will also be awarded to the highest scoring Multi-Operator station in the same areas but for All band scores only. (Alaska and Hawaii will be considered as separate countries for both scoring and award purposes.)

X Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of this contest, or unsportmanship conduct, will be deemed sufficient cause for disqualification.

XI Log Instructions: 1. Indicate a prefix only the first time it is contacted.

2. Use a separate sheet for each band and also a tally sheet or report form.

3. All times indicated must be in GMT. And the 12 hour rest period must be clearly indicated.

4. All contestants are expected to compute their own scores. Logs should be checked for contact and prefix duplication and proper point credit before they are submitted. Unscored logs will be used as check logs only.

5. A prefix check list is not only desirable but a *must* for proper contest operation.

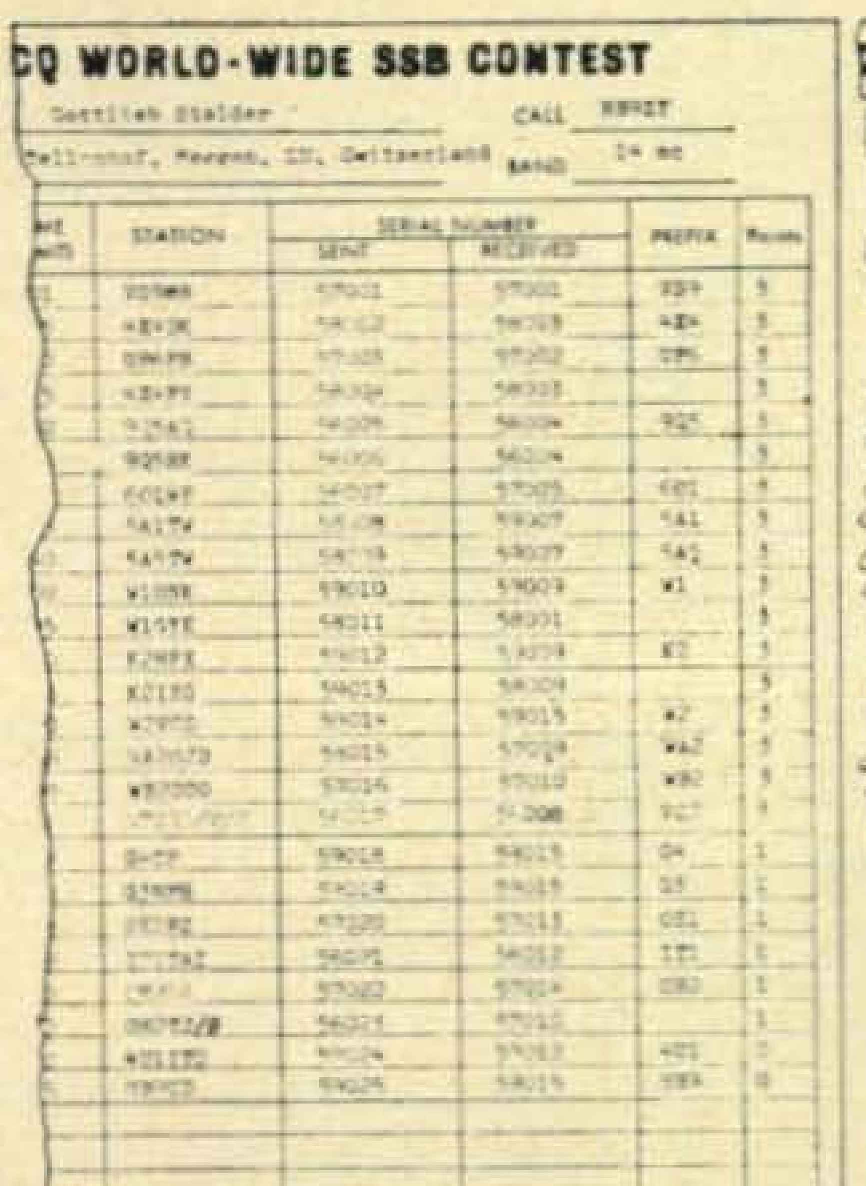
6. Make sure name and address is clearly shown on each summary sheet. *PRINT or TYPE.*

7. Each contestant must sign a pledge that all rules and regulations have been observed and that the report is a true one.

8. Official log forms are available from *CQ*. Send a large-size, self-addressed envelope with sufficient postage to cover your request. If official forms are not available use a duplicate form. The size is 8½ x 11" with 40 contacts to the page. (The same forms used in our World-Wide DX contest can be used.)

9. It is suggested that you send your prefix check-off list along with your log.

XII DEADLINE: All logs must be postmarked *no later* than April 30, 1965. Send logs to: *CQ*, 14 Vanderventer Avenue, Port Washington, New York 11050. Attention: WW SSB Contest.


CQ WORLD-WIDE SSB CONTEST
CALL
BAND
STATION | SERIAL NUMBER SENT | RECEIVED | PREFIX | POINTS
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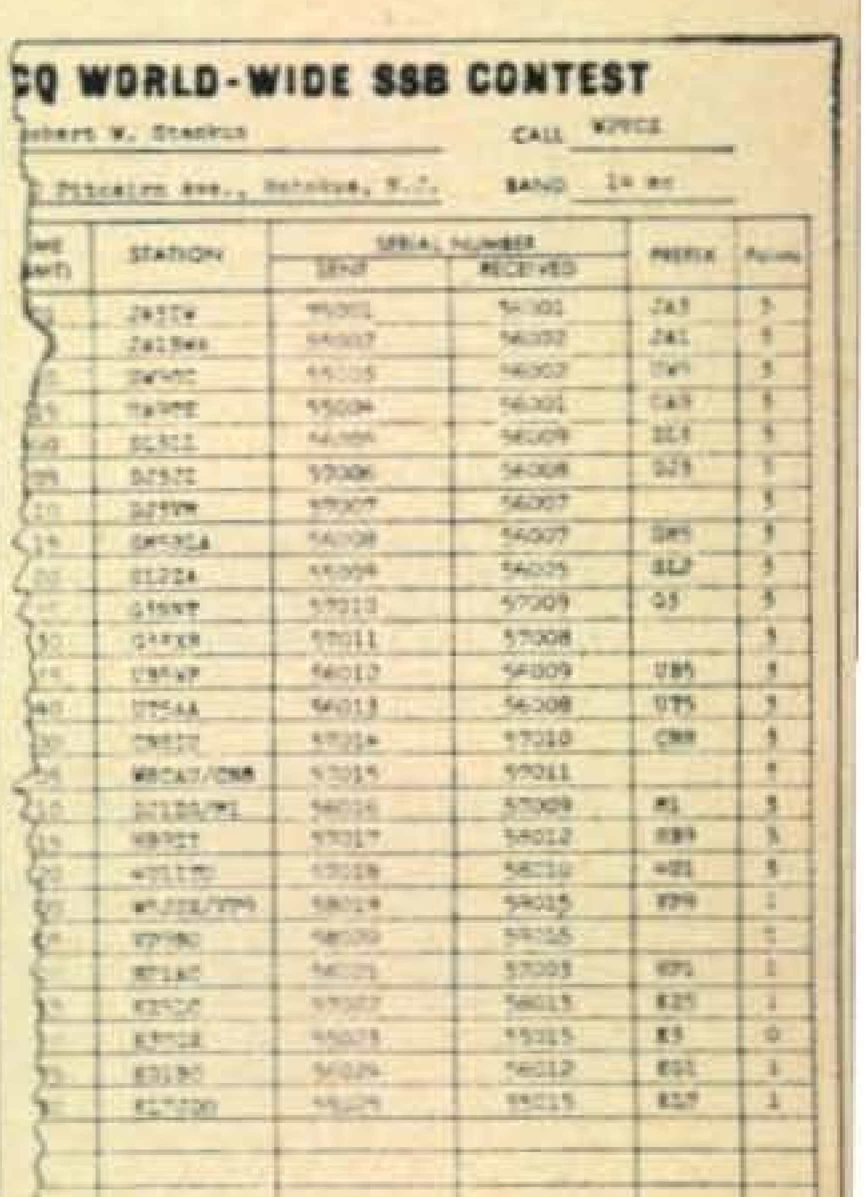
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Replacing R. F. Amplifier Tubes

BY W. F. FRANKART,* WB6BLA

MANY pieces of amateur equipment can stand an increase in gain for improved performance. Frequently the increase can be had with no modifications or at worst a slight circuit change. The answer lies in careful selection or changing of tubes, particularly those in i.f. or r.f. amplifiers. The gain provided by a tube may be judged best by its value of transconductance (also called mutual conductance and shown as g_m), rated in micromhos. The higher the value of transconductance, the better the tube will perform, generally. To get the rated g_m the proper cathode bias resistor must be used and the value required for each tube is indicated in the charts below.

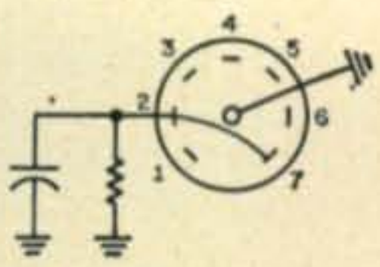


Fig. 1—When the tube socket is wired as shown left, any of the types listed in the Table may be used without rewiring.

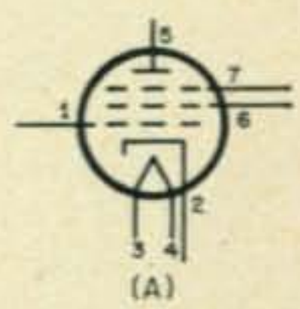
Note that the chart is divided into three groups, with identical socket basing within each group. If the tube changes are confined to the same group, no rewiring is necessary other than the changing of the cathode resistor, R_c, if indicated. If the socket is wired as shown in fig. 1, then all the tubes are directly interchangeable. ■

*c/o Gonset, 1515 Manchester Ave., Anaheim, California.

TABLE I

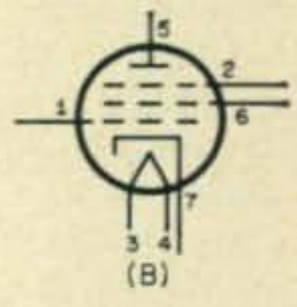
Basing A

Type	g_m	R_c
6BZ6	8K	100
6CB6	8K	100
6CF6	8K	100
6DE6	8K	100
6DC6	5.5K	180
6BH6	4.6K	100
6BJ6	3.6K	100
6DT6	2K	200


(A)

Basing B

Type	g_m	R_c
6BA6	4.4K	68
6AH6	9K	160
6AU6	4.5K	100
6BD6	2K	200


(B)

Basing C

Type	g_m	R_c
6A65	6K	180
6AK5	5K	180
6BC5	6K	180

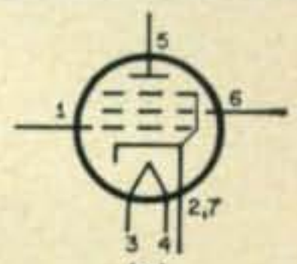
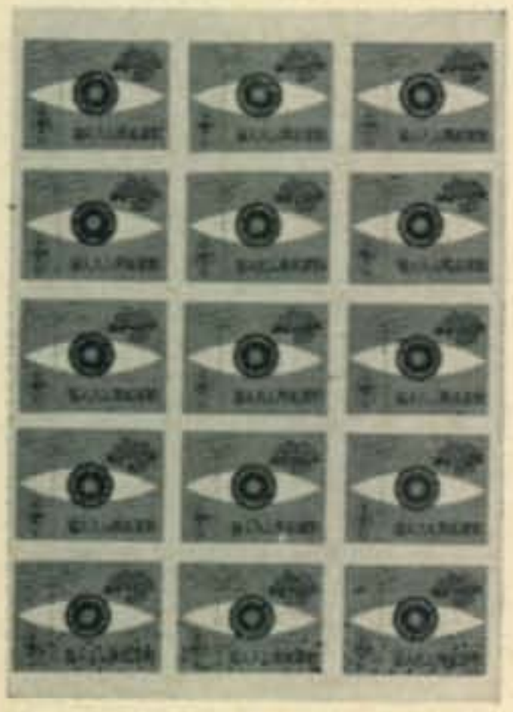

(C)

Table I—The tube types listed above are directly interchangeable within the grouped types. If the tube socket is wired as shown in fig. 1, then all the types are directly interchangeable. The g_m figures are based on a plate voltage of 250 and a screen voltage of 100 volts.

The Japanese Blind Hams Club

IN Japan today there are more than 200,000 blind people. Out of consideration for these people, the Japanese Amateur Radio League assisted in the formation of the Japanese Blind Hams Club (JBHC) 5 years ago. Through JARL the nucleus of 5 original members has grown to over 300.



A sheet of JBHC seals.

In Japan, as in any other country, amateur radio for the blind (and/or other handicapped) presents the opportunity to lift their own confidence and create pride of accomplishment by doing something worthwhile. It is a means of greatly enlarging their somewhat limited world of expression. However, the Japanese aspirant must pass the state examination. Over there, this requires a rather high level of knowledge and technical ability. Unfortunately there are no Braille reference books on the subject in Japan. This makes the task of getting a license extremely difficult.

The JBHC has now begun a program with the assistance of the JARL similar to the Xmas Seal program. The money gathered will go towards printing reference books in Japanese Braille.

There is no organized solicitation outside of Japan. Anyone wishing to participate in this program can send a donation to: The Japanese Blind Hams Club, c/o The Japanese Amateur Radio League, Mr. K. Shirai, Box 377, Tokyo, Japan. We thank Ray Eichman, WA6IVM for bringing this to our attention.

The Common Ground

BY ROBERT P. BRICKEY,* W7QAG

Plagued by hum in your audio equipment? Clobbered by oscillation in your r.f. equipment? Do you get belted every time you touch two different chassis? Then you may have common ground problems. Covered below are the effects of improper grounding and the corrective measures necessary in power line a.f. and r.f. circuits.

Too often, the importance of using proper grounding techniques is not fully appreciated. Technological advances are constantly making possible higher gain lower noise receiving equipment, while at the same time the density of other types of electronic equipment is rapidly increasing. With the rapid increase in the use of two-way radio equipment, amateur, citizen band, industrial, business band, police, *etc.*, as well as the constantly increasing number of TV sets, portable radios, and the like, it is becoming of paramount importance to use proper grounding techniques in a congested area in order to avoid unnecessary interference between these services.

Of course grounding alone will not solve all interference problems. With the great congestion of electronic equipment many other factors must be considered in order to keep interference to a minimum. Such things as proper circuit design, shielding, proper operating techniques, *etc.*, must receive special attention. It is true however that many interference problems can be traced, at least in part, to improper grounding.

Interference is not the only aspect of proper grounding. Next time you build an amplifier that behaves more like a signal generator it might be well to take a closer look at the grounding techniques you used. Many problems associated with instability can be traced to improper grounding techniques.

Because of these factors many common grounding practices are not adequate under present day conditions. As we will see later, a grounding system which is entirely adequate under some conditions may be useless in others. While some of the effects caused by improper grounding appear baffling, when they are analyzed in terms of basic electrical theory most of these effects are easily understood. With a little forethought it is possible to avoid most of the pitfalls connected with grounding.

Why Ground?

If circuits could be made completely independent of each other in such a way that they had no circuit elements in common there would be no need for common ground. A transistorized portable receiver for instance, if it contains its own power source, antenna, speaker, etc. does not need to normally be connected in common with other surrounding equipment. It is necessary however, to provide common connections within the radio receiver itself. This common connection is usually referred to as ground although it is not always common to an actual earth ground. The term ground is commonly used to express a common return connection from a number of loads. When using a receiving antenna one side of which is the earth itself, it is necessary to include the earth in the common connection. Also the a.c. power source is frequently connected to ground on one side of the circuit. This sometimes makes it necessary to include the earth in a common connection.

In the same piece of equipment, sometimes, there may be more than one common system. For instance there may be a common circuit for the return currents in the audio section. another common system for the return currents in the r.f. section and still another common system for the power supply. In other designs all of these returns may be made common to each other.

The common connection may take the form of any type of electrical conductor. The most frequently used common return in electronic equipment is the metal chassis that the equipment is constructed upon. Since the chassis usually has a considerable surface area, it provides a reason-

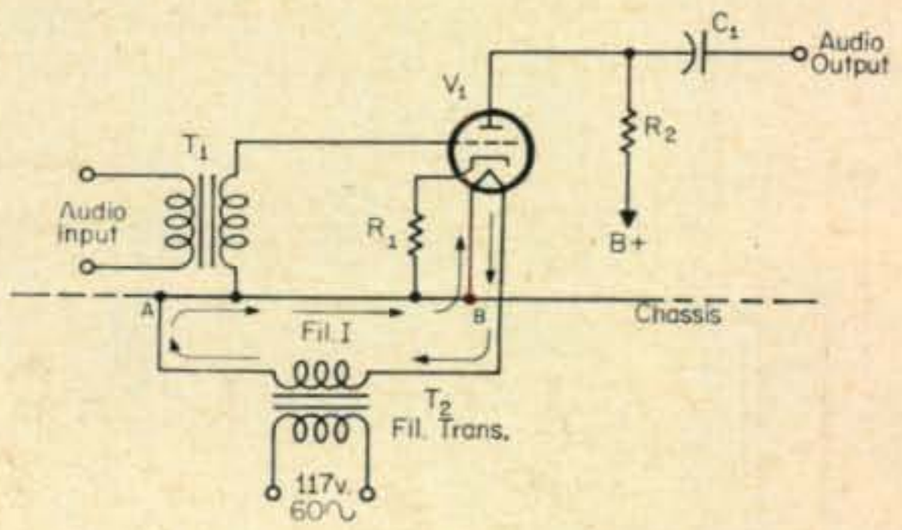


Fig. 1—Circuit diagram of an audio amplifier showing coupling between the filament circuit and the audio input signal. This type of coupling could be eliminated by grounding all of the ground returns to the same point on the chassis.

*Utah Trade Technical Institute, 349 North 250 East, Orem, Utah.

ably low impedance connection between the various loads which are connected to it. The impedance between two points on the chassis is not zero, however, and it is this fact which creates many of our grounding problems.

An example of the trouble that this chassis impedance can cause is shown in fig. 1. In this example the chassis is being used as a common return for both the filament circuit and input circuit of the amplifier. The arrows show the path of the filament current during one-half cycle of the supply frequency. Since the filament return current flows through a section of the chassis, and this chassis contains resistance, the result will be a very small a.c. voltage drop between points *A* and *B* on the chassis. Notice that part of this voltage is in series with the input circuit to the vacuum tube amplifier. This a.c. voltage will add to the incoming signal and the amplifier output will contain some of the filament supply frequency in addition to the desired output signal.

It might be thought that the voltage drop across the chassis would be small enough to be negligible. In some cases this is true, especially when the amplifier gain is low, the chassis resistance is low, the filament current is not too great and a very low hum level is not necessary. In many cases, however, the results would *not* be satisfactory. The ripple from this source could be eliminated in this circuit by either running a separate filament return lead to the tube instead of using the chassis or by returning the secondary of T_1 directly to R_1 in order that the filament circuit and the input circuit of the amplifier do not contain the common chassis impedance.

When building any type of high gain amplifier, considerable care must be exercised when connecting various points in the circuit to the common chassis in order that output current returns will not produce voltage drops that will be fed back into the input of the amplifier. If the feedback through the chassis is properly phased the amplifier may oscillate. This type of feedback is often very difficult to isolate and correct once the equipment has been constructed. It is usually good practice to connect all of the bypass capacitors and other returns for a particular stage or closely associated group of stages to a common point on the chassis. Grounding in this way eliminates the return currents flowing through the chassis and therefore prevents producing a voltage drop across it.

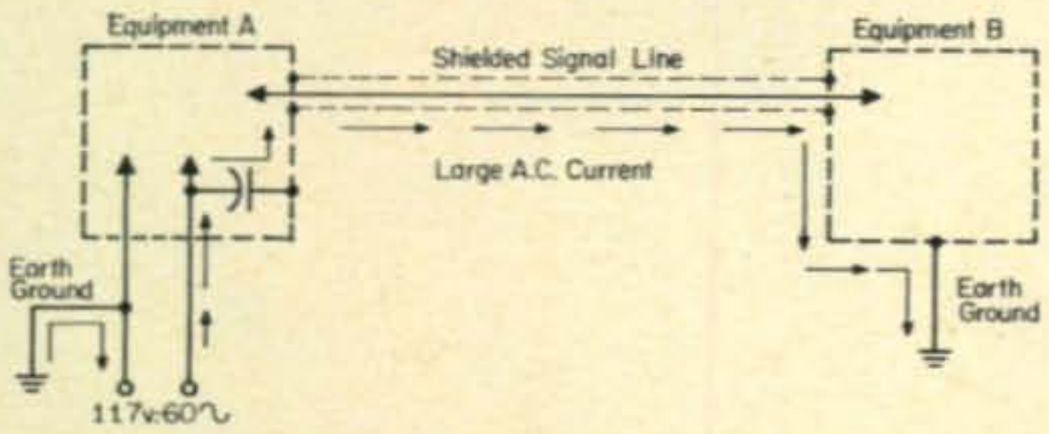


Fig. 2—Since there is no common ground lead between equipment *A* and equipment *B*, there will be a large a.c. current flowing in the shield around the signal line. This a.c. current will induce hum in with the signal.

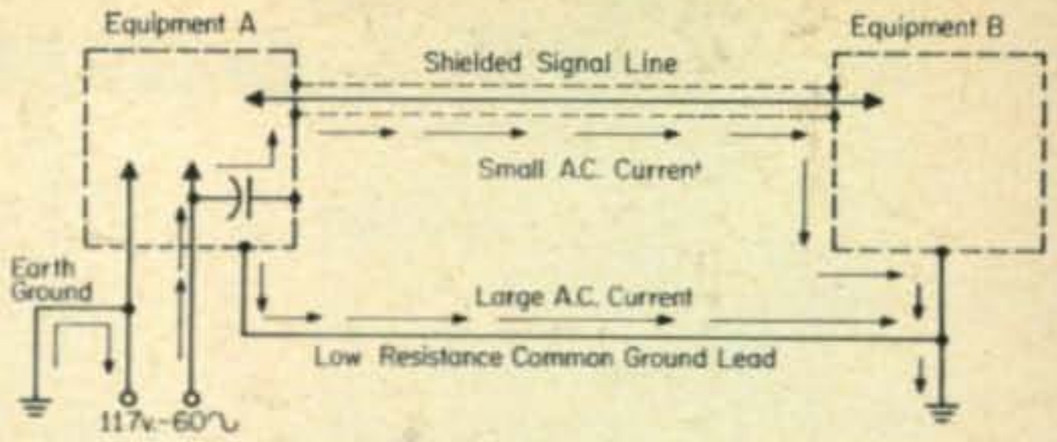


Fig. 3—If the common ground lead has low resistance compared to the resistance of the shielding on the signal line, most of the a.c. ground current from equipment *A* will flow through the ground lead.

When duplicating equipment described in magazine articles it is wise to follow the grounding scheme used in the original equipment as closely as possible. This is especially important at high frequencies. Don't be too quick to criticize the author of the article when your equipment doesn't function properly if you have made any changes whatsoever in the grounding system or in parts placement. To those who lack experience it is difficult to impress the importance of grounding to the chassis in the right way. While it often seems to the beginner that anything connected to the chassis is really connected to a common potential it can be seen in fig. 1 that this is not the case.

Safety

Another important reason for using a common ground is safety. Although sometimes it may not be necessary to ground certain pieces of equipment together for their proper operation, it is advisable to connect their chassis in common to eliminate any difference in potential that may exist between them. As there will normally be other objects in the immediate vicinity that are at earth ground potential, this common chassis connection should also be connected to an earth ground. The lead used for this ground connection should be at least as large as the incoming power mains from the breaker panel. This is important because in the event of a short circuit in the equipment between the incoming power line and the chassis, the ground lead should be able to carry sufficient current to trip the breaker. If an insufficient wire size is used and such a short should develop, the resulting current through the small wire could produce enough heat to start a fire without tripping the breaker. There is also a possibility that the wire may burn out altogether leaving the equipment with line potential to ground. Since this ground lead may be required to carry an appreciable current it is advisable to run the ground lead back to the same ground point used for the incoming power. Doing this will eliminate the resistance through the earth back to this point.

Connecting various pieces of equipment to a common ground also has many operational advantages. It is common practice to connect a bypass capacitor from the power line to the chassis in each piece of equipment in order to bypass radio-frequency signals that may enter

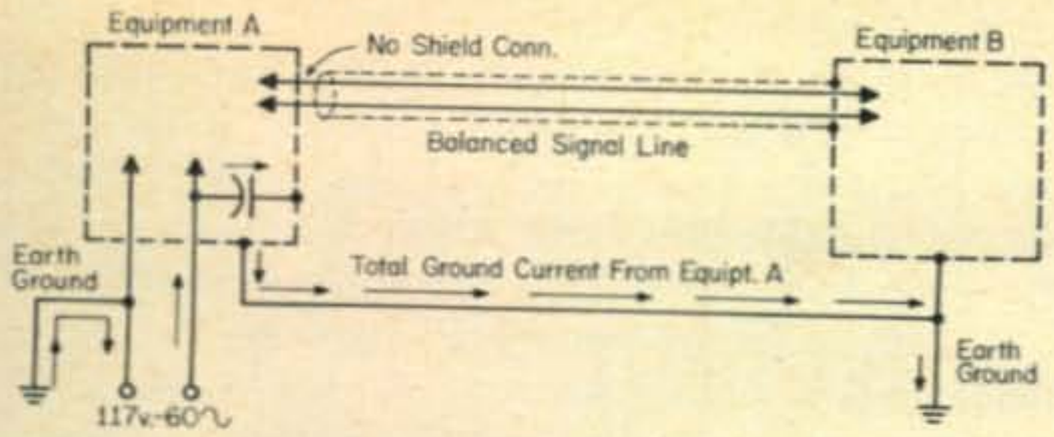


Fig. 4—If a balanced signal line is used the shield need not be connected on the sending end, eliminating the a.c. current through the shield.

or leave via the power line. Usually a small valued capacitor is used which has low reactance to the radio-frequency and a fairly high reactance at the power frequency. While the reactance of this bypass capacitor at the power line frequency is fairly high there is still enough current flow to cause problems when a signal is fed from one piece of equipment to another unless proper grounding techniques are used.

Figure 2 shows an example of the sort of thing that can happen. An unbalanced shielded signal line is connected from equipment *A* to equipment *B*. Of course the line is shielded to prevent pick-up of stray magnetic or electrostatic fields in its vicinity. However if equipment *A* is not properly grounded, current can flow from the ungrounded side of the power line through the bypass capacitor to the chassis of equipment *A*, down the shield of the signal line to equipment *B* and then to ground. The supply frequency current flowing through the shield will produce an alternating magnetic field around the shield which will cut the inner-conductor and produce alternating currents in it also. In some cases the hum pick-up from this source can be very serious. It is often thought that it isn't necessary to ground equipment *A* in a case like this since it is grounded anyway through the shielded lead. It can be seen in fig. 2 that the ground currents flowing through the shield do more harm than good.

Figure 3 shows the same equipment setup with units *A* properly grounded. If the resistance of the common ground lead is made very low compared to the resistance of the shield on the signal line the bulk of the a.c. current will flow through the common ground. This greatly reduces the hum induced in the signal line. To be effective in this way it can be seen that the common ground lead must have very low resistance.

A still better approach to the problem is shown in fig. 4. If a balanced signal line is used rather than an unbalanced one as in the preceding examples it will not be necessary to connect the line shield to both pieces of equipment. This is because the returning signal current will flow through the second conductor of the balance line rather than through the shield. It can be seen that now the total ground current will flow through the common ground lead and there will be no line current flowing in the shield. The shield on the signal line will be most effective if it is grounded at the load end of the line. If it was grounded at the source, the a.c. voltage drop across the ground lead resistance would be present between the shield and the input at the load.

R.F. Grounds

Due to the increased impedance of ground conductors the grounding technique used becomes even more important at radio-frequencies. The impedance of the ground conductor becomes higher for several reasons. As the frequency of the current flowing in a conductor increases, the magnetic field this current produces causes the bulk of the current flow to be near the surface of the conductor. This is shown in fig. 5 and is known as skin effect. The reduction of current in the center of the conductor at high frequencies reduces the effective cross sectional area of the conductor. The result is an increase in the effective resistance at high frequencies.

Not only is the resistance of the conductor greater at high frequencies, but unless its length is exactly right it will also have considerable reactance. Any conductor has inductance and the inductive reactance it causes increases directly with frequency. However, not only does a conductor have inductance but it also has distributed capacitance. If the capacitive reactance is of the same magnitude as the inductive reactance, the conductor will be resonant and if it were not for radiation from the line its impedance would be equal to its effective resistance.

When a long ground run must be made, its impedance is often reduced by making it a resonant length. However the radiation from a resonated ground lead of this type will in some cases be fairly high, raising its impedance. This radiation may also produce harmful interference.

In general then, in order to reduce the impedance of the ground lead, while at the same time keeping the radiation from the line to a minimum, it is desirable to use the shortest possible ground leads at radio-frequencies. Also in order to reduce the inductance and effective resistance of the line as much as possible, a conductor with considerable surface area should be used. A copper strap for instance will have a much lower impedance at radio-frequencies than a round conductor with the same cross sectional area.

The type of material used at very high frequencies is also important since almost all of

Fig. 5—Cross sectional drawing showing the variation of current density in a conductor carrying radio frequency current. Since the interior of the conductor is surrounded by more flux lines than the exterior, it will have more reactance. As a result there is more current flow near the surface, increasing the effective resistance.

the current flow is concentrated very near the surface of the conductor. It is desirable that this surface have conductivity and it is often helpful to use plated materials. It is important that a good plating job be done however as a poor one may have higher resistance than the original material. In some cases protective coatings may be applied to the conductors in order to prevent deterioration of the surface. Because of these effects, construction of v.h.f. and u.h.f. equipment on chassis of different material can have a great effect on a performance.

Earth Grounds

Several times in this article we have referred to an earth ground. It is often very difficult to obtain a good ground connection to the earth. While the old standby water pipe ground connection may be adequate in some cases, the impedance of this type of ground at radio-frequencies is likely to be fairly high. In considering a ground connection it should be recognized that the type of ground system necessary may depend on the frequency involved.

At low frequencies, due to the multiple paths for the current through the subsurface of the earth, the resistance of the earth itself is negligible even though the resistance through any one path may be fairly high. In fact, due to the earth's great size, its resistance is so low that if a series loop is formed of a trans-atlantic telephone cable and earth, all of the resistance in the series loop can be accounted for in the wire.[1]

It can be seen, therefore, that the primary problem is to obtain a low resistance connection to the earth since the earth itself has a very low resistance. At low frequencies a satisfactory ground can usually be obtained by burying conductors with large surface area deep in moist soil. The ground resistance can be reduced considerably by depositing salt in the area around the conductors since this is where the current density is greatest. Of course the salt will shorten the life of the ground system as it will attack the metal conductors chemically.

In dry rocky areas it is difficult to obtain a low impedance ground connection. At radio-frequencies, in areas like this, a counterpoise will often provide a better ground. This may be formed by placing a network of conductors

[*Continued on page 94*]

[1]Card, R. H., Earth Resistivity and Geological Structure, trans. *AIEE*, 54, 1153, 1935.

CQ Reviews:

The Dow-Key DK78 Coaxial Switches

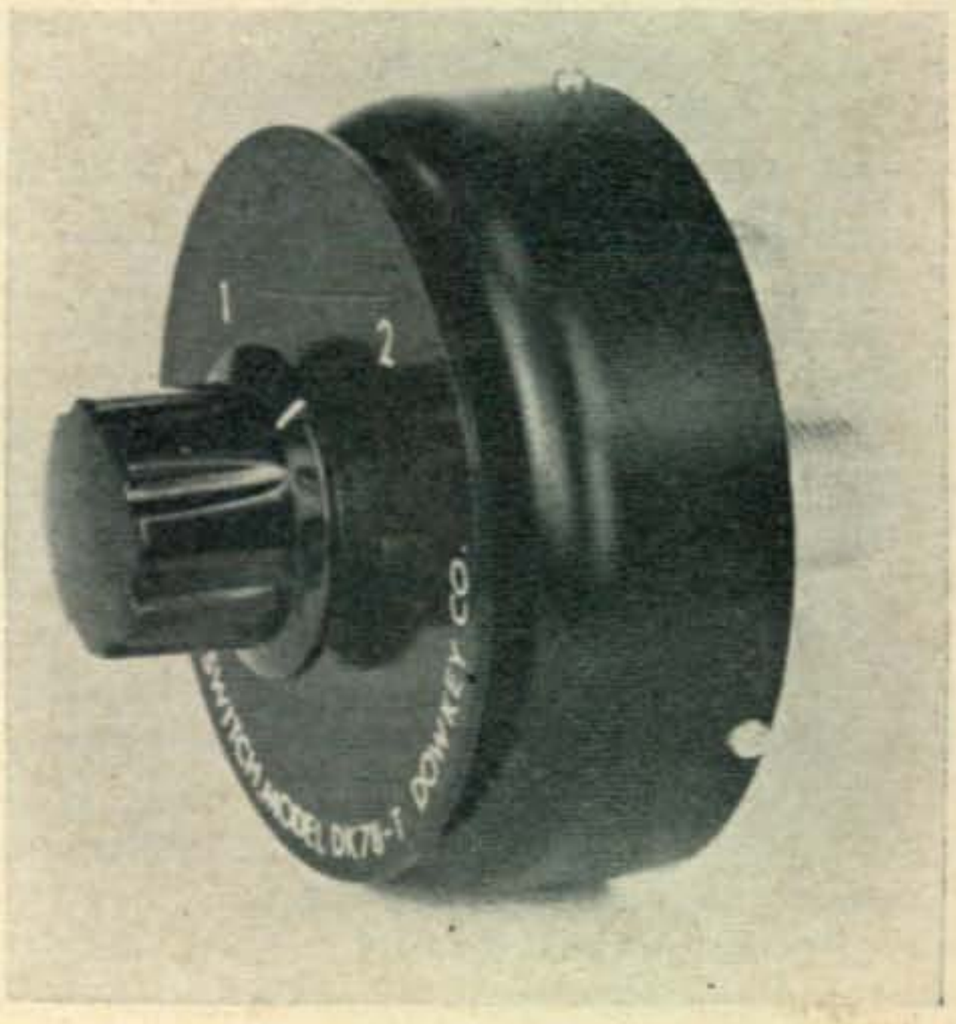
BY WILFRED M. SCHERER,* W2AEF

THE latest addition to the line of products put out by the Dow-Key Company is their DK78 series of manually-operated coaxial switches. These are especially designed for the purpose, both electrically and mechanically, and as such are not just adaptations employing wafer-type switches. They are relatively small in size, yet are ruggedly constructed for reliable operation with high current-carrying capacity for handling r.f. power of 1 kw at frequencies up to 500 mc and they have high cross-talk isolation and low v.s.w.r. All the r.f. connectors are mounted in the same plane facing directly out from the rear to facilitate cable connections in a minimum amount of space and without the need of right-angle connectors for doing so. The switches are available in four configurations as shown at fig. 1. These are: s.p.d.t., s.p.3t., s.p.6t. and transfer-type.

Construction

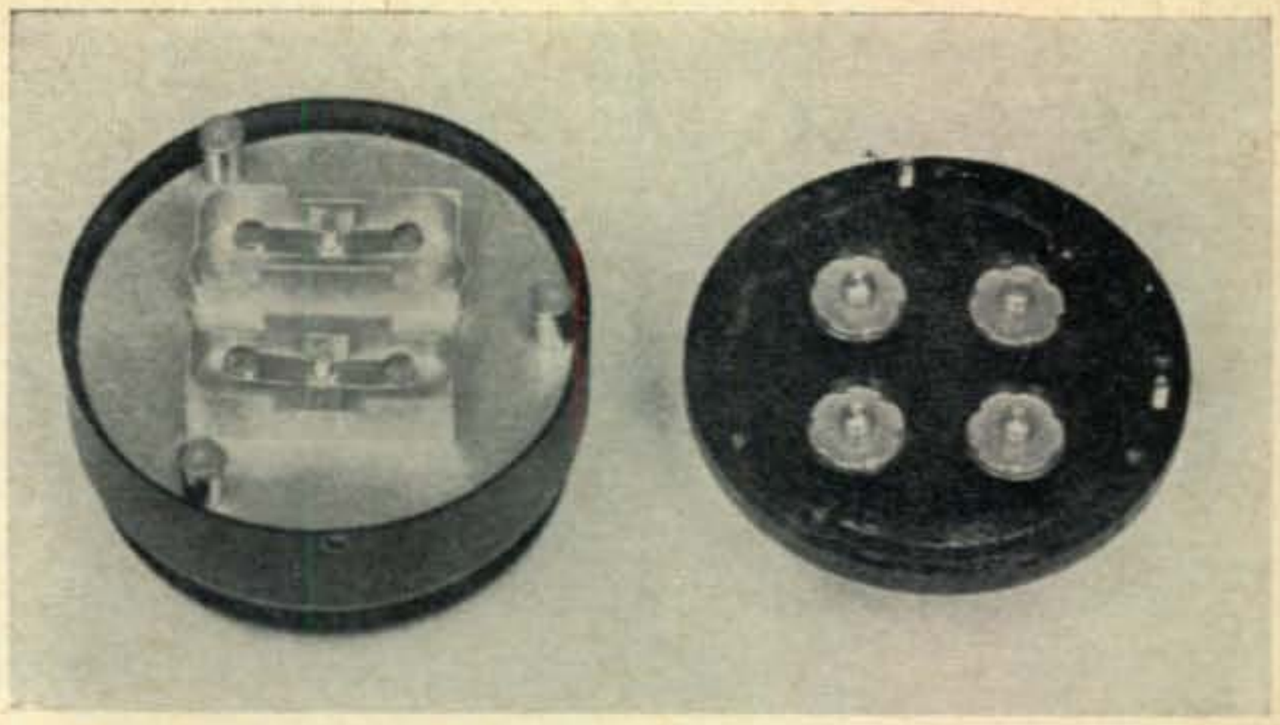
Since the Dow-Key DK78 coaxial switches utilize a specially designed switching mechanism, we thought you'd like to see a picture of the "innards" of one of them. Shown in the accompanying photograph are those of the DK78-T transfer switch.

The main body or shell of the switch is shown at the left. The large circular metal disc is rotated by a shaft from the other side of the shell. Two dual-contact arms are mounted on insulators on this disc, each in a separate oblong box-like shield enclosure. At the right of the photograph is the back plate of the switch showing the rear of the four r.f. connectors with



One of the Dow-Key DK78 coaxial switches. This is the transfer model.

*Technical Director, *CQ*.



Interior view of the Dow-Key DK78-T coaxial transfer switch. See text for explanation of operation.

a single silver contact secured directly to the inner conductor of each.

When turned over, the section at the left fits on top of the right one and the upper dual-contact arm connects the upper r.f. connectors together while the lower dual-contact arm likewise joins the lower r.f. connectors. When the rotatable disc is turned 90 degrees, the dual-contact arms will be positioned vertically (running from top to bottom in the photograph) so one will now join the two left r.f. connectors together and the other, the two right connectors

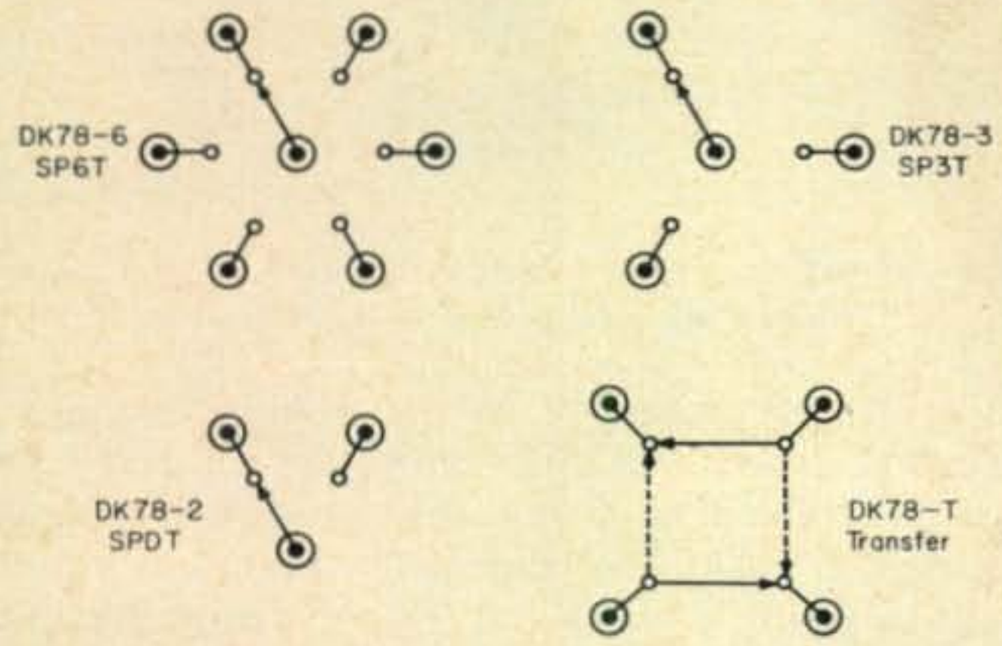


Fig. 1—Configurations available with the Dow-Key DK78 series of manually-operated coaxial switches.

together. Thus a transfer switching action is obtained. All the contacts, which are 3/16" diameter, are silver for reliability and low r.f. contact resistant, while a spring between the rotatable disc and the switch shell provides the necessary pressure to ensure a positive contact.

The metal enclosures around the dual-contact arms lessen impedance discontinuity and provide shielding between each arm or branch of the circuit to minimize cross talk. The small aperture near the ends of each enclosure allows passage and clearance over the r.f.-connector contacts when the switch is operated. The three cylindrical objects at the edge of the rotatable disc are part of the stop and detent arrangement. They also serve as guide bearings to maintain alignment.

Performance

The rated v.s.w.r. and cross-talk characteristics are shown at fig. 2. The only model we had on hand was the DK78-T transfer switch. This was checked up to 144 mc and its performance was within the specifications indicated by the curves shown, so the other models undoubtedly also would likewise meet their v.s.w.r. and cross-talk specifications.

Other specifications are as follows:

R.F. Ratings: 1 kw to 500 mc (switching not intended when r.f. power is applied).

Impedance: 50 ohms

Contacts: Fine silver, others available upon request.

Connectors Available: UHF are standard, types N, BNC, TNC and C are also available.

Operating Temperature Range: —55 degrees C. to +85 degrees C.

Finish: Coaxial connectors, silver plated; Body—black anodized.

Mounting: Requires one 7/16" diameter hole and one 5/32" diameter hole.

Weight: 10 oz.

Size: 3" diameter × 1⅛" deep.

Prices are as follows:

Model	*Standard Conn.*	*Spec. Conn.*
DK78-2	$12.75	$15.75
DK78-3	12.75	15.75
DK78-6	15.75	21.75
DK78-T	15.75	18.75

The DK78 switches are guaranteed for a period of one year. They are produced by the Dow-Key Company, Thief River Falls, Minnesota. ■

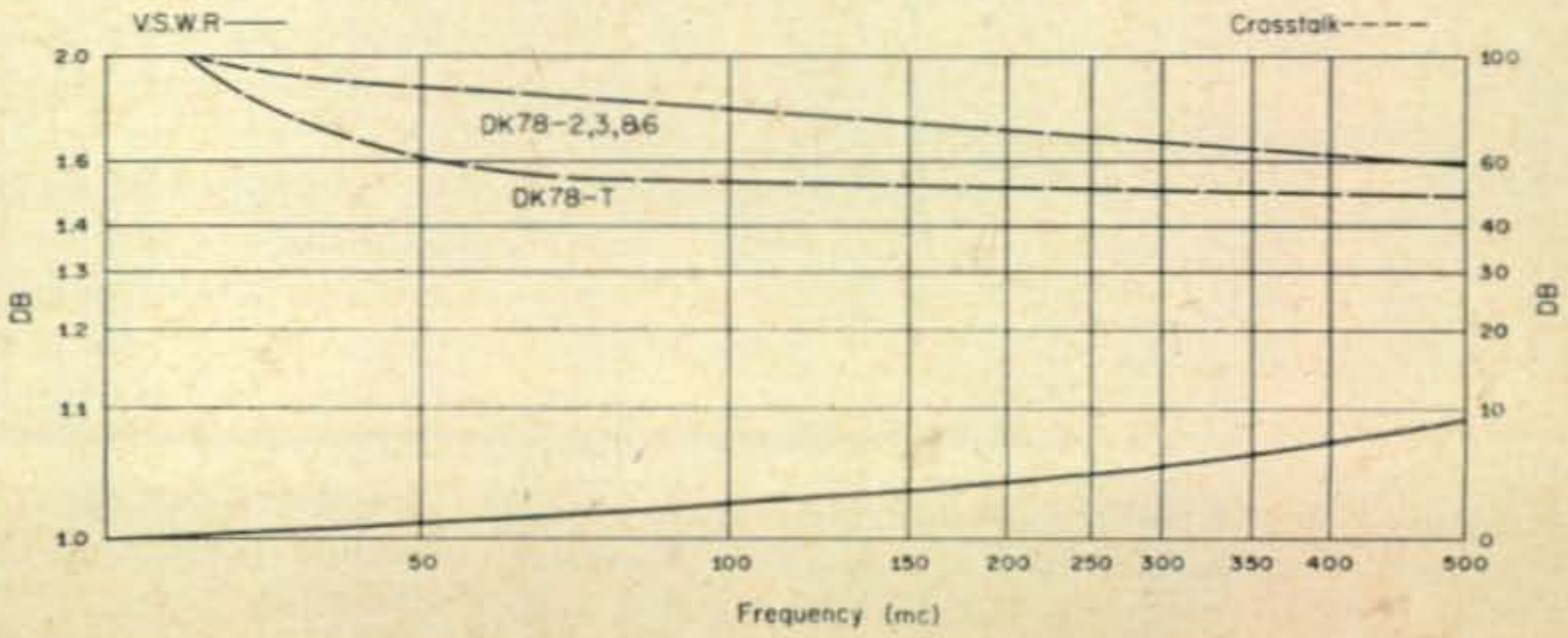


Fig. 2—The v.s.w.r. and cross-talk characteristics of the DK78 coax switches.

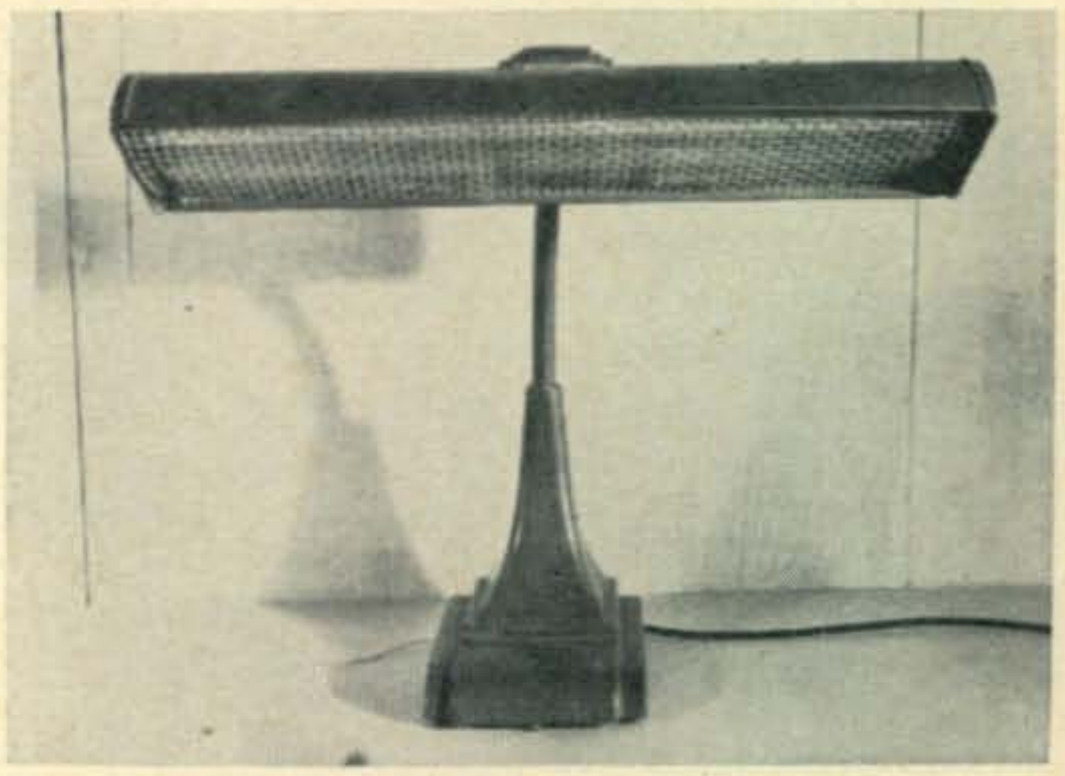
R.F. Filtered Lamps

BY LOU DEZETTEL,* W9SFW

Bothered by fluorescent desk lamp noise at your operating position? Here is a sure cure.

PROBABLY the most popular light source for the operating table of a ham shack is a fluorescent desk lamp. It is also one of the best random frequency signal generators there is. I wonder how many hams gave theirs the usual bypass capacitors treatment, still got too much interference, then gave up and switched to an incandescent lamp. I was one that almost did, but I solved the problem.

After using capacitors to keep the generated r.f. from backing out the a.c. line, there is still one avenue of escape for fluorescent r.f., direct from the lamps themselves, via the airwaves. The fluorescent lamps are really good transmitters, generating r.f., modulated by 60 cycles, and have self-contained antennas, so to speak.



View of the fluorescent lamps shielded by ¼" square chicken wire to prevent r.f. radiation.

Shielding

So what do you do with it? You "bottle it up." The bottling up process consists of keeping the r.f. out of the a.c. line, *and* shielding the lamps themselves. The schematic circuit shown in fig. 1 is that of a common two-lamp desk fixture, using the two-button on-off switch deal, instead of starters. The four capacitors are small disk ceramics, 1500 mmf at 500 volts. The ground symbol is the metal base or frame of the fixture. Also connect a long wire between one of the foot mounting screws in the metal base to an external ground. If your lamp has a wood base, you will need to bring this ground out from inside the base. The capacitor treatment shown here absolutely takes out all r.f. from the line.

The "radiators", or lamps themselves, are bottled up by covering them with a wire screen in the manner shown in the photo. The screen material is "chicken wire" or ¼" wire mesh. It can be bought in just about any hardware store, even in the city. The reflector hood of my lamp, and most of those I have seen, have inside folded lips on the two long edges that hold the white reflector. Cut the mesh into a rectangular shape just short of the long length, and just about the same width as that across the face of the hood. By carefully pressing on the mesh you can get it to practically snap into place, held by the edges of the hood foldover. One last thing; it is important that the hood have an external ground. If the hood is fastened to a metal base by a metal gooseneck or other metal support, the external ground mentioned above will be enough. If it is supported by wood, you will need to jumper or transfer the external ground wire to the hood.

Treat your metal fluorescent desk lamp like this and be in for a surprise. Never has so much r.f. been so thoroughly bottled up. There is absolutely no noise in the receiver, regardless of the polarity of the a.c. plug, the closeness of the lamp to the receiver or the ham band you are operating. ■

*10034 Luella Avenue, Chicago, Illinois.

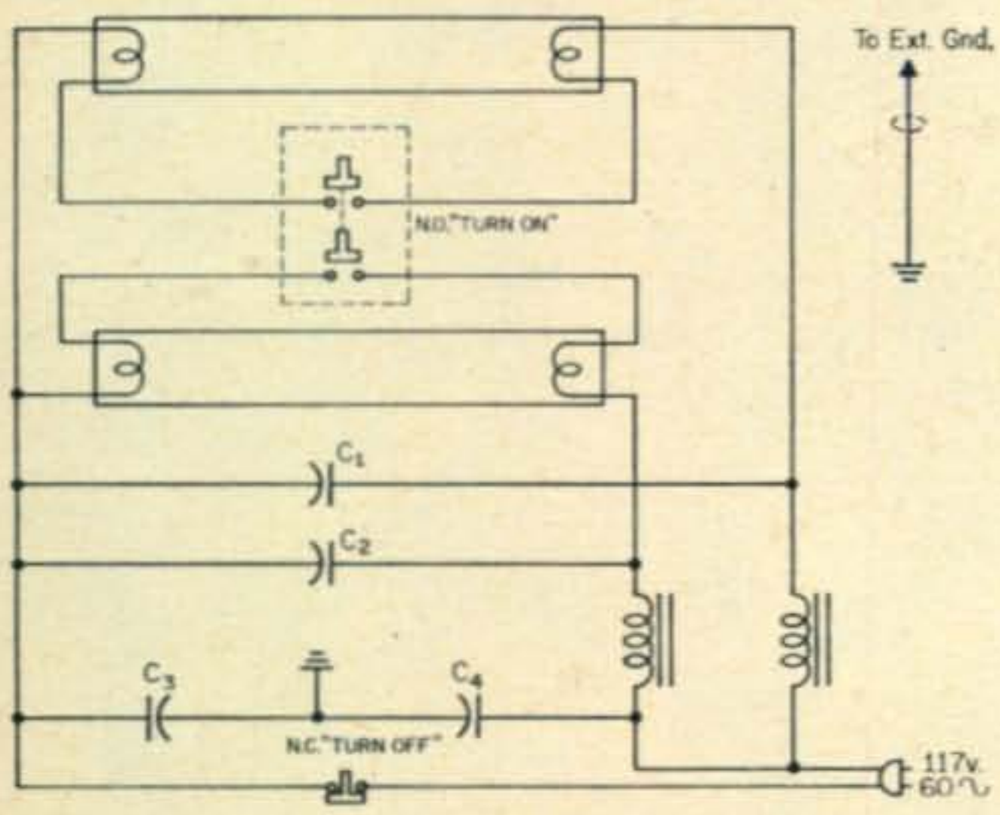


Fig. 1—Circuit of a two bulb fluorescent desk lamp using push button switches rather than starters. The capacitors C_1 to C_4, 1500 mmf disc ceramics, effectively block all hash from being fed back to the a.c. line.

Second Generation No-Clobber Converter For 2M.

BY ELWOOD C. THOMPSON*

THE excellent results obtained with the six meter converter described in a previous issue of *CQ*[1] led to experiments with a similar converter for the two meter band, which when completed provided ample justification of the original theories. The usual method of solving low noise, low cross-modulation and low overload factor problems in the six and two meter regions has been to over-emphasize the design characteristics of the r.f. stage and to neglect the inherent problems of the mixer stage where low overload is a vital determinant in the successful operation of the conversion process.

Basic Mixer Principles

Before going on to details of this circuit it seems advisable to quickly review a couple of the basic principles involved. Overload and cross-modulation are generally caused by strong signals that overcome the mixer bias (on positive peaks), causing the mixer to draw grid current and thus act as a detector. When a mixer starts to detect it is inevitable that the effect of this process will appear as a superimposed distortion product on all adjacent signals. A further result of this non-wanted detection is the desensitizing of the overall converter action due to a decrease in the efficiency of the heterodyning within the mixer itself.

Since the efficiency of any mixer stage is largely a result of the interacting relationships of the correct parameters for the particular tube being used, it is obvious that maximum efficiency, both in amplification and in the mixing process can be obtained only with the most optimum parameters coupled with proper input signal levels. Most problems originating in mixer stages, which are seldom traced to the true trouble source, occur when one or more parameters and/or input voltages vary from their optimum values. Obviously, when a mixer stage grid is forced into the grid current region by an excessively strong voltage impressed on the primary grid, a situation arises where action other than the mixing process begins. The voltage imposed on the secondary grid of the mixer coming from the oscillator stage is overridden and inherently modulated by the control grid when it is operating in this undesirable portion of the operating curve. This situation then prohibits mixing action in the exact proportion to which the control grid is drawing current and at this stage, it begins to act as a simple plate detector, with all of the resultant evils.

R.F. Amplifier

Nuvistors (6CW4's) were tried in the r.f. stage, but their noise figure[2] was not satisfactory in this region of the spectrum. During the experimental work we discovered that the Raytheon CK-5842/417-A did the job admirably and was incorporated in the final design.

The high Mu of this tube *plus the cathode coupling* used in all three stages proved to be the answer to the problems mentioned above. However, the problems inherent in the construction aspect of this converter should be emphasized here. It is most important that proper shielding between stages be provided for; that any stray coupling between the oscillator and other stages be eliminated, and that all grounds be run the shortest possible distance and to a common point, if possible.

Construction

During the experimental work on this converter it was found that the unwanted coupling problem was the most serious, from the construction angle. This was solved by copper shields *between and around all stages.* Mechanically the converter can take on many forms. This particular layout follows closely that of W2LVQ[3], which uses extensive shielding. The judicious use of r.f. chokes as a decoupling medium, augmented by properly placed bypass capacitors, cleared up the last major problem, and the converter began to operate as preliminary theories had predicted.

The 6DS4 Nuvistors are used in the cathode-coupled mixer primarily because of their remote-

*514 Forest Ave., Dayton, Ohio 45405.

[1]Thompson, E. C., "A No-Clobber Converter For 6 Meters," *CQ*, Dec. 1964, p. 48.

[2]Connelly, W6QID, "Noise Figures of V.H.F. Amateur Converters," *Electronics World*, Sept. 1964, p. 34.
Hall, J. A., "The Effect Of Converter Gain on Receiver Noise Figure," *QST*, Oct. 1964, p. 16.

[3]Gibbs, "A High Performance Two Meter Converter," *QST*, June 1964, p. 50.

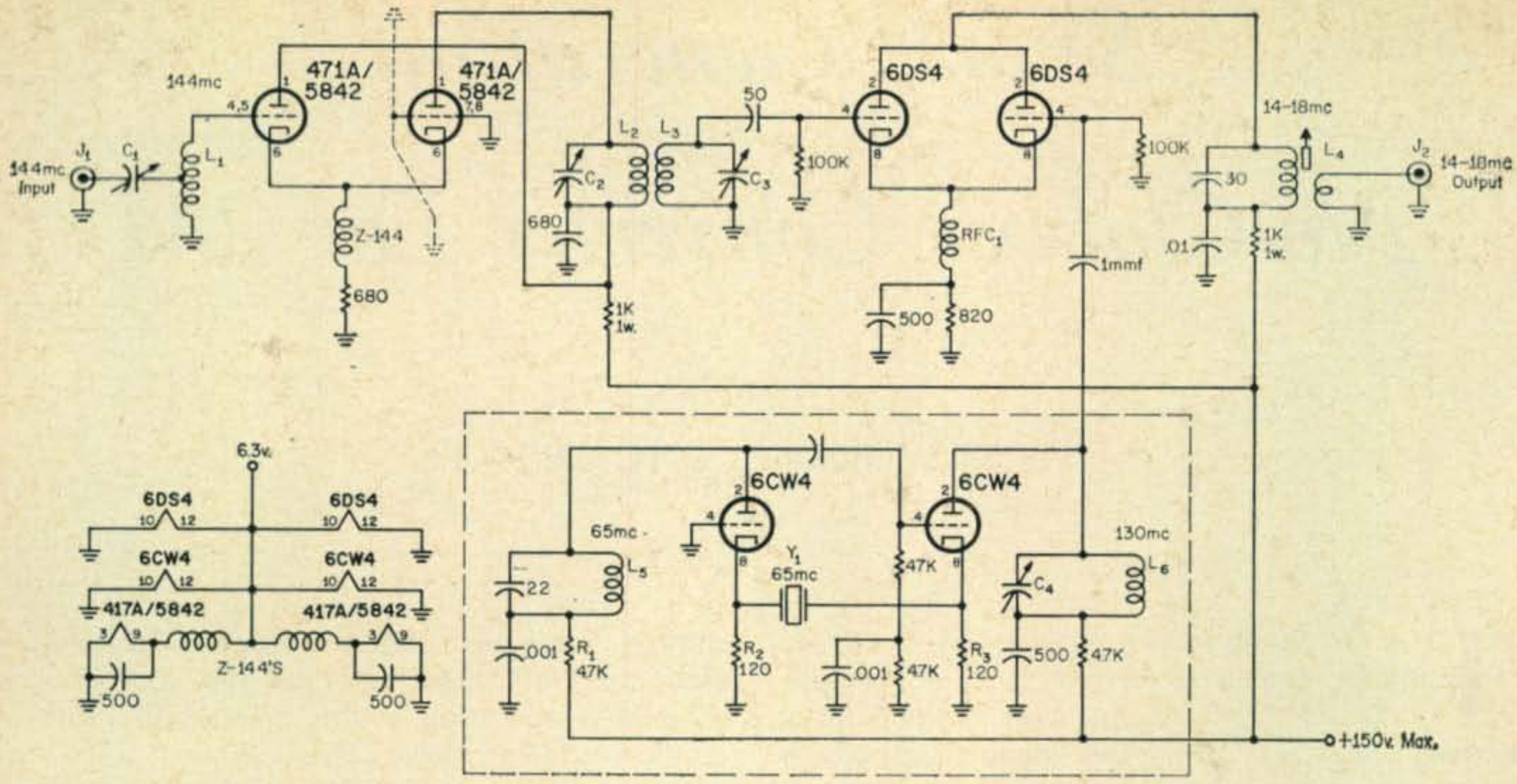


Fig. 1—Circuit of the No-Clobber Converter for 2 meters

C_1—7-45 mmf ceramic trimmer.
C_2, C_3—1-6 mmf tubular ceramic trimmer.
C_4—2-12 mmf ceramic trimmer.
L_1—4 t. #16 silver plated wire, 5/16" dia., ½" l. center-tapped.
L_2—7 t. #16 silver plated wire, ⅜" dia., ⅝" l.
L_3—4 t. #16 silver plated wire, 5/16" dia., ⅜" l.
L_4—22 t. #26 enamel, ⅜" dia., close-wound on slug tuned form. Link—4 t. #22 hookup wire at cold end of L_4.
L_5—6 t. #20 tinned, 5/16" dia., 5/16" l.
L_6—4 t. #16 tinned, 5/16" dia., ⅜" l.
RFC_1—10 t. #24 Formvar, 5/32" dia., closewound.
Y_1—65 Mc. crystal, International type FA-5.

cutoff characteristics. In addition, two separate tubes provide better isolation and a more stable mixer combination. The local oscillator (known as the Butler Oscillator) was chosen to provide maximum stability and trouble-free operation. This design insures an adequate amount of injection voltage, free of unwanted frequencies. This circuit uses two 6CW4 Nuvistors. The oscillator is essentially a grounded-grid amplifier and a cathode follower with feedback through a crystal connected between the cathodes. Since there is no phase shift through either the amplifier or the cathode follower section, the crystal must operate at series resonance. Oscillator output is doubled in the plate circuit of the second 6CW4 and fed to the grid of the cathode-coupled mixer.

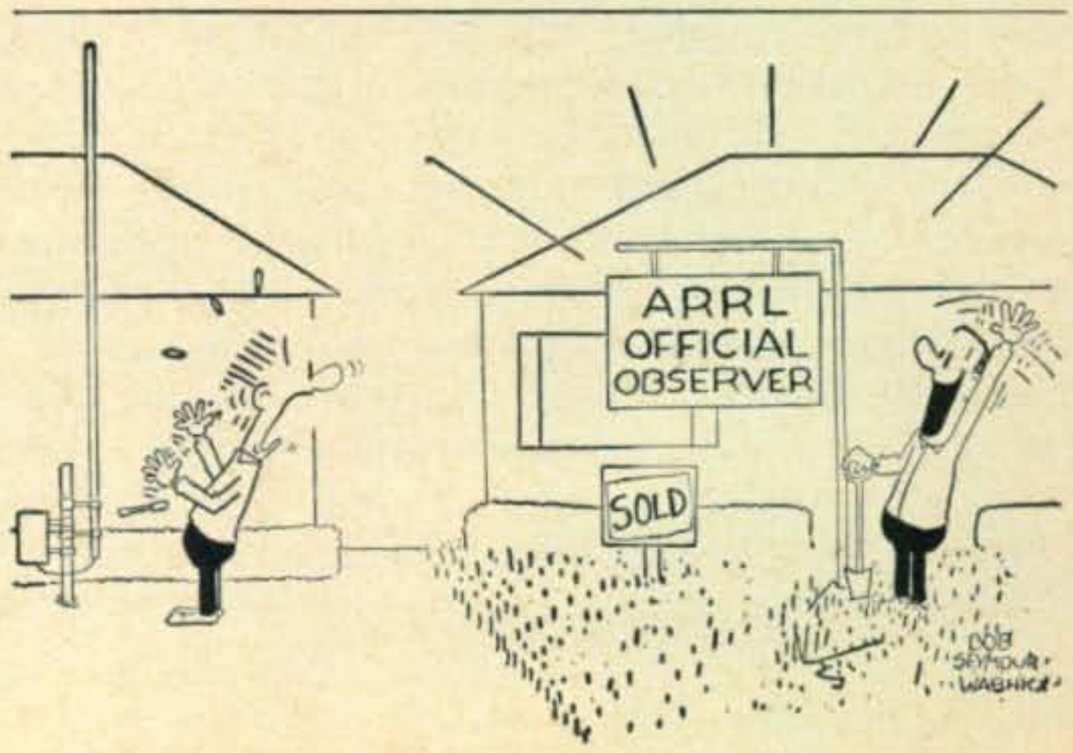
The only critical adjustments of this stage are the values of the cathode resistors, R_2 and R_3. The values of these resistors are reduced to a point where the output is minimum, but still retaining the oscillator's capacity to function at once when the B plus is switched on and off.

This stage requires extreme care in layout so that short direct connections can be made. The oscillator injection voltage may be varied by using a higher value dropping resistor, R_1, in series with coil L_5 in order that adjustments can be made that will not affect the signal-to-noise ratio, rather than the gain.

Further Steps

If you are still plagued by overload and cross-modulation the next step is a resonant cavity bandpass filter. This is not a difficult project and will amaze the constructor with its efficiency and ease of construction. However, this is another story and if enough interest is evident another article will be written on this fascinating addition to the solution of common v.h.f. reception problems. This converter worked as well as the six meter version and has provided a new delight in noise free, low distortion reception of two meter signals. The circuit itself and the construction techniques are within the capabilities of any serious minded v.h.f. experimenter and completion of this project will be a welcome addition to any ham shack.

The author wishes to thank K8AEC for his many hours of discussion and consultation on this highly controversial subject. ■



The CPR Award

BY MIROSLAV JOACHIN,* OK1WI

Buried in the logs of thousands of amateurs is information which, when properly tabulated, could provide the basis of a propagation study of tremendous proportions. From this study it may be possible to predict the probable date, time, quality and points of origin of a DX QSO, months or even years in advance, based on past performance! To encourage participation in the study, the IARC has inaugurated the CPR Award described below.

SHORT-WAVE intercontinental radio communications are now more than 40 years old. It would be impossible to evaluate the number of amateur long range communications which have occurred during this period, but it is obvious that the experience gained, if properly assessed, would provide a tremendous amount of information of value not only for operational but also for scientific purposes.

When the QSL card was introduced during the first years of shortwave amateur intercontinental communication, it was mainly intended as a material proof of QSO. Without such proof many people, including scientists, could suspect stations of being operated under false call-signs.

Soon afterwards, when the existence of the ionosphere was verified by pulse transmission, the possibility of long-range transmission of decametric[1] waves was theoretically investigated. It was, however, necessary to continue investigation of the ionosphere at different places in the world for a prolonged period before the fundamental connection between propagation conditions and solar activity was discovered.

By the nineteen-forties, it became possible to systematize the results of ionosphere observations in a comprehensive prediction technique.

It is well known that this method consisted of the division of the world into three zones. East (E), Intermediate (I), and West (W). In each of these zones the ionospheric characteristics were assumed to be identical. In some prediction methods, it was assumed that even two zones (E and W) would be sufficient to characterize the overall propagation conditions. Another assumption was that of so called "control points," at a distance of two thousand km from the ends of the communication path, which were assumed to be typical for the propagation over the given paths.

These rather rough approximations were necessary because of the time-consuming manual method of calculation.

The last decade has seen the introduction of electronic computers in the field of propagation predictions, and the International Radio Consultative Committee (CCIR) is now preparing an atlas of ionospheric characteristics for use in propagation predictions, giving ionospheric characteristics on a world-wide scale according to the time of day, month and degree of solar activity. Unfortunately, due to the lack of systematisation, the results of amateur radio experiments cannot yet be taken into account.

A large amount of information contained in radio amateur logs, when properly used, could allow elimination of some systematic distortions which could otherwise occur in the results due to the differences in the densities of radio amateur stations in different RR zones, the influence of hours of free time in different parts of the world, etc.

The CPR Award

To systematise the results of propagation experiments of the world amateur radio community in the last 40 years, it was decided to create a Radio Amateur's CPR (Contributed to Propagation Research) Award.

The goal is the preparation (and publication) by the IARC of a manual giving prevailing propagation conditions (probability of communication time) between each of the 75 ITU geographical zones, defined in Radio Regulations (Geneva, 1959)—therefore called "RR zones," as a function of the amateur band used, month, and the solar activity. This manual will be prepared on the basis of histograms giving probability of contact during appropriate time intervals (say 5 to 15 minutes). The histograms in their rough form will also be available for research purposes and be at the disposal of participating amateur radio societies.

Requirements

The CPR Award is issued by the International Amateur Radio Club (IARC), operators of 4U1ITU in Geneva, Switzerland.

*President, International Amateur Radio Club (IARC), Geneva 20, Switzerland.

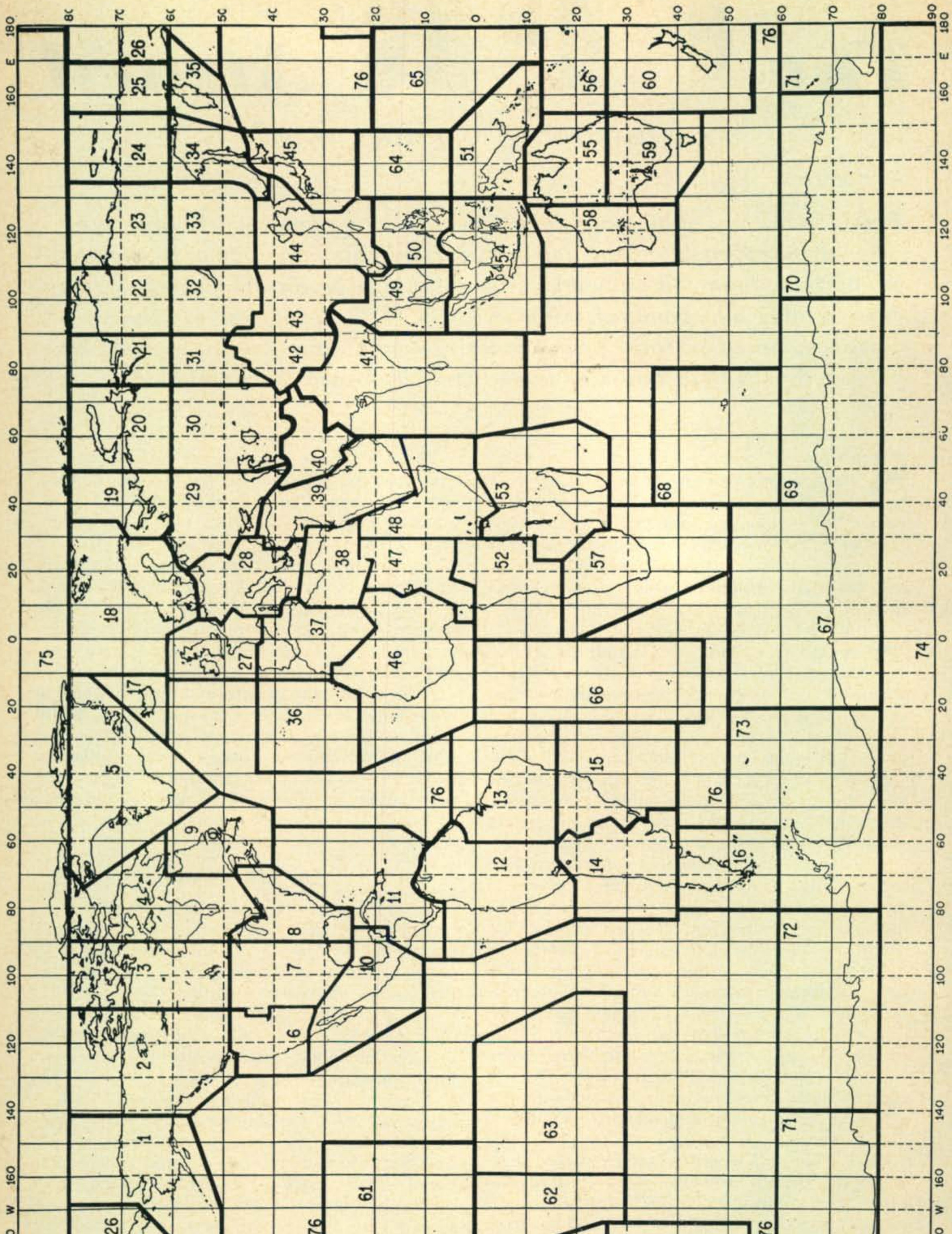


Fig. 1—Map showing the "R.R. Zones" established at the 1959 ITU Conference in Geneva. As far as amateurs are concerned, these zones are used only for the purposes of the CPR (Contributed to Propagation Research) Award issued by the International Amateur Radio Club in Geneva. Please note that these zones *do not* correspond to those used for CQ's WAZ (Worked All Zones) Award, which were in effect internationally prior to the 1959 conference. Maps indicating the pre-1959 zones (for WAZ purposes) are available free from CQ.

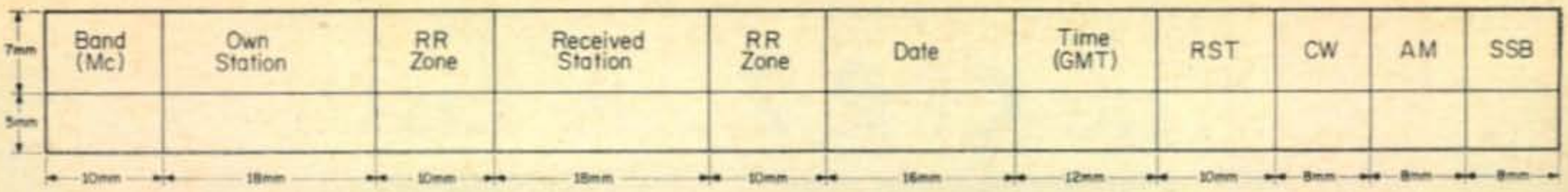


Fig. 2—Standard suggested log form will facilitate handling data for the CPR Award. The form shown is actual size. In addition to using this form for submitting CPR data, it is suggested that it be incorporated at the lower edge of QSL cards to ease the gathering of data, and to speed deliveries of QSL's by QSL bureaus.

Both active and former radio amateurs (and s.w.l.'s) throughout the whole world can participate. Families of deceased radio amateurs can also participate in the winning of an "in memoriam" CPR award.

For the purposes of this award, the world is divided into 76 zones. (The list of countries within each zone can be found at the end of this material.)

Any radio communication between different zones, or reception of an amateur radio transmission from a different zone, can be taken into account, provided that the communication or reception report has been confirmed by a QSL card and that frequencies in the 160 through 10 meter amateur bands have been used.

The submitted data should be arranged as indicated in fig. 2 and should contain the band, call signs of the called and calling stations and their geographical zones, time (GMT or Universal Time), date, RST, and type of emission.

The following awards will be issued by the IARC:

1st class: Award for more than 10,000 confirmed amateur radio communications or receptions.

2nd class: Award for more than 5,000 confirmed amateur radio communications or receptions.

3rd class: Award for more than 1,000 confirmed amateur radio communications or receptions.

4th class: Award for more than 100 confirmed amateur radio communications or receptions.

Furthermore, a 4U1ITU CPR Gold Medal will be awarded to amateurs who contribute in an outstanding manner beyond the conditions required to obtain the 1st class CPR award.

In cases of doubt, a national amateur radio society may be asked to verify the existence and correctness of QSL cards indicated in the applicants' reports. By sending in their results to the IARC, the applicants accept the IARC ruling in the matter and agree to the inclusion of their propagation results in the manual of amateur radio propagation, published by the IARC.

The Standard Log Form

To facilitate handling of the log data, a specific form *must* be followed. This form is shown in fig. 2. The data to be entered is as follows:

Band: The band of operation must be indicated by a two-digit number entered in the following manner:

1.7 mc	02	14 mc	14
3.5 mc	04	21 mc	21
7.0 mc	07	28 mc	28

Own Station: Enter your own call or if you are an s.w.l., enter your s.w.l. identification.

Your Zone (RR): Enter the zone location of your station, according to the Radio Regulations (Geneva, 1959). See fig. 1.

Station Called or Received: Enter the call of the station worked or heard (fig. 1).

His Zone (RR): Enter the zone location of the station worked or heard. (fig. 1).

Date: The date entered must consist of a group of six numbers in the following sequence: Day (01-31); Month (01-12); Year (last two numbers only). Thus, March 18, 1965 would be 180365, and June 3, 1960 would be 030660.

Time: The time entered *must* be in Universal Time (GMT) and consist *only* of four digits, *i.e.*, 1321.

RST: Enter the signal report of the received station (either two or three digits).

CW/AM/SSB: Place an "X" in the appropriate column for the mode of operation of the received station. In the other two columns, place an "O", indicating that these modes were *not* used.

Side Benefits of the Standard Log

The form suggested above for the CPR Award, if used at the bottom of QSL's, would eventually facilitate CPR Award applications by an amateur. The applicant would then simply transpose the information, letter for letter, directly from the QSL to his CPR log. It would even be possible to use photographic reproduction and automation for the transposition.

Furthermore, the ever increasing number of QSL cards arriving in the QSL bureaus of the amateur radio societies could be sorted and distributed to different destinations with the use of electro-mechanical methods now becoming common in the postal services. Therefore, it would be much appreciated if the radio amateurs of the world study the proposed form of notation and communicate to the IARC their proposals or amendments, or their consent.

It would be too soon to talk already on the final statistical evaluation of the CPR competition; but with the cooperation of the world's amateur radio community, there is no doubt that very interesting results concerning radio propagation research could be reached. ■

Turn page for CPR Zone List

The CPR Zone List

The listing below shows the 76 zones used for the CPR (Contributed to Propagation Research) Award issued by the International Amateur Radio Club in Geneva, Switzerland. The zones indicated bear no relationship *to the 40 zones used in CQ's Worked All Zones Award. Note that Zone 76 includes all areas not covered by another zone (fig. 1).*

Zone	Prefix	Country
1	KL7	Alaska
2	KL7	Alaska (South of 60° N.)
	VE	Canada (South of 80° N. and West of 110° W.)
3	VE	Canada (South of 80° N. and bet. 90° and 110° W.)
4	VE	Canada (South of 80° N. and bet. 70° and 90° W. incl. Baffin I.)
5	OX, KG1	Greenland
6	W, K	U.S.A. (Wash., Ore., Calif., Nev., Ariz., Utah, Idaho and the part of Mont. West of 110° W.)
7	W, K	U.S.A. (N. Dak., S. Dak., Neb., Wyo., Col., N. Mex., Tex., Okla., Kans., La., Ark., Miss., Iowa, Minn., the part of Mont. East of 110° W.)
8	W, K	U.S.A. (Wisc., Mich., Ill., Ind., Penn., Miss,. Ala., Ga., Fla., N. Car., S. Car., Va., W. Va., Md., Dela., Ohio, Penn., N. J., N. Y., Conn., Rhode I., Mass., New Hamp., Vt., Me.)
9	VE	Canada (South of 80° N. and East of 70° W. incl. Labrador, New Foundland, Nova Scotia, excl. Baffin I.)
	FP	Miquelon, St. Pierre I.
10	FO8	Clipperton I.
	XE, XF	Mexico
	XE4	Revilla Gigedo
11	CM, CO	Cuba
	FG7	Guadaloupe I.
	FM	Martinique
	FS7	Saint Martin I.
	HH	Haiti
	HI	Dominican Rep.
	HKØ	Bajo Nuevo
	HKØ	Malpelo
	HKØ	St. Andres & Providencia
	HP	Panama Rep.
	HR	Honduras Rep.
	KC4	Navassa I.
	KG4	Guantanamo Bay
	KP4	Puerto Rico
	KS4B	Serrana Bank & Roncador Cay
	KS4	Swan I.
	KV4	Virgin I.
	KZ5	Canal Zone
	PJ2M	Sint Maarten
	TG	Guatemala
	TI	Costa Rica
	TI9	Cocos I.
	VP1	Brit. Honduras
	VP2H	Anguilla
	VP2A	Antigua, Barbuda
	VP2V	British Virgin I.
	VP2G	Grenada & Dependencies
	VP2D	Dominica I.
	VP2M	Montserrat
	VP2K	St. Kitts, Nevis
	VP2L	St. Lucia
	VP2S	St. Vincent & Dependencies
	VP5	Cayman I.
	VP5	Jamaica
	VP5	Turks Caicos I.
	VP6	Barbados
	VP7	Bahama I.
	VP9	Bermuda I.
	YN, YNØ	Nicaragua
	YS	Salvador
12	FY	French Guiana & Inini
	HC	Ecuador
	HC8	Galapagos I.
	HK	Colombia
	OA	Peru
	PJ	Neth. West Indies I.
	PZ	Neth. Guiana (Surinam)
	VP3	British Guiana
	VP4	Trinidad & Tobago I.
	YV	Venezuela
	YVØ	Aves I.
13	PY	Brazil (North of 16° 30′ S.)
14	CE	Chile (South of 20° S.)
	CEØZ	Juan Fernandez
	CP	Bolivia
	CX	Uruguay
	LU	Argentina (North of 40° S.)
	ZP	Paraguay
15	PY	Brazil (South of 16° 30′ S.)
	PYØ	Fernando de Noronha
	PYØ	Trindade & Vas I.
16	CE	Chile (South of 40° S.)
	LU	Argentina (South of 40° S.)
	VP8	Falkland I.
17	TF	Iceland
18	LA/p	Jan Mayen
	LA	Norway
	LA/p	Svalbard
	OH	Finland
	OHØ	Aland I.
	OY	The Faeroes I.
	OZ	Denmark
	SL, SM	Sweden
19	UA1-6	European USSR (European part bet. 60° and West of 50° E.)
	UN1	Karelo-Finnish Rep.
20	UA1-6	European USSR (European part bet. 60° and 80° N. and East of 50° E.)
	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and West of 75° E.)
21	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and bet. 75° and 90° E.)
22	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and bet. 90° and 110° E.)
23	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and bet. 110° and 135° E.)
24	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and bet. 135° and 155° E.)
25	UA9, Ø	Asiatic USSR (Asiatic part bet. 60° and 80° N. and East of 170° E.)
26	UA9, Ø	Asiatic USSR (Asiatic par tbet. 60° and 80° N. and bet. 155° and 170° E.)
27	EI	Ireland
	F	France
	G, GB	England
	GC	Channel I.
	GD	Isle of Man
	GI	Northern Ireland
	GM	Scotland
	GW	Wales
	HB	Switzerland
	HE	Liechtenstein
	LX	Luxembourg
	ON	Belgium
	PA, PI	Netherland
	PX	Andorra
28	DL, DJ, DM	Germany
	FC	Corsica
	HA	Hungary
	HV	Vatican
	I	Italy and Sicily
	IS	Sardinia
	LZ	Bulgaria
	M1	San Marino
	OE	Austria
	OK	Czechoslovakia
	SP	Poland
	SV	Crete
	SV	Dodecanese (Rhodos)
	SV	Greece
	UR2	Estonia
	YO	Roumania
	YU	Yugoslavia
	ZA	Albania
	ZB1	Malta
	3A	Monaco
29	UA1-6	European USSR (Europ. part South of 60° N. and West of 50° E.)
	UA2	Kaliningrad
	UB5	Ukraine
	UC2	White Russian S.S.R.
	UD6	Azerbaijan
	UF6	Georgia
	UG6	Armenia
	UO5	Moldavia

Zone	Prefix	Country
	UP2	Lithuania
	UQ2	Latvia
30	UA9, Ø	Asiatic USSR (South of 60° N. and West of 75° E.)
	UH8	Turkoman
	UI8	Uzbek
	UJ8	Tadzhik
	UL7	Kazakh
31	UA9, Ø	Asiatic USSR (South of 60° N. and bet. 75° and 90° E.)
	UM8	Kirghiz
32	UA9, Ø	Asiatic USSR (South of 60° N. and bet. 90° and 110° E.)
	JT	Mongolia (West of 110° E.)
33	UA9, Ø	Asiatic USSR (South of 60° N. and bet. 110° and 135° E.)
	JT	Mongolia (East of 110° E.)
	C9	Manchuria
34	UA9, Ø	Asiatic USSR (South of 60° N. and East of 135° E. incl. Sachalin and Vladivostock)
35	UA9, Ø	Kamchatka and Kuril I.
36	CT2	Azores I.
	CT3	Madeira I.
	EA8	Canary I.
37	CN2	Tangier
	CN2, 8, 9	Morocco
	CT1	Portugal
	EA	Spain
	EA6	Balearic I.
	EA9	Ifni
	EA9	Spanish Morocco
	FA	Algeria
	ZB2	Gibraltar
	3V8, TS	Tunisia
38	SU	U.A.R. (Egypt)
	5A	Libya
39	HZ	Saudi Arabia
	JY, ZC1	Jordan
	MP4	Bahrein I.
	MP4	Quatar
	MP4	Trucial Oman
	OD5	Lebanon
	TA	Turkey
	VS9	Aden, Soccotra
	VS9K	Kamaran I.
	VS9	Sultanate of Oman
	YI	Iraq
	YK	Syria
	ZC4, 5B4	Cyprus
	ZC6	Palestine
	4W1	Yemen
	4X4	Israel
	9K2	Kuwait
	9K3	Kuwait (Neutral Zone)
40	EP, EQ	Iran
	YA	Afghanistan
41	AC3	Sikkim
	AC5	Bhutan
	AP	East Pakistan
	AP	West Pakistan
	CR8	Damao, Diu
	CR8	Goa
	VS9M	Maldive I.
	VU	India
	VU	Laccadive I.
	4S7	Ceylon
42	AC4	Tibet (West of 90° E.)
	BY, C	China (West of 90° E.)
	9N1	Nepal
43	AC4	Tibet (East of 90° E.)
	BY, C	China (bet. 90° and 110° E.)
44	BY, C	China (East of 110° E.)
	BV, C3	Taiwan
	CR9	Macao
	HL, HM	Korea
	VS6	Hong Kong
45	JA, KA	Japan
	KAØ, KG6I	Bonin, Volcano I.
	KR6	Ryukyu
46	CR4	Cape Verde I.
	CR5	Portuguese Guinea
	EA9	Rigo d'Oro
	EAØ	Spanish Guinea
	EL	Liberia Rep.
	FF8	French West Africa (before Aug. 6, 1960)
	TJ	Cameroons
	TU	Ivory Coast (after Aug. 7, 1960)
	TY	Dahomey (after Aug. 1, 1960)
	TZ	Mali Rep. (after June 20, 1960)
	XT	Voltaic Rep. (after Aug. 5, 1960)
	ZD1	Sierra Leone
	ZD3	Gambia
	5N2, ZD2	Nigeria
	5T	Mauretania (after June 20, 1960)
	5U7	Niger (after Aug. 3, 1960)
	FD, 5V	Togo
	6W8, FF8	Senegal Rep.
	7G1	Rep. of Guinea
	9G1	Ghana
47	CR5	Sao Thome, Principe
	FQ8	French Eqator. Africa (before Aug. 16, 1960)
	ST	Sudan (West of 30° E.)
	TL	Rep. of Central Africa (after Aug. 16, 1960)
	TN	Congo Rep. (Brazzaville after Aug. 16, 1960)
	TR	Gabon Rep. (after Aug. 16, 1960)
	TT	Chad Rep. (after Aug. 16, 1960)
48	ST	Sudan (East of 30° E.)
	ET2	Eritrea
	ET3	Ethiopia
	FL8	French Somaliland
	I5	Italian Somaliland (before June 30, 1960)
	VQ4	Kenya
	VQ5	Uganda
	VQ6	Brit. Somaliland (before June 30, 1960)
	6O1, 2	Somali Rep. (after July 1, 1960)
49	HS	Thailand
	VU	Andaman, Nicobar I.
	XW8	Laos
	XZ	Burma
	3W8, XV5	Vietnam
	—	Cambodia
50	DU	Philippines
51	JZØ	Neth. New Guinea
	VK9	Papua
	VK9	New Guinea
	VR4	Solomon I.
52	CR6	Angola
	9Q5, OQ5, OQØ	Congo Rep. (Leopoldville)
	9U5	Ruanda Urandi
53	CR7	Mozambique
	FB8	Comoro I.
	FB8	Tromelin I.
	FR	Reunion I.
	VQ1	Zanzibar (see Tanzania, 5H3)
	VQ2	Northern Rhodesia (Zambia, after Oct. 24, 1964)
	VQ3, 5H3	Tanganyika 5H3 Tanzania (after April 26, 1964)
	VQ8	Cargados Carajos
	VQ8	Chagos I.
	VQ8	Mauritius
	VQ8	Rodriguez I.
	VQ9	Seychelles
	ZD6	Nyassaland (Malawi, after July 6, 1964)
	ZE	Southern Rhodesia
	5R8	Malagasy Rep. (after July 1, 1960)
	—	Aldabra I.
54	CR10	Timor
	PK1, 2, 3	Java
	PK4	Sumatra
	PK5	Neth. Borneo
	PK6	Celebes, Molucca I.
	VS1	Singapore
	VS4	Sarawak
	VS5	Brunei
	ZC5	Brit. North Borneo
	9M2	Malaya
55	VK	Australia (VK4, VK5-North Territory)
56	FK	New Caledonia
	FU8, YJ	New Hebrides I.
	VR2	Fiji I.
57	ZS1, 2, 4, 5, 6	Union of South Africa
	ZS2	Marion I.
	ZS3	South West Africa
	ZS7	Swaziland
	ZS8	Basutoland
	ZS9	Bechuanaland
58	VK6	Australia
59	VK	Australia, Tasmania (VK5-South Austr., VK1, 2, 3, 7)
60	VK	Lord Howe I.
	VK4	Willis I.
	VK9	Norfolk I.
	KVØ	Macquarie I.
	ZL	Auckland and Campbell I.
	ZL	Chatham I.
	ZL1	Kermadec I.
	ZL	New Zealand
61	KB6	Baker, Howland, Phoenix I.

[*Continued on page 98*]

DX

BY URB LE JEUNE,* W2DEC

Here and There

EL Liberia: The radio amateurs in Liberia, Africa have formed a club called "EL-TWO's". They have forty-two members. At their first meeting, it was agreed that a field day be held from 1200-2400 GMT on Saturday, March 13, 1965. Special QSL cards will be issued for all contacts made on this field day. At a later date, awards will be given to stations working one of each amateur in each of the call areas EL1 thru EL9. Be sure to listen for a EL2 station. Transmitters will be on 7010, 14020, 14260, 21030 and 21300 kc on March 13th. *(Tnx EL2AI).*

FB8W Grozet Island: The new FB8WW operator, Maurice, is now reported active using the Hallicrafters SR-150 transceiver, formerly used by FB8ZZ. He has been reported QRV on various frequencies in the 14 mc band.

FR7 Reunion Islands: FR7ZI, J. J. Terrasson, Box 253, St. Denis, active on low end of c.w. usually around 14010 kc from 1900 GMT.

HC8 Galapagos: HC8FN, Forrest, usually 14110 kc from 1200 GMT weekends. *(Tnx WGDXC).*

HS Thailand: HS1P/W4LCY, Phil says, in WGDXC, that the Radio Amateur Society of Thailand is now legally registered and in process of petitioning the government to recognize and license amateurs. However, it is a long process and when, as or if such activity is permitted, W4LCY will inform WGDXC. Until that time, working HS1 stations remains illegal.

KG6: Marcus, KG6IF; Iwo Jima, KG6IJ; Saipan, KG6SB, are all active on s.s.b. around 14250-14270 kc. *(Tnx WGDXC).*

KS6 American Samoa: KS6BN is active daily on 14 mc c.w. starting at 0700 GMT.

LA Jan Mayen: The following stations are active from Jan Mayen. LA's 2AJ, 2QJ, 3IJ, 3P, 4EJ, 5AJ and 8FI.

PY Trinidade Island: PY1BCR 14083 kc drifting T7 note reported now active around 2200 GMT. *(Tnx WGDXC).*

SVØ Rhodes: The following are active from Rhodes: SVØWF and SVØWQ.

SVØ Crete: The following are active from Crete, SVØ's WT, WO, WR, WFF, WGG, WKK. *(TNX WGDXC).*

VK4 Willis Island: VK4TE may be found weekends on 7022 kc between 0700 and 1000 GMT, also 14062/14080 kc at the same time. VK4TE returns to the mainland in June. *(Tnx WGDXC and NEDXA).*

VK9 Christmas Island: VK9DR skeds VK6RU weekends at 0045 GMT on 14146 c.w. *(Tnx NEDXC).*

VP2K St. Kitts: Please note that VE6TP is not the QSL manager of the most recent VP2KT operation, only of the VP2KT operation by Reg, VE8RG, during October of 1963.

VP5 Grand Turk: Bert, VP5BB/W4IOI, passes on the following: "All QSLs for Grand Turk are to be made direct via the proper mail service, that is for the missile base station thru Patrick AFB and the Naval Facilities Stations thru Navy 104, FPO, New York. The *Callbook* specifies all QSLs be made direct. Occasionally, some of my QSLs are made via the home station, W4IOI, where I am at present. There is no QSL Bureau for Grand Turk Island, nor do I, VP5BB, have a QSL manager.

"It might be of interest to note that VP5CW is now ZD8CH on Ascension Island; VP5CH is now VP7DF on San Salvador Island and VP5NK gets his mail direct not via VP5BB.

"It sure would be great if DXers would avail themselves of an up-to-date *Callbook*. I have most likely lost out on QSLs by the senders having sent them to some supposed QSL Bureau. I must add that the RSGB was instrumental in forwarding QSLs to Grand Turk."

VR6 Pitcairn Is.: Tom, VR6TC, has a weekly sked with W5OLG. After their sked on Mondays on 21060 kc at 2000 GMT, Tom will stand by for others. *(Tnx WGDXC).*

VS9O Oman: Thanks to W4RBZ for passing on this letter he received from Alex of VS9OC. "Dear Bob, Many thanks for your card and I have pleasure in returning the compliment. Yes, I hope to see you on s.s.b. sometime although I am afraid that it will not be before 1965, allocation of grants and funds is a slow business.

"It appears that some publication in the States is giving the address of our club as "Cpl. T. E. Druce, etc." and since Cpl. Druce has been back in England for some time now, cards for the club are making the unnecessary journey out here, back to the UK, and then readdressed once more to the club. This results in considerable delay. In fact, this happened to your own card. All cards for VS9OC should be addressed to: VS9OC Amateur Radio Club, Royal Air Force, Masirah, BFPO 69. via APO London and not to individuals. The cards, of course, can be marked to Alec, Earl, Dave or whatever the operator's name happens to be.

"Since overseas tour on Masirah is only 12 months, quite a number of cards arrive after the operator has left for home. If the cards are addressed to the club, they can then be confirmed."

XT2 Upper Volta Republic: XT2HV, Gilbert, now is active almost every day around 1800 GMT between 14105-120 kc. We will be there until about June of 1965. QSL to Gilbert Demangeat, Boite Postale 788, Ouagadougou, Rep. Upper Volta. He has and will tune for W/Ks when requested about 14250 kc. *(Tnx VERON).*

*Box 35, Hazlet, New Jersey 07730.

The following certificates have been issued during the period from December 6th, 1964 to and including January 5th, 1965:

CW-PHONE WAZ

2080	SM5BST	Bernt Endermark
2081	WA6FTM	D. Alfred Dantes
2082	K6OT	Wesley J. Wiseman
2083	W2FVI	LeRoy Reeves
2084	EA3KI	Juan Oliveras Parldes
2085	JA2DO	R. Takasu
2086	W4NO	Fred B. Westervelt
2087	W2EXH	Arthur Fenster
2088	W5LRY	Pat W. Hiati
2089	KØUKN	Bill Dennis
2090	WA6QGW	Oliver Sweningsen
2091	OH3TA	Vilho K. Hiilesmaa
2092	F9BB	Louis Fenu
2093	W2QDY	Joseph J. Blair
2094	W5RU	Roy L. Alciatore
2095	W8FKY	Paul R. Brumbaugh
2096	W6KTE	R. J. Krist
2097	I1ZCT	Segio Pesce

ALL-PHONE WAZ

279	DJ5LA	August Lehner
280	WA2AEI	John D. Griffiths
281	KØUKN	Bill Dennis
282	W6KTE	R. J. Krist

TWO-WAY SSB WAZ

282	WA2AEI	John D. Griffiths
284	VE6SF	Ray J. Nadeau
285	K2JGG	T. A. Hughes
286	K4WHD	Edmund Baydush
287	KØUKN	Bill Dennis
288	W6KTE	R. J. Krist
289	SM7BKZ	Stig Nilsson

CW WPX

598	K6KII	Clifford G. Moore
599	UA3NP	G. T. Shaztsev
600	UA4SM	Vouri E. Dmitriev
601	UQ2AS	L. H. Freimanis
602	SM3BNV	Bengt Eurenius
603	CR6AI	Joao Carlos Chaves
604	JA1BN	Akira Tani
605	VQ4KRL	Kenneth R. Long
606	WA2RUB	Richard Koppel

SSB WPX

203	F2MO	Michel Dort
204	W4HKJ	William E. Ethier

MIXED WPX

108	W4HKJ	William E. Ethier
109	I1HL	Luciano Hinze
110	F3ZU	J. P. A. Morpain

YK Syria: Rasheed, YK1AA, active most days lately 1400-1500 GMT anywhere 14240-14300 s.s.b. usually long path from East Coast depending on general band conditions. QSL Box 35, Damascus, Syria.

ZB1 Malta: The following news is from ZB1A. "Not much news from ZB1 land; I am still almost the only active ZB1 on s.s.b. ZB1CR's equipment was taken over by ZB1HKO but he is very seldom active. Following independence last September, we are expecting the prefix to be changed to 9H1 but no information is available as to when the change is to take place. If you can spare a few words in your column, would like to know the whereabouts of W4WRK/MM."

ZD9 Tristan De Cunah & Gough Islands: ZD9RB operates c.w. various frequencies 14000-14100 kc each Sunday between 1300-1700 GMT. *(Tnx WGDXC).*

ZL4 Campbell Island: ZL4JF, with a new operator, is active again. Kip so far only has been reported on 14 mc s.s.b. working W stations transceive on the high end around 1330 GMT. He is running very low power only about 30-40 watts p.e.p., which makes it difficult to find him. He has also been reported active around 0900 GMT on 14315 and 14325 kc. *(Tnx VERON).*

5T5 Mauritania: 5T5AD reported active around 14250 kc 2000-2100 GMT.

7G1 Republic of Guinea: 7G1H 14345 and 21445 kc s.s.b. from 1100 GMT daily and QSLs go to Harold Charvat, K9BPO, 207 Mandel Lane, Prospect Hts., Illinois. This operation is part of Project *Hope* using SR-150, SX-117 and rotary beam located in Seaman's Club in Conakry, where it will remain active until the departure of the S. S. *Hope* slated for August 15, 1965. W8BZB/7G1 is on the hospital ship along with 88 members of the medical staff, 89 trainees, 35 nurses and dozens of volunteer doctors, plus 92 officers and crew. *(Tnx WGDXC and NEDXC).*

9M8 Sarawak: 9M8EB is currently active on s.s.b. on 14100/14125. Best time is around 1100 GMT and 2300 GMT. *(Tnx VERON).*

DX, The International Handclasp

The Virginia Century Club has awarded the 1964 DX Certificate for outstanding contribution to the advancement of DX during the past year to W2GHK, Stuart Meyer of Linden, New Jersey. Stu's energy, enterprise and ingenuity have been responsible for the phenomenal success of "The DXpedition of the Month" sponsored by Hammarlund Manufacturing Company. Without Stu, the man behind the scenes, the various DXpeditions and the expeditious handling of QSL cards would have bogged down and many "new countries" would not have been heard.

The handsomely engraved certificate was presented at the Club's annual dinner on January 22nd in Norfolk, Virginia. The 1962 award went to Gus Browning, W4BPD, and the second award was received by Ack Atkerson, W4ECI, Gus' QSL manager and mentor. All these amateurs have played a tremendous part in extending the international handclasp of DX to little known parts of the world.

The runner up for the award was W9WVN, who was responsible for the great adventure in Cambodia and Viet Nam, together with numerous other "hard to get" countries. His part in the great activity in DXing is recognized and appreciated and he will be notified by letter.

The Virginia Century Club has also issued a special letter of commendation to W2CTN, Jack Summings, of Amityville, New York, expressing appreciation for the work he has ac-

complished during the past several years as QSL manager for many foreign countries thereby enabling QSL cards to be received without undue delay and expense.

160 Meters

More than 50 nations are participating in the International Quiet Sun Year research program, a sequel to the IGY, (International Geophysical Year of 57-58). This IQSY is a two year program starting Jan. 1, 1965 when sunspot and solar flare activity is at a low point, in an approximate 11 year cycle. At their peak, sunspots and solar flares release bursts of electrical particles and disrupt or assist radio communications, making the sky bright with auroras, and upset the earth's magnetic fields.

The principle objective of the IQSY will be to gather data and then compare it with the data gathered when the sun was most active during IGY 57-58—its greatest activity in 200 years. U.S. scientists will concentrate on eight major fields. Rockets and balloons around the world will probe the earth's uppermost atmosphere—11 miles and beyond. A pioneer type space probe will be launched and many other scientific activities will abound. As an adjunct gation conditions that exist on the amateur to this, the activity of the ionospheric propabands, communication-wise, will be of great interest.

Considerable attention is focused on the lower frequencies, since under IQSY much less absorption is expected and greater distances should be covered. This is where we 160 meter DXers come into the picture. Our operation represents one of the best ways of obtaining information of value on l.f. propagation which may or may not prove or disprove previous theories concerning its behavior. While no fixed program of reports or forms is provided, our activities and accomplishments in themselves provide the necessary record. These will be recorded in the W1BB Summary Log of 160 meter operations. Results by various stations will be logged, number of participants and many other items.

At least one amateur "beacon" is already in operation, ZE1AZD, 1801.5 kc, 10 watts. Reports of unusual conditions or accomplishments will be sent to magazines for publication. W1BB will issue a special souvenir IQSY QSL card. A report of unusual conditions observed, a QSO with W1BB, or report of DX logged, will qualify, as will reports of your own accomplishments. Anyone is eligible if information pertains to 160. This should be quite an exciting and interesting two years for us all. *(Tnx W1BB).*

73, Urb, W2DEC

QTH's and QSL Managers

G2BVN was recently reported, in error, to be the QSL Manager for VP3YG. Des handles his own cards and does so very promptly, I might add.

The same holds true for VP5BB. W3MRR was erroneously listed as QSL Manager for VP5BB. Bert handles all of his own cards.

AP5HQ	(for QSOs after Oct. 1st, 1964) via W4LRN.
CEØAC	via CE3HL.
CEØAG	via VE3DGX.
CN8GB	via W2CTN.
CO2JB	Box 6996, Havana, Cuba.
CR4AD	via W2VCZ.
CR4BC	Box 36, St. Vincente, Cape Verde Islands.
CR5AJ	Box 25, Bissau, Portuguese Guinea.
CR6AU	Box 6, Luso, Angola.
CR7FC	Box 2060, Laurenco Marques, Mozambique.
DJ4KK/YA	via DL3RK.
DL4KP	via WA9CNC.
DL5DT	via WA9CNC.
DL5BH	via WA9CNC.
DL5BL	via WA9CNC.
DL5GO	Lt. David Fox, Det. 7332, 1030th USAF, Auditor General GP. APO 109, N. Y., N. Y.
DL5GU	via K2ABW.
EL2AD	via K5SGL.
EL2AE	Box 98, Monrovia, Liberia.
EL2AP	via WB2BAL.
EP2DM	via W2IPB.
F5CH	Henri Castro, 91 Rue Jordaens, Lille (Nord) France.
FO8AA	Box 374, Papeete, Tahiti, French Oceania.
FO8BJ	Box 867, Papeete, Tahiti.
FY7YK	via WB6KIG.
GB3RAF	via G2BVN.
HL9KA	Lt. Gen. T. Conway, D/CG EUSA, APO 301, San Francisco, Calif.
HL9KR	T/Sgt. Quinn, Det. #5, 6146th AFAG, APO 18, San Francisco, Cal.
HL9TD	SFC Chichester, Hqt. Hq. Co. 1st Bn 31st In. APO 24, San Francisco, Cal.
HL9TE	CWO McGee, Co. "A" 27th Maint. Bn 1st Cav. APO 24, San Francisco, Cal.
HL9TU	Capt. Skelton, Hq. & Hq. Co. 1st Cav. Div. APO 24, San Francisco, Cal.
HZ3TYQ/8Z4	via W1RAN.
HZ3TYQ	via Aramco, Box 1721, Dharan, Saudi Arabia.
IS1VEA	via IS1FIC.
K7LMU/3W8	via K6EVR.
ex-KL7DRM	now W9GXR.
KR6BQ	via W2CTN.
KR6JZ	via WA8ECH.
KW6CV	Box 68, Wake Island.
KZ5KY	via KZ5MQ, Box 1061, Cristobal, Canal Zone.
LU7FAG	via WA9BXR.
M1XS	via DL1XS.
MP4BDC	F. S. Peacock, 4 Kent Gardens, Braintree, Essex, England.
MP4MAH	Box 81, Sultanate of Muscat.
ON4QY	via K6ICS.
SVØWGG	*not* via W5GMS.
SVØWPP	via W5EGR.
TJ1AC	F. Bucher, c/o Electricity Corp. Victoria, West Cameroon.
TJ8AC	Box 26, Garoua, Cameroon.
TI2KQX	American Embassy, San Jose, Costa Rica.
TR8AD	Box 1025, Libreville, Gabon Republic.
TU2AE	Gilbert Laine, Posts & Telecoms. Abidjan, Ivory Coast.
ex-TU2AU	c/o American Embassy, Mogadiscio, Somali Republic.
VE1AJR/SU	UNEF Base, P. O. Beirut, Lebanon.
VE8ML	via VE3BZO.
VK4TE	(Willis Is.) via VK2AGH.
VK9NT	via W2CTN.
VK9TL	via VK3TL.
VP2KT	via W2CTN.
VP7NG	Box 5755, Nassau, Bahama Islands.
VQ1IZ	via K6PUC.
ex-VR5AR	now W9EXE.
VS9MG	W's via WA2WUV, DX via Bob Milton, Box 777, Singapore.
VS9PGM (ex-602GM)	Don Bushe, D.W.S. (F.O.) Aden/Perim, POB 5153, Maala, Aden.

[*Continued on page 98*]

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

ANSWERING the hundreds of letters that come into HAM CLINIC every month takes time. Generally the XYL and myself will begin answering letters after dinner in the evening and we always spend at least three hours every night trying to help hams from all over the world. On the weekends we spend nearly every Saturday and Sunday reducing our correspondence backlog. Some letters take more time than others because we must do a certain amount of research for some answers. On the other hand, you could help us to help you give better service if you will make your letters brief and to the point. We do not mind reading and answering your lengthy letters but remember you are taking time away from someone else.

If you feel your answer is a little slow in coming, please have patience. Letters sent to us at our home QTH accompanied by two U.S. Post Office International Reply Coupons (IRC) will, of course, be answered sooner than letters forwarded to us. Our QTH: 4 Lutzelmatt Str. Luzern, Switzerland.

Please confine your letters to *one* subject. Although there are some questions we cannot answer we do our very best, and as we have said before, even with over 30 years of ham radio behind us we still don't know it all.

Using the SB-10 SSB Adapter

Of the thousands of letters we have answered during the last 7 years, those requesting information on the Heath SB-10 s.s.b. adapter were in the majority. After running information on using the SB-10 with the Viking Ranger in the March 1961 column, we were literally swamped with letters from hams wanting information on how to use the SB-10 with a particular transmitter. In most cases, step-by-step conversion instructions were requested.

Finally realizing that we could not possibly spend the time answering each letter differently, we prepared a three sheet mimeographed folder and sent it out to exactly 1,119 hams! This was done at our expense. For our trouble, we received two letters thanking us. We continue to receive letters from hams who are picking up SB-10s second-hand as well as new ones. So this is a *final* effort (based on the information contained in our folder—of which there are no more copies left) to cover the typical SB-10 conversion and troubleshooting.

The Heath SB-10 s.s.b. adapter (exciter) first made its appearance when many hams were still dubious about the merits of s.s.b., but for less than a hundred dollars, this unit has proven to be an economical way for thousands of hams to satisfactorily use their regular a.m.-c.w. transmitters for s.s.b. work. But many hams owning a.m.-c.w. equipment shied away from obtaining an SB-10 for they thought they would encounter too much difficulty connecting it to their equipment. Of the 1,119 folders sent out, many went to hams who were trying to make up their minds if the work involved in using the SB-10 with their equipment was worth the trouble. We are happy to say that many hams did buy SB-10s after reading the conversion folder.

The SB-10 was designed to be used with the Apache or the DX-40 transmitters and Heath did not publish any specific information on how to use it with other manufacturers' transmitters. It has been and is being used successfully with such transmitters as the Viking Ranger, Valiant, DX-100, DX-60, DX-40, 32V, AF-67, various Globe models, Adventurer, Viking I and II, T-150A, Eico 720, Challenger, HT-40K, AF-68 and others. It is also being used for 6 meter s.s.b. operation by simply converting the 10 meter components to operate on 6 meters. It is also being used on 6 meters by feeding it into a special mixer stage.

General Information

The SB-10 is an audio phasing type exciter which requires power, a microphone and r.f. input at the frequency on which you wish to operate—and covers 10-80 meters.

Before you begin to modify your present a.m.-c.w. transmitter, make sure the SB-10 is working properly according to the instructions contained in the SB-10 manual. Proper alignment is extremely important for more trouble has been traced to mal-alignment than to nearly any other cause except defective tubes.

If your unit is a second-hand one, *do* check all tubes before you do anything else. Furthermore, make certain that the carrier null pots are *wire-wound* units—not carbon, or you will experience carrier null drift. The new models contain the wire-wound pots.

Power Supply

I advocate using a separate power supply with the SB-10. On the other hand, if your a.m. transmitter has a husky power supply for the speech amplifier you can "borrow" the power required from this. You will require 350 volts at 140 ma (85 ma average) and for the filaments 6.3 volts at 3.5 amps.

Some hams have removed the speech amp and modulator tubes permanently from their a.m. rigs and use the SB-10 exclusively. This is a good idea.

The power supply I recommend is the one recommended by Heath and is diagrammed in the SB-10 instruction book as well as in the March 1961 HAM CLINIC column. This supply

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

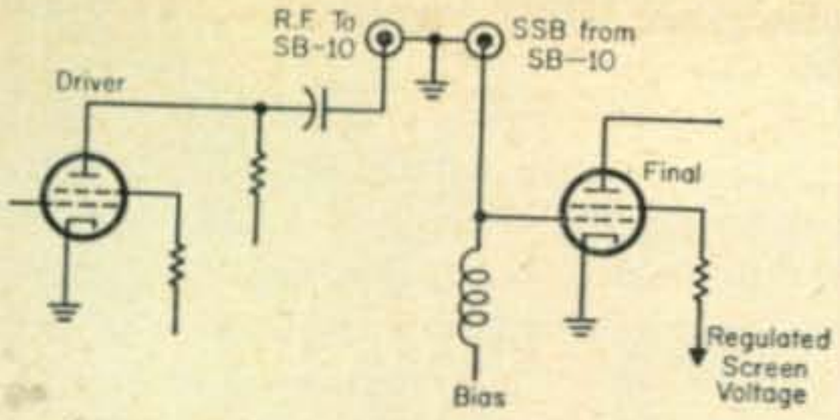


Fig. 1—Simple diagram showing how r.f. is fed to SB-10 and s.s.b. r.f. is fed to final.

furnishes the high and bias voltages required, is well filtered and inexpensive.

Frequency Stability

Everyone now knows that for s.s.b. work good frequency stability is a must. The *average* v.f.o. may work fine on a.m. or c.w. but on s.s.b. its drift cannot be tolerated. For this reason, those who experience frequency modulation or drift with their v.f.o.'s should use crystals when using the SB-10.

Connecting the SB-10

Why some hams consider connection of the SB-10 to their rigs difficult is beyond me! Of course, if they want elaborate switching this is another matter, but on the whole, the connection of the SB-10 to *any* transmitter having *sufficient* r.f. drive to the final transmitter stage is relatively simple.

The r.f. output from the driver tube (the one feeding your rig's final r.f. stage) must be routed to the SB-10. This can be done simply by connecting the plate of the driver (after disconnection of its coupling capacitor or link from the final stage grid(s)), through a *short* piece of coax cable to a coax connector mounted on the rear of the transmitter chassis. The output of the SB-10 then goes to the grid(s) of your final tube(s) via another coaxial connector. If you wish, you can install a *ceramic* switch to switch the r.f. from the driver to the SB-10 or the final grids, and/or the s.s.b. r.f. from the SB-10 to the final grids. This switch can contain an additional deck to switch bias voltage for the final (to make the final linear) or to switch the final back to class C operation. See figure 1 for a simplified connection diagram.

Linearizing the Final Stage

Most sets on which we have had queries for use of the SB-10 employ one or more 6146 tubes in the final stage. These are easy-to-drive tubes and do *not* require an additional driver tube installation. However, some hams have found that the drive on 10 and 15 meters after installation of the SB-10 was too low and they added an additional driver-amplifier stage. In most cases this is not necessary.

The grid bias voltage for a pair of 6146's for class AB-1 operation is around 55 volts. This voltage should be stable.

Screen voltage for the final tubes must be stabilized and this can be done either by using v.r. tubes or zener diodes. The screen voltage for a pair of 6146's will run 210 volts or so.

The bias voltage may be fed to the final via a ceramic switch as explained above. One caution however, make sure that the bias voltage is fed to the final grids through an r.f. choke. Some sets do not have the choke.

Clamp tube circuits should be removed or switched in or out for a.m.-c.w. or s.s.b. operation respectively.

Neutralization is not required for most rigs, but if it is, the usual procedures apply.

Generally, the a.m. rig to which an SB-10 is connected is switched to the c.w. position and left there. If there is r.f. leak-out which bothers reception, the oscillator can be relay switched (along with other stages).

If your transmitter does not use 6146's in its final, a glance at available tube tables (for class B a.f. operation) will give you "working" voltages and drive requirements for your tube(s). These can be adjusted for proper operation without exceeding a tube's voltage and current rating.

The SB-10 Vox

The relay used in the SB-10 is a good one and seldom requires attention. However, if you experience vox difficulties, first check the relay tube—do NOT attempt to adjust the leaves on the relay.

SB-10 Troubles

Space here precludes covering *all* the troubles encountered by hams when first using the SB-10 —especially the old models—but here are the troubles encountered most frequently: Lack of drive: r.f. cables from SB-10 too long; bad driver tube; insufficient voltage for the SB-10 (under load); improper SB-10 r.f. alignment; lack of choke in grid of final; coupling capacitor of driver tube (to final grid(s)) too small—increase by 40% to begin with; bad connections to plate of driver and grid of final; bad 6CL6 or 6BQ5 tubes in the SB-10; SB-10 improperly tuned; improper bias on the final and bandswitch set wrongly.

Bad carrier null: bad null pots, r.f. leaking through due to poor wiring or wire dressing, bad tubes or bad swamping resistors in balanced modulator.

Distorted speech: bad tubes, too much mike gain (over driving); final not linear; screen voltage regulation bad; improper final bias voltage; bad microphone or improper mike impedance.

Sideband suppression not equal: bad phase shift network (very unlikely); improper adjustment of pot associated with phase shift network; audio balance or ratio balance controls defective; modulator wired wrongly. Please note that with *all* phase-shift networks, *equal* suppression of sidebands cannot always be accomplished but does not degrade performance.

Reports of splatter: unit overdriving, improper final linearization.

Fuzzy speech: may be due to faulty v.f.o.

Information on the SB-10 is contained in Oct. and Nov. 1959, Jan., Feb., March and Nov. 1960, May, March, Oct. 1961, June 1962, and Jan. 1963 *CQ*'s

Ham Clinic Bargain Counter

WRL, 3415 Broadway Council Bluffs, Iowa, offers a 4 transistor tape recorder for only $12.98.

Barry Electronics, 512 Broadway, N. Y. 12, N. Y. offers a 300 watt pep grounded-grid linear amplifier, 10 through 80 meters with built-in power supply for only $69.00.

Note to distributors and dealers: *prove* to us that you have a *bargain* to offer HAM CLINIC readers and we'll publish information on your item here.

Questions

32S Vox Relay Time Constant Control—"Any information available for adjusting the time constant of the vox control relay in the 32S series?"

Yes. Write Collins for their Bulletin No. 3 dated Aug. 8, 1960. The changes suggested will enable the operator to obtain a more uniform operation of the relay by compensating for variations in microphone and voice characteristics. Increasing the time constant will increase the time between the last spoken word or keyed character and the release of the relay; decreasing it will have converse effects. Eight parts are involved in the change.

32S Improved c.w. Operation—"I hear that Collins came out in around 1962 with changes for the 32S to improve c.w. operation. I own a second-hand set and do not have any bulletins."

Write Collins and ask them for Bulletin No. 4A dated Feb. 20, 1962. This gives information on the modification of the 32S to provide for eliminating the spurious r.f. signal that may be transmitted along with the main signal, and eliminating a short carrier "burst" that may occur immediately upon closing of the vox relay.

DX-100 Rectifier Replacement—"Is it true that by replacing the tube rectifiers in the DX-100 that somewhat more voltage is made available if silicon diodes are used? Won't the extra voltage cause heat problems?"

Yes to the first question, no to the second—in fact there will be less heat within the set cabinet.

DX-40 Intermittent—"Sometimes my DX-40 will for no apparent reason 'go out of tune' and the plate current will soar. Switching the set off and then on, everything works well again. What gives?"

No doubt lack of drive. Check your oscillator and driver tubes. If the tubes are okeh, check the coupling capacitors associated with these tubes.

SR-150 R.F. GAIN CONTROL—"I have had brilliant success with my SR-150 transceiver, but I notice lately that I must advance the R.F. GAIN control to wide open to receive stations that I used to receive with half the gain. What do I check for?"

Check the r.f. amplifier tube, your relay contacts, antenna connections and ground system.

Tune-up Device for the Blind—"A fellow ham friend of mine is blind. He was given a transceiver for Christmas. The set he has actually requires only one knob tuning. Can you come up with a gadget which will give him an audible tone when the antenna is loaded to maximum?"

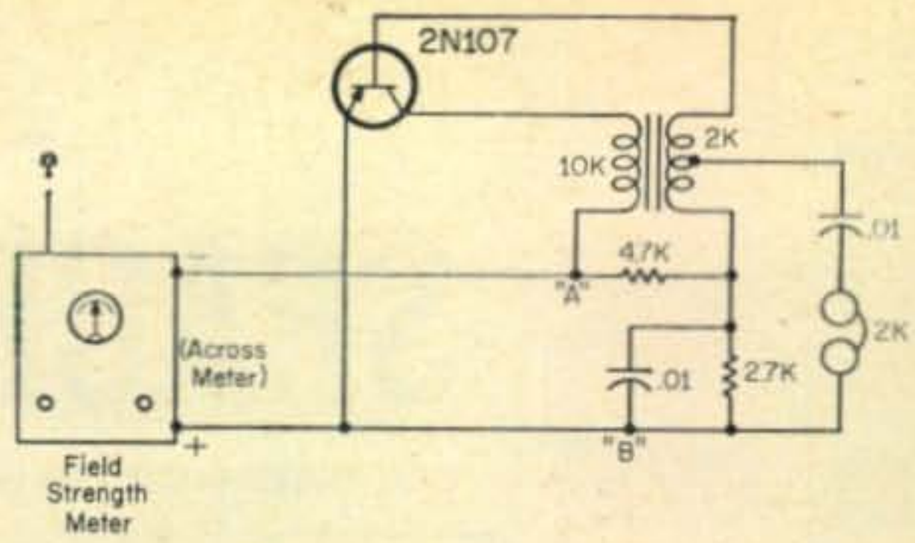


Fig. 2—A tuning device that can be used by the blind. A solar cell can be connected between points "A" and "B" and activated with a dummy load (bulb) as explained in the text.

We'll try. See fig. 2. This gadget, though not infallible will work. An ordinary absorption type field strength meter is used to produce rectified d.c. for operation of the tone oscillator instead of indicating this on a meter. The stronger the signal, the louder the note (about 400 c.p.s.). After a few practice adjustments with another ham standing by, your friend's sensitive ears will tell him when maximum r.f. is being sent into the antenna. Instead of a field strength meter, a solar cell may be connected to the oscillator to supply the power. A light bulb dummy load placed near the cell will activate it. This load can be switched out and the antenna in after transmitter adjustment.

Seneca Drive—"I just bought a second-hand Seneca transmitter. Although it works with crystals it does not work with the v.f.o. All voltages seem to be normal and tubes good. Any help?"

First check the coax cable coming to the top of the v.f.o. through the phono type plug. Check the XTAL-V.F.O. switch. Bet either of these is defective.

Shawnee Squelch Action—"I have a Shawnee 6 meter transceiver which has suddenly developed squelch trouble. What do you suggest I look for?"

What kind of trouble? Suggest you check the 6BJ6 squelch tube (V_7). If this is not your trouble, then check R_{54} and R_{55}. Make sure that R_{49} is not *open*, and that R_{51} is okeh.

Model OP-1 Scope Trouble—"I own a Heath OP-1 scope that has performed day in and day out for a long time, but recently my modulation patterns have lost brightness. I can still see them but with the INTENSITY control full on. What's my trouble likely to be?"

Check the high voltage components, especially the high value coupling resistors.

Comanche b.f.o. Intermittent—"My Comanche b.f.o. sometimes operates and sometimes it doesn't. When it does the pitch varies as I gun the engine of my car. Any hints?"

Yes. First check the 0A2 voltage regulator

[*Continued on page 94*]

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

IF this issue of *CQ* arrives late, blame it on this column! The presses have been stopped in order to include the latest information about OSCAR III.

At press time, which is late January, Project OSCAR Headquarters reports that OSCAR III has passed all its prelaunch tests, and is being prepared for shipment to the launching organization. It now appears almost certain that amateur radio's communication satellite will either be in orbit by the time this column appears in print, or will be launched shortly thereafter.

The OSCAR III satellite has been discussed in considerable detail in a special two-part article entitled, "OSCAR III; An Active Communication Satellite for Radio Amateurs," which appeared in the October, 1964 (Part I), and February, 1965 (Part II), issues of *CQ*. This article should be read carefully by radio amateurs, amateur space experimenters, and space-listeners planning to participate in the project.

OSCAR III Telemetry Data

A 25-milliwatt transmitter aboard the OSCAR III satellite will relay three channels of telemetry data to ground observers on 145.85 mc. From this data it will be possible to check continuously the temperature levels at critical points within the satellite, as well as the level of primary battery voltage. This information will be valuable for determining how well the translator is operating, what the life of the satellite will be, and how to improve the design of future OSCAR satellites.

OSCAR III's telemetry signal will resemble fig. 1A. One complete telemetry sequence will consist of:

a. A four-second burst during which time two HIs will be transmitted in Morse Code as an identifier. The HIs will not convey telemetry data as was the case with OSCARS I and II.

b. A two-second train of pulses which will contain data on the temperature of the transistors in the linear amplifier of the translator.

c. A two-second train of pulses which will convey the temperature level of the main battery case within the satellite. This will indicate the average internal ambient temperature.

This sequence will be repeated continuously for the life of the power supply.

To determine temperature, it will be necessary to measure the duty cycle, or factor, of the pulses in each train, and use the calibration curves shown in fig. 2 to convert these measurements to actual temperature readings. (The duty cycle is the ratio of the actual pulse width, to the width of a single pulse cycle, as shown in fig. 1B.)

OSCAR's telemetry signals will be triggered by a multivibrator within the satellite, which has been designed to have a nominal frequency of 64 c.p.s. at 25° C, at a nominal battery voltage of —18 volts. The frequency of the multivibrator will change as the battery voltage changes. Thus, as the main silver-zinc battery deteriorates over a period of 3 or 4 weeks, the rate of the pulses will decrease from about 69 c.p.s. at the beginning to about 37 c.p.s. after the main battery goes dead and the telemetry switches over to the solar-cell-charged auxiliary battery. The telemetry calibration curve for primary battery voltage versus pulse rate is shown in fig. 3.

Figures 2 and 3 provide the necessary conversion data that will permit ground observers to interpret the telemetry data transmitted from the OSCAR III satellite. To measure the duty factor and repetition, or pulse rate of the telemetry sequence will require a sensitive v.h.f. receiver *with* a beat-frequency oscillator, an oscilloscope and an audio oscillator (inexpensive ones should do).

Figure 4 shows how this equipment can be used to determine the pulse rate, and thus, the primary battery voltage. The telemetry signal is tuned in on 145.85 mc, and the b.f.o. of the receiver is adjusted for a comfortable beat note in the range of 500 to 1000 cycles. During reception of the pulse trains, the audio oscillator is adjusted to provide a stable Lissajous pattern on the oscilloscope. The audio frequency that accomplishes this will be the same value as the pulse rate, and should be between 35 and 75 cycles. When the Lissajous pattern is stable, the audio frequency may be read from the dial of the oscillator, and the corresponding primary

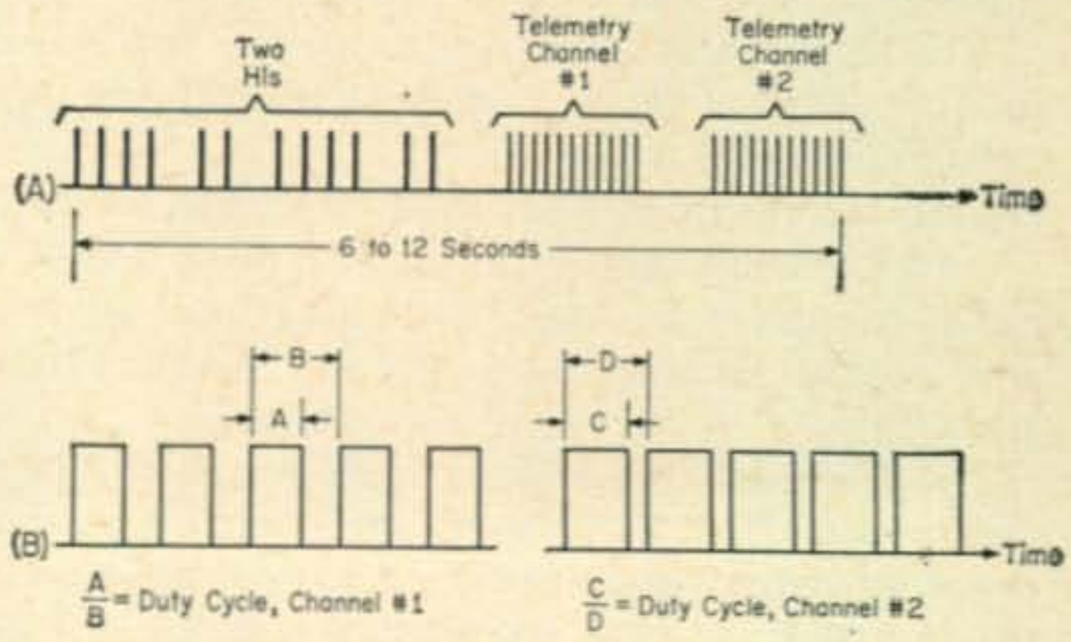


Fig. 1—OSCAR's telemetry sequence (1A) will consist of 2 HI's sent in Morse Code, followed by 2 short trains of pulses. The repetition rate of the sequence will be a measure of battery voltage, while the duty cycle of the pulses will convey temperature data. The first train of pulses measures the temperature of the transistor in the satellite's linear amplifier, while the second train conveys the average ambient temperature within the satellite. Fig. 1B shows how to determine the duty cycle of each pulse train.

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

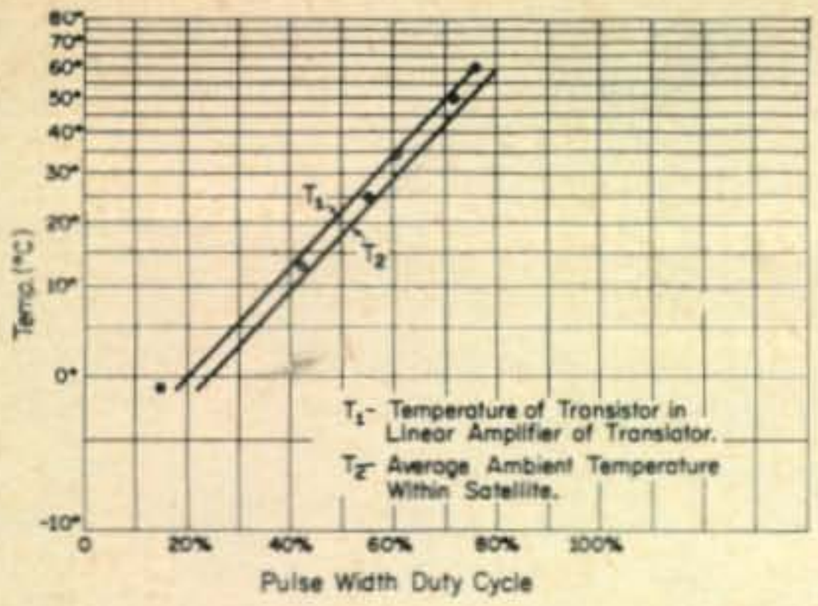


Fig. 2—Calibration curves for duty cycle measurements, which represent temperature (degrees Centigrade) for two points in OSCAR III. Curve T 1 is the temperature of the transistor in the linear amplifier, while T 2 is the average ambient temperature as measured at the battery case.

voltage level can be determined from fig. 3.

Figure 5 shows the equipment adjusted to determine the duty cycle of the two trains of pulses conveying temperature information. The telemetry signal is tuned in as before, and the b.f.o. is adjusted to provide a pleasing beat note. The sweep and synchronization controls of the oscilloscope are adjusted so that the pattern of pulses on the screen stand still. Sweep speed and horizontal amplifier gain should be adjusted so that one complete pulse cycle expands to fill ten horizontal divisions on the oscilloscope screen. With such an arrangement, it should be possible to read directly from the screen the percentage of pulse "on" time to the time of the full pulse cycle. This is the duty factor, as shown in fig. 1B. Record the duty factor for the first train of pulses, then repeat the same measurement for the second train of pulses. Convert these readings into temperature levels by means of the calibration curves appearing in fig. 2.

Telemetry readings should be made as accurately as possible. With each reading, log the date, time (in GMT), and orbit number, if known.

OSCAR Coordinators

The OSCAR Association, Box 183, Sunnyvale, California, USA, will serve as a clearing house for *all* reports dealing with the OSCAR III satellite. Reports of communication through the satellite, tracking reports, telemetry reports, signal reception reports, and the results of experiments, etc., should all be sent to the Association, where the data will be evaluated and then made available for scientific use on a world-wide basis.

Reports can be sent directly to the Association *by airmail*, or through the following local OSCAR coordinators:

Alaska—Peter Brown, KL7DMB
Argentina—Eugenio Fontana, LU9MA
Austria—G. Schiffner, OE3SG
Australia—Ray Hart, VK2HO
Belgium—J. DeDycker, ON4-1024
Brazil—Cicero Barreta, PY1CQ
Canada—H. Wrightman, VE2UQ
Congo—Jan Gysbers, 9Q5GS
Denmark—H. Rasmussen, OZ7BQ
Finland—J. Velamo, OH2YV
France—Andre Bertemes, F3NB
Germany—Edgar Brockmann, DJ1SB
Italy—Adolgo Carmimati, I1BBB
Japan—Kenzo Sano, JA1EC
Netherlands—J. Lodeizen, PAØLOD
New Zealand—W. Hamer, ZL2CD
Norway—Henning Theg, LA4YG
Philippines—Elidore Clare, DU1CE
Puerto Rico—Tom Talpey, KP4AXX
South Africa—Al Solomon, ZS1SW
Spain—Jesse Cordova, EA4AO
Sweden—Olaf Karlsson, SM6PU
Switzerland—B. Pellaton, HB9WB
Tasmania—P. Frith, VK7PF
United Kingdom—W. H. Allen, G2UJ

Reports may also be sent to W6EE, the OSCAR Headquarters station, via amateur radio. Such reports, however, should be followed by written confirmation as soon as possible.

Avoid Interference

OSCAR III will be a "free access" satellite, and will require no special codes or procedures for working through it. It is available for use by radio amateurs in all countries of the world. Its use will be limited only by the number of stations communicating through it at the same time. The greater the number of stations calling the satellite at the same time, the weaker will be the signals relayed, and the greater the interference level. All radio amateurs participating in the OSCAR III experiment are urged to use the

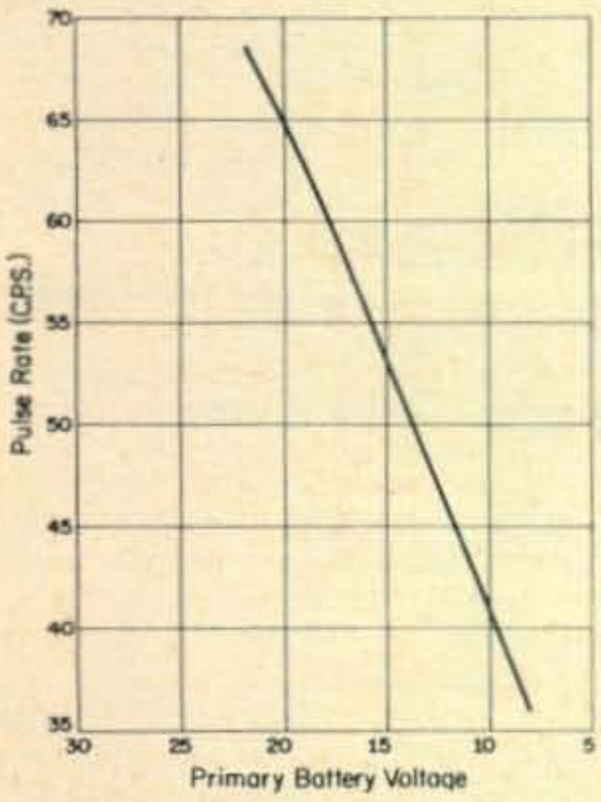


Fig. 3—Calibration curve for primary battery voltage as represented by pulse rate (cycles per second).

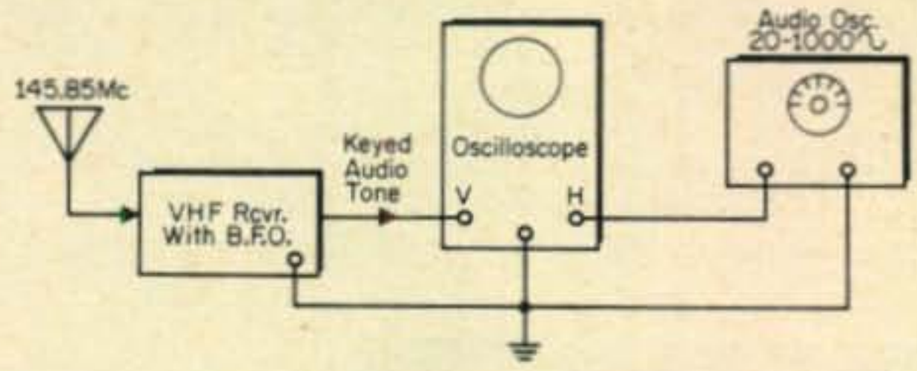


Fig. 4—Determining pulse rate of OSCAR III. A stable vhf receiver, equipped with a beat frequency oscillator; plus an inexpensive oscilloscope and an audio oscillator are the only equipment required. The dial calibration of the audio oscillator should be checked against a standard (the power line, for example), for accuracy. A Lissajous pattern is created on the screen of the scope, and the audio frequency of the oscillator is adjusted to make the pattern stand still. The pulse rate is then equal to this value of audio frequency. Use fig. 3 for conversion of pulse rate to primary battery voltage.

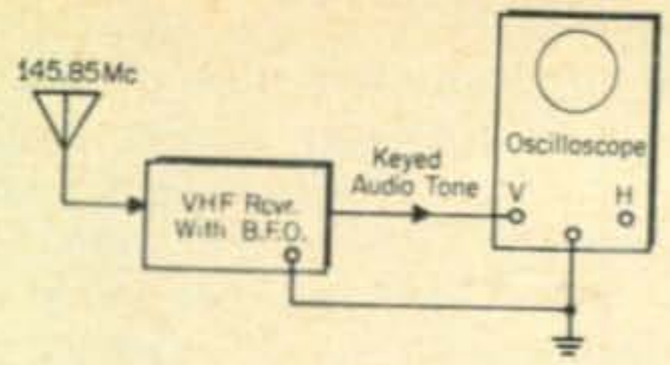


Fig. 5—Determining OSCAR III's telemetry duty cycle. The sweep and synchronization controls of the oscilloscope should be adjusted so that the pattern of pulses on the screen stand still. Adjust the sweep speed and horizontal amplifier gain so that one complete pulse cycle expands to fill ten horizontal divisions on the screen. With such an arrangement (see fig. 1B), it should be possible to determine the duty cycle for each train of pulses directly from the screen.

maximum amount of operator discipline in an effort to avoid overloading the satellite. Radio amateurs *not* participating in the experiment are urged to avoid the use of the two meter band between 144.075 and 144.125 mc and 145.875 to 145.925 mc, as well as the frequencies 145.85 and 145.95 mc. This will reduce the possibility of interference between stations communicating on the ground and those communicating through the satellite, and will also permit interference-free reception of the beacon and telemetry transmitters aboard the satellite.

As OSCAR III rockets into space, amateur radio will begin a new, and brilliant chapter in its long history.

NASA Amateur Radio Expedition

Amateur radio maritime operation on 40, 20 and 15 meters is planned during a mobile rocket launch expedition sponsored by the National Aeronautics and Space Administration.

An escort carrier, the USNS *Croatan*, has been outfitted to launch Nike-Apache two-stage sounding rockets which carry 75 pound instrument payloads to altitudes of 100 miles, while making a variety of scientific measurements.

Aboard the *Croatan*, with a Drake TR-3 s.s.b. transceiver will be, among others, WA9DNF and W9YRV of the University of Illinois. The ship will leave Baltimore on February 15, 1965, transverse the Panama Canal on February 23, operate in the Pacific off Lima, Peru, from March 6 to March 25, then steam to arrive at Valdivia, Southern Chile, on April 18. Arrival back at Baltimore is scheduled for May 5. The radio amateurs aboard the *Croatan* hope to make as many contacts as possible during the expedition.

73, George, W3ASK

New Amateur Products

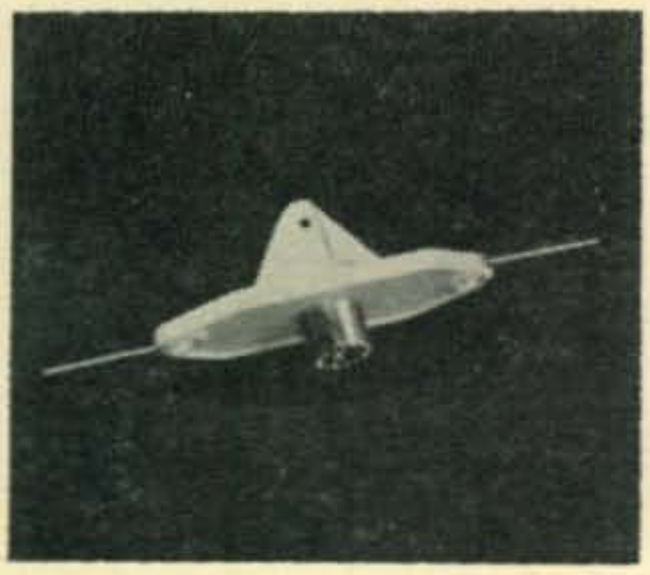
National HRO-500 Receiver

THE National Radio Company, Inc., announces the introduction of the HRO-500, the latest in their famous series of HRO receivers. A radical departure from its predecessors, the HRO-500 is totally solid state. Frequency is determined by a phase-locked crystal synthesizer feeding a VFO-controlled tunable IF.

The HRO-500 covers the entire VLF through HF spectrum . . . 5 Kc through 30 Mc in 60 synthesized 500 Kc bands, with equal stability and dial accuracy throughout its tuning range . . . providing total coverage of commercial, amateur, foreign broadcast, marine, VLF communications, and test and experimental frequencies. All required heterodyne frequencies are generated by the frequency synthesizer. Dial calibration and accuracy over the entire tuning range is one kilocycle, employing a linear VFO and National's PW epicyclic dial mechanism. 1 KC divisions are ¼" apart, for easy interpolation to 200 cycles or better. VFO tuning rate is identical on all bands.

The HRO-500 is designed for versatile fixed or portable applications . . . power may be obtained from flashlight cells, 12 volt battery, or from 115v/230V 50/60 cycle sources. Total battery drain is less than that required for two dial lamps. Net price of the HRO-500 will be approximately $1000.

For further information, write: National Radio Company, Inc., Equipment Division, Dept. P, 37 Washington Street, Melrose, Mass., or circle 65 on page 110.



Budwig Antenna-Coax Connector

A RUGGED, specially-designed fitting for connecting a coaxial feedline to dipole elements now is available from Budwig Manufacturing Co. The molded plastic and metal fitting features holes at both ends for element tie-points, and has molded-in copper leads for electrical connection to the SO239 coax connector. A reinforced, high center rib provides support for the entire antenna system. The connector fits standard PL259 attached to the feedline. Further details may be obtained from Budwig Manufacturing Company, P.O. Box 97, Ramona, Calif., or circle 66 on page 110.

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
and ALLEN KATZ, K2UYH*

THE hiss and crackle coming from the speaker of your receiver may seem to be just plain noise but to the radio astronomer it is a most interesting phenomena. While rotating your beam some night you may have noticed that the noise level was higher in one direction than another. This change in noise level could have been due to a faulty neon light or a particularly busy street. However, it might also have been due to a radio star.

Just as stars give off radiation in the optical spectrum, many objects in space also radiate in the radio spectrum. The study of this radiation (and just about everything associated with it) is known as radio astronomy; a subject which should be of particular interest to the v.h.f. amateur.

The science of radio astronomy was started back in the thirties by a fellow radio amateur named Groth Reber, who chartered the cosmic noise picked up by his receiver with the aid of a parabolic reflector. Most "experts" looked upon him as a nut, but by the start of World War II his genius was vindicated. Since then radio astronomy has grown tremendously, and today is connected with such intriguing subjects as the cosmology of the universe (Is the universe actually expanding?), and project Osma—the government-sponsored experiments in communication with intelligence from outer space.

Besides radio astronomy's intrinsic appeal to the v.h.f. amateur spirit, it can also be of practical importance to the enthusiast. The radio astronomer sees through his antenna. The narrower the beam width, the more detail he sees and therefore, he is just as interested (if not more so) in the development of large antennas as we are—the 1,000 foot diameter Arecibo dish, for example. Furthermore, like us (the 1,000 watt power limitation), the radio astronomer cannot increase the power level of the source of radio energy he wishes to listen to. When commercial communication interests cannot make a path, all they do is crank the transmitter power up a few more megawatts. The radio astronomer, like the amateur, was therefore among the first to make use of the parametric amplifier and the maser. Likewise he has been using under-the-noise detection techniques for many years now. It is a much harder job to dig noise out of noise than to dig information out of noise. Here we can learn a great deal from the radio astronomer.

Also if you are at all interested (on a level a little deeper than just being on at the right time) in moon bounce, m.s., or aurora, then the place to look is a book on radio astronomy. All of these propagations have been extensively used as research tools by radio astronomers. In fact, the first moon bounce echoes were the results of a radio astronomy experiment.

If the little we have said here on radio astronomy has at all whetted your appetite, may we suggest the following books (The first two are general, the latter more practical.): Brown and Lovell's *Exploration of Space by Radio Astronomy*, Steinberg and Lequex's *Radio Astronomy* and Hyde's *Radio Astronomy for the Amateur*. Not much is found in radio amateur books on polar mounts or even Fariday rotation. However in the future there will be!

Project Oscar Antennas

With the imminent launching of Oscar III, now is probably as good a time as any to renew the subject of diversity-polarized antennas. Such an antenna certainly seems desirable for communication via a satellite (with its changing antenna polarization). Although Oscar's signal levels are not expected to be of the extremely weak variety, having the right polarization should help a great deal and in some cases even mean the difference between a QSO or not.

Dave Bray's, K2LNG, cross yagi, described

Century Club Rules

The requirements for earning *CQ*'s VHF Century Club Certificates are actually quite simple:

1. Awards are issued to those holding the required number of QSL cards confirming contacts all made on a *single* v.h.f. band within *any* one 365-day period.
2. On 50 mc, 150 QSL cards are necessary; on 144 mc, 100 cards; on 220 mc, 50 cards; on 432 mc, 25 cards.
3. Separate entries must be made for each award; there is no limit to the number of certificates you can earn provided proper application is made for each.
4. Official application forms are available free of charge from *CQ*. Drop a card to: VHF Century Club, *CQ*, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050.

Certificates are individually numbered for classification purposes and are issued by band operated. All CCC's bear the cherished autograph of esteemed *CQ* editor, K2MGA.

*c/o Allen Katz, K2UYH, Electrical Engineering Dept., Murray Hall, Rutgers University, New Brunswick, New Jersey.

in this column several times in the past, appears to be the best Oscar antenna choice. With this antenna vertical, horizontal, right or left circular polarization can be chosen at the flip of a switch, or the vertical and horizontal feedlines can be connected to separate converters and used in a diversity system (probably the ultimate approach to satellite communications).[1] We have been experimenting with cross yagi antennas for some time now and have tried them (24 foot yagis) in several different stacking configurations. At present we are working on a backfire cross yagi. If you have the space, a 10 foot yagi fired into a 12 by 24 foot plane reflector will give you nearly 20 db gain without a lot of phasing problems. This type of antenna is certainly worth investigating—20 db is not easy to obtain on 144 mc.

Varactor Diodes

Opinions on varactor diode operation are still coming in. I guess the controversy still isn't over. Here are two of the most informative letters.

The first is a portion of a long technical discussion on the diode by Dick Bain, W8WNZ/9: "The varactor is just a fancy diode (isn't it?). We know that a non-linear device is responsible for the generation of harmonics, and a tuned-tank circuit favors the desired harmonic with the fly-wheel effect of the tank tending to restore the missing parts of the cycles. When we have modulation, the harmonic and the modulation frequencies are all mixed producing a carrier and sidebands of the proper frequencies—and I suppose some sidebands which are multiples of the original sideband frequencies. These extra sidebands, I guess, constitute some distortion."

[1]For the less ambitious we note that Cushcraft of Manchester, N.H., is heard to be manufacturing cross yagis (Twist antennas) for the amateur market.

Look what you can buy by the pound! K2UYH picked this one up at a Belleville, N.J., war surplus outlet. She measures 6 feet across. (Shot is of the installation upon homebrew mount in Verona, N.J.). Coming soon: K2UYH's 16 foot monster at Stockhom, N.J.

This is K2TKN's 20' homebrew parabolic dish, used primarily for moonbounce experiments. Built from chicken-wire mesh stretched over an aluminum frame, this antenna loads on 144 through 432 mc using a log periodic antenna for a feed.

Right you are, Dick. Which brings us back to where the discussion started, with the statement that there should be some distortion on the modulated output of a varactor tripler.

In the words of Gil Kowols, W9BUB, "The 432 signal has side bands at the original modulating frequency. This is the intelligence desired. However, —8 db down is the second harmonic of the modulating frequency and —23 db down is the third harmonic of the modulating frequency. Further evaluation of the output indicates that the modulation is non-linear giving the effect of volume expansion on the positive peaks." *We would like to note that the distortion produced is not great enough to make the modulation indistinguishable, as has been proven in practice on many occasions. I hope this discussion has been of some value to everyone. I hope it has also shown that the American radio amateur is just as interested in the technical aspects of his hobby as any other amateur. Thanks everyone!*

From The Mailbag

Dick McDonald, K5WOR, on his 50 mc converter: "In the past weeks I have built a transistorized 6 meter converter which I feel will be of interest to your readers. It uses a TI390/2N2996 as an r.f. amplifier, two 1N82's as a mixer, TI390 as i.f. amp and a 2N753/706 as an oscillator. The r.f. stage has a gain of approximately 20 db and a noise figure of about 2 db. A balanced mixer

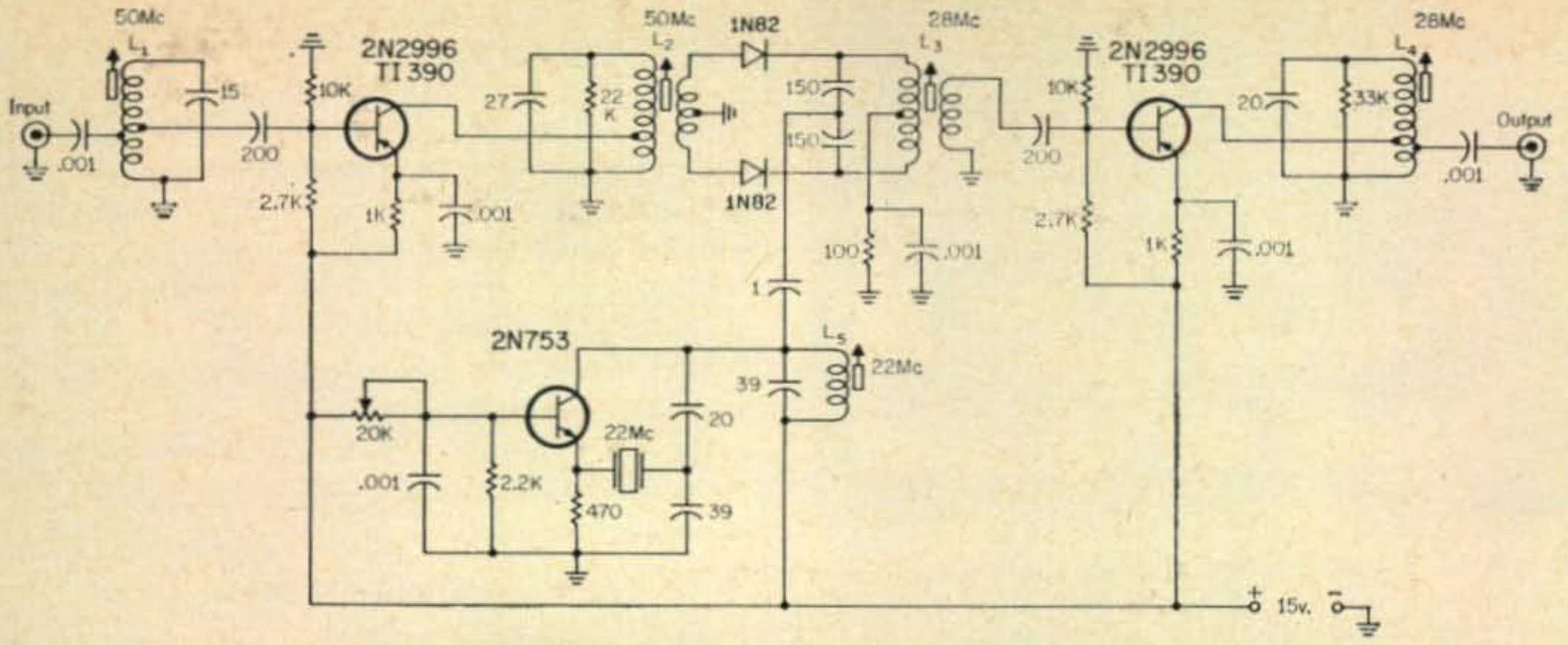


Fig. 1—Schematic diagram of K5DOR's 6 meter transistorized converter as described in this month's column. This converter cost Dick $15.00 in parts and was ready for action in about 5 hours.

L_1—11t. #22e. Taps at 2 and 3t.
L_2—Bifilar primary 7t. Tapped @ 3t. from cold end. Sec. 6t., center tap, #22e.
L_3—Bifilar primary 6t., center tapped. Sec. 6t. #22e.
L_4—15t. #22e. Tapped @ 3 and 7t.
L_5—12t. #26e.

was used for several reasons: 1.) Noise generated by the oscillator is cancelled out. 2.) Lower cross modulation. 3.) The 22 mc oscillator signal does not radiate as much through the antenna.

The mixer has a loss of about 3 to 6 db. The i.f. stage, having a gain of about 25 db, however, makes the overall gain of the converter between 40 and 57 db. The converter works well on as little as 6 volts and only draws 10 ma at 12 volts.

A good example of transistor performance is shown by the results of a comparison test run between my model and a converter using two 6CW4's in grounded grid. A milliwatt test oscillator was placed in a tree some 100 feet from the shack. The antenna was turned until a signal could just be heard with the transistor converter. I then switched to the 6CW4 converter and no signal was heard. The antenna was then turned until a signal could be heard. Switching back to the transistor converter produced a signal about 10 db above the noise. One last word—the converter only costs $15 and was constructed in about five hours.

If you think your readers would be interested, I would be most happy to supply more information or a complete article." *That sounds like a fine idea, Dick. There is no doubt in my mind as to the importance of the transistor in the v.h.f.-u.h.f.'s future. This little device seems to be able to out-perform just about everything except the parametric amplifier. An article stressing general techniques, mounting, neutralization, etc., would be particularly valuable.*

Stephen A. Karkos, K1VUE: "Enclosed is a photograph of my double sideband transmitter, the diagram of which I sent you in the earlier letter. The schematic of the balanced modulator section as shown on page 77 of the December 1964 edition, contains three errors which might give others attempting to use this circuit some difficulty in achieving efficient stable operation. These are as follows:

1.) The screens of the 1625's should be bypassed by disc ceramic capacitors, about 500-1000 mmf each.

2.) The rotor of C_1 should not be grounded.

3.) L_2 should be about 4 turns of #18 bare wire ¾" long on a ⅜" dia. form. (The inductance of this coil is rather low because of the high input capacity of two 1625 grids in parallel.)

A means must also be provided to disable the heater of one 1625 when it is desired to use amplitude modulation. I use one 6L6 to furnish audio to the screens of the 1625's, which is more than adequate.

For a while during the past summer I used 1050 volts on the plates of the 1625's. The plate current during a whistle was about 180 ma. The tubes under these conditions were a dull glow of red (after a sustained whistle of ten seconds).

I wish to thank you for the mentions of my station in *CQ* recently. I'm not on the air much now because of other commitments.

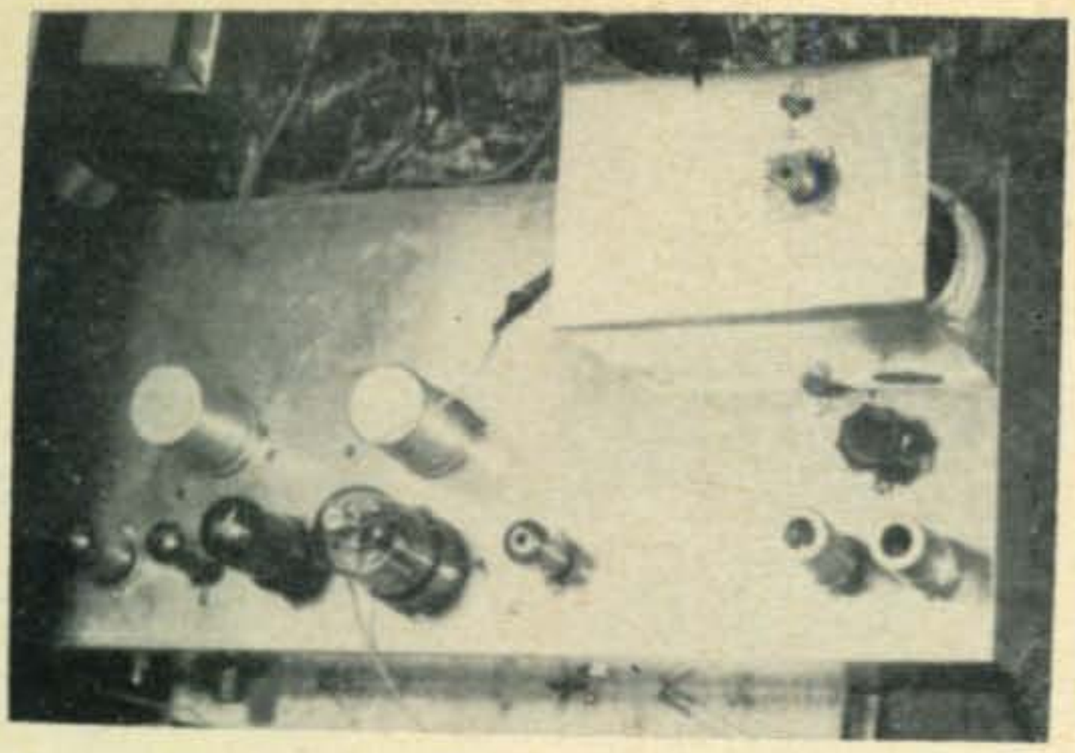
Two and six meter activity here is woefully lacking. When I've been around during good groundwave conditions, very few are on to take advantage of them. Also a lot of hams either don't have rotators or are unable to use them, especially those to the southwest." *Okay fellows, let's give Steve a call once in a while! You'll earn a QSL from Maine in the process.*

"I have many projects in the planning stage, but lack the time to get at them: 9 mc s.s.b. generator, single-frequency heterodyne exciters for 6 and 2 meters, and a transistorized i.f. receiver for my six and two meter converters." *Well, sounds like you've got your work all cut out for you! Keep us posted on your doings.*

Dave Olean, K1WHS: "I just wanted to drop you a line concerning the unusual opening of December 29, 1964 as viewed from this Connecticut QTH. The two meter band was hopping from about 2000 EST until 0200 the next morning. North Carolina was well represented with K4MHS on c.w. and W4HJZ on s.s.b. as well as one or two of the other North Carolina c.w. regulars.

I lost out on working W4HJZ since he wouldn't tune up to my frequency (enough of this 145 mc jazz). I did

Photo of K1VUE's double sideband transmitter as outlined in our December '64 column. This inexpensive rig can be mounted as shown on an old ARC-5 chassis or from scratch.



Here it is! One month late, but we finally got the pictures developed of the TV transmitter built by K2UYH as described in last month's column.

hook up with K1IED/4 Virginia and W4VCJ also in Virginia. Signals were about 57 both ways. I used s.s.b. to work W4VCJ who was pushing S9 on peaks on our stingy meter I then worked a number of eastern Massachusetts low-power stations including one fellow north of Boston using a Twoer (with Twoer receiver! !). I swung the array S.W. at about 0100 Dec. 30, but the band was fading out. At this time W4HJZ was 55 on s.s.b. and K4MHS's c.w. signal was running 559 with 100% copy.

I would appreciate it if you could mention to your friends that Arn and I have high-precision tuned circuits available for remote-tuned v.f.o. construction. They are from a sexto-diversity receiver and consist of a precision vernier dial, a beautiful heavy duty straight line frequency capacitor and ceramic coil form, wound with heat treated copper wire in an expansion oven. All of this is enclosed in an aluminum container. It is surely the best way to obtain good stability on v.h.f. whether you multiply or heterodyne. We will let these units go only to interested v.h.f. homebrew artists for a token charge ($2.50). I know they are worth a bit more than that!

Arn is currently running down a lead—that the telephone company has a 100 foot relay station tower available for any ham who will take it down." *ZOWIE!*

Arthur Castrup, Jr., WN9NKV: "Was reading your VHF column in the January issue of *CQ* and read about the contest. Being a newly-licensed ham and in the process of converting some surplus gear to two meters, I decided to try my hand at winning, provided I get the rig on the air before then. I enjoy your column very much." *Thanks for the interest, Art. See you in the contest!*

Ray Martin, WAØDZI: "Thought I would try to sit down and write a short letter to you, so here I am. Guess I better tell you about the gear and DX worked. We have an HT-40 transmitter, the main rig, xtal controlled, about 75 watts in on 6 meters, an Army surplus ARC-3 for 2 meters, 50 watts input. And the receiver is a Hammarlund HQ-110C. Antennas include several beams, up about 36'. They are the A-56 by Mosley, 210 by Hy-Gain. We are very active in ham activities, being an OES in the Kansas section, and very active in contests. We are also in RCC/ARRL/MARS/HARC/S-ME H.S. RC/SWL. Good luck in the future." *What about the DX worked?*

The Midwest VHF Meeting April 10-11

With all the fanfare that normally accompanies the Dayton Hamvention, (April 10 this year) let us not forget about the coinciding Midwest VHF Meeting, sponsored by WØCUC, KØCER, KØFKJ and KØSZJ.

Complete with drawings and displays, the meeting will be high-lighted by two well-known speakers on the 10th. At 2 p.m., Bill Roberts, W9HOV, active contributor to this column and president of Gain, Inc., will talk on v.h.f. antennas . . . their design, construction and feeding. Sam Harris, W1FZJ, v.h.f. conductor of *QST* will speak at the 6:30 p.m. Banquet. Sam's topic will be weak-signal scatter techniques plus a film on East Coast v.h.f. stations and tapes of the KP4BPZ moonbounce efforts.

For more detailed information, contact the Midwest VHF Meeting, P.O. Box 400, Sioux Falls, S.D. 57100. Oh yes, the gathering will converge on the Holiday Inn in Sioux Falls early Saturday morning.

He Doesn't Have 2 Meter Gear

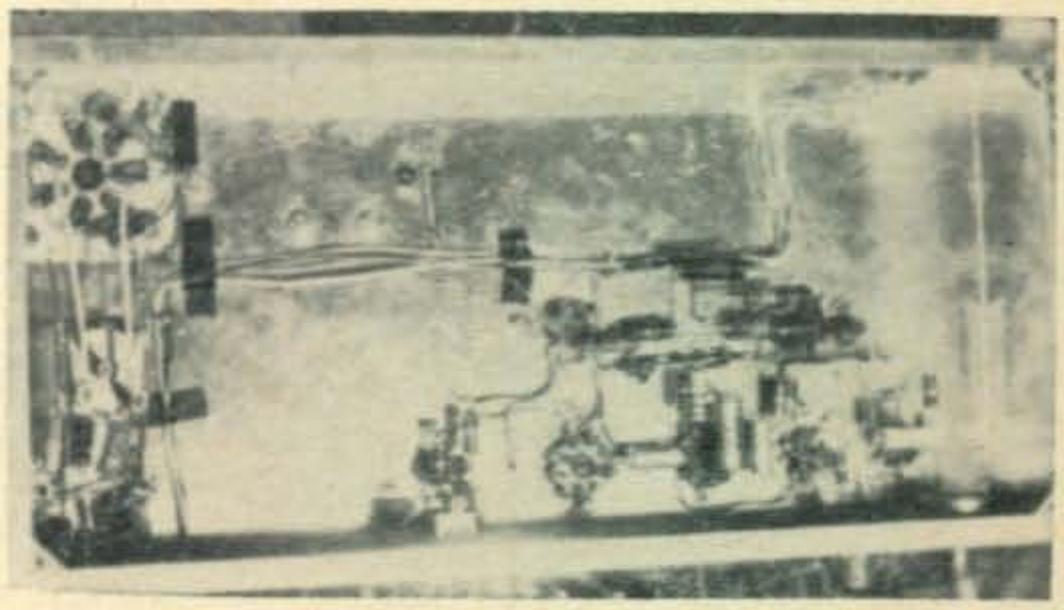
After two days of fervent searching we are prepared to swallow our deflated pride and admit perhaps the most embarrassing goof we have ever bestowed upon the v.h.f. contest world. In the Summer '64 contest results (which appeared in January *CQ*) W8DJY was hailed as the highest scoring station on 144 mc. Although no award is issued on a nationwide basis (certificates are distributed on individual state competitions) who can help but acknowledge admiration for the station who scored so high above the rest? Well, W8DJY called *CQ* to thank us for the honors, but confessed that he doesn't own any 144 mc gear. Inadvertently his six meter log landed in the wrong pile.

Our belated congratulations to N.Y. top scorer WB2CYL who actually captured the nation high with his 2 meter score of 243,398. And to W8DJY for his much-appreciated sense of humor we present no certificate but instead bestow K2ORS's famous "Brass Filigree with Oak Leaf Palm"—symbol of service above and beyond the call of duty.

Thirty

Bear in mind that we are always receptive to detailed information on club activities, construction projects, and v.h.f. dx-peditions for publication in this column. See that your club secretary reports to us regularly in addition to mailing us your club bulletin!

73, Bob, K2ZSQ
Allen, K2UYH



Underside view of last month's TV transmitter project showing relatively nothing. In spite of poor focus, we thought you'd like to see how we placed parts. No, they aren't 10 watt resistors; they're pieces of tape.

NOVICE

WALTER G. BURDINE,* W8ZCV

MANY letters and much discussion with the ham fraternity has brought to light the fact that getting an amateur radio license of the Conditional, Novice or Technician grade is more difficult than just learning the code and theory. Finding an amateur licensee to volunteer to give the test is one of the hardest parts of getting the license. A large percentage of the old timers that I have talked to have told me they do not wish to get "mixed up in this mess." Some have told me that the moment that a ham gives the test that he is immediately branded for life; too many of the fellows are crooked in giving the test, that many of the new breed are not willing to study for the license and that they have too much money for taking the time to come by their license as we did, by hard study and practice. I must admit that some of these satements are true, but only a small percentage. I have had only one aspirant offer to bribe me to pass his test, I'll go on record as saying that if this fellow ever takes the test I'll give it to him AND that he won't even think of getting any help whatsoever. I truly think I handled the matter to my satisfaction and that he will think a long time before he thinks of the amateur as an "easy mark" for getting an amateur license. I always apply the "Golden Rule" to my dealings with the new amateur aspirant, he will always respect your confidence in his ability to pass the test. If he doesn't, we don't want him any way. I believe this world is becoming too thickly populated with the kind that think the world owes them everything that they desire, without any effort on their part. Think, what good would he do for the status of the amateur anyway.

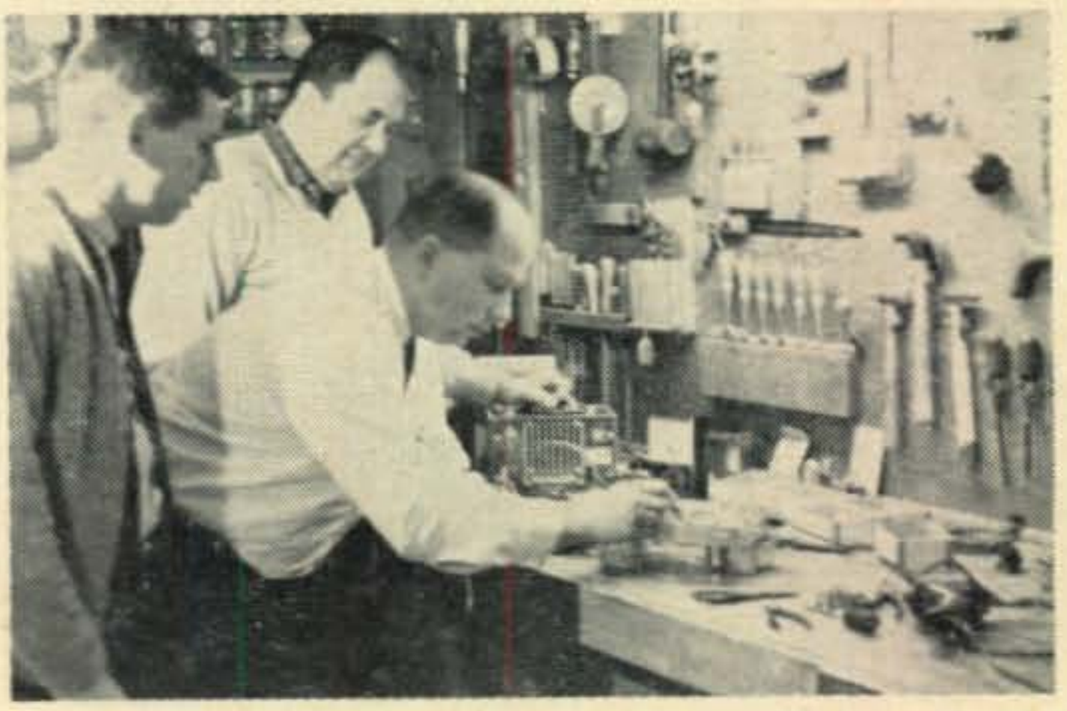
All of my dealing with the FCC have left me with the impression that they wouldn't consciously give me any chance to be crooked in any way, therefore they did not grant me the privilege of giving the test to future hams lightly. I will always respect their confidence in me. I think that any one qualified to give the test should do so. We are prone to gripe about the amount of taxes that we have to pay yet we are not willing to help them with their heavy chores. I consider this a privilege just the same as voting. I won't fail to uphold it either. Just don't forget that the amateur is the grea est policeman for his hobby, you can help or hinder as you please, it is your hobby. Fellows, if you are asked to give the test, pitch in and help us get the job done. I will tell you how to go about the job, it isn't easy any more but you can spare a little of your time. Don't forget, the young ham of today will be the old timer of tomorrow.

Within the last year the procedure for giving the test has taken a change for the better. Before the change, any one could give the technical part of the test, and this possibly gave rise to the idea that the amateur license was a mail order item and had lost much of its prestige. The complete test must now be given by an FCC licensee. The volunteer examiner may give the test for Conditional, Technician and Novice licenses. These licenses are only given by volunteer examiners. The code test is given first and then the technical part of the test is sent to the volunteer examiner and administered. It is to be sent back to the FCC within twenty days. Code test and theory test are given at different times. A copy of the statement sent with the test is shown below. This is the part that has caused the most trouble, plus finding the necessary one hour for the Novice and three hours for the Technician (I have never given the Conditional test) license test. The test is returned to the FCC, (Federal Communications Commission, 334 York Street, Gettysburg, Pennsylvania 17325) in an 8 × 12 manila envelope with your return address on the envelope.

I think that the easiest way to tell you how to conduct the examination would be to quote directly from the regulations, either verbatim or give a summary of the new part of the rules. By the way if you haven't read the rules and regulations within the last year, you are behind the times. They have changed. I would suggest that you send $1.25 for *FCC Rules and Regulations Volume VI, part 95, 97 and 99.* It is your duty to keep abreast of the regulations.

Manner of Conducting the Examination

97.29 (a) The examinations for Extra and General Classes of amateur operator licenses will be conducted by an authorized Commission employee or representative at locations and at times specified by the Commission.



The Neenah-Menasha Amateur Radio Club, Inc., Neenah, Wisconsin members are getting ready for the Inland Lake Yachting Association races at Lake Winnebago where they furnish communications for the races. The photo shows Steve, WA9CIV, Warren, W9HHC and Ed, W9GSS, readying the equipment. This should give them some much needed good publicity.

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

(b) Unless otherwise prescribed by the Commission, an examination for the Conditional, Technician or Novice Class license will be conducted and supervised by a volunteer examiner selected by the applicant. A volunteer examiner shall be at least 21 years of age and shall be the holder of an Extra, Advanced or General Class Amateur Radio operator license, or shall hold a commercial radiotelegraph operator license issued by the Commission, or shall be employed in the service of the United States as the operator of a manually operated radiotelegraph station. The written portion of the examination shall be obtained, supervised, and submitted in accordance with the following procedure.

(1) Within 10 days after passing the required code test, an applicant shall submit an application (FCC Form 610), together with any filing fee prescribed to the Commission's office at Gettysburg, Pennsylvania. 17325. The application shall include a written request from the volunteer examiner for the appropriate examination papers. The examiner's request shall include (I) the names and permanent addresses of the examiner and the applicant, (II) a description of the examiner's qualifications to administer the examination, (III) the examiner's statement that the applicant has passed the code test for the class of license involved under his supervision within the 10 days prior to the submission of the request, and (IV) the examiner's written signature. Examination papers will be forwarded only to the volunteer examiner.

(2) The volunteer examiner shall be responsible for the proper conduct and necessary supervision of the examination. Administration of the examination shall be in accordance with the instructions included with the examination papers as prescribed in 97.29(c) and (d), 97.31 and 97.33.

(3) The examination papers, either completed or unopened in the event the examination is not taken, shall be returned by the volunteer examiner to the Commission's office at Gettysburg, Pennsylvania within the time prescribed (normally not more than 20 days after the date when the papers are forwarded by the Commission).

(c) The code test required of an applicant for the amateur radio operator license, in accordance with the provisions of 97.21 and 97.23 shall determine the applicant's ability to transmit by hand (straight key or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key) and to receive by ear, in plain language, messages in the International Morse Code and not less than the prescribed speed, free from omission or other error for a continuous period of at least 1 minute during a test period of 5 minutes counting five characters to the word, each numeral or punctuation mark counting as two characters.

(d) All written portions of the examinations for the amateur operator privileges shall be completed by the applicant in legible handwriting or hand printing and diagrams shall be drawn by hand, by means of either pen and ink or pencil. Applicants unable to comply with these requirements, because of physical disability, may dictate their answers to the examination questions and the receiving code test and if unable to draw the required diagrams, may dictate a detailed description essentially equivalent. If the examination or any part thereof is dictated, the examiner shall certify the nature of the applicant's disability and the name and address of the person taking and transcribing the applicant's dictation.

93.21 The Conditional class license requires the applicant to pass a code test of 13 words per minute for a period of at least one minute. The Novice and Technician class must pass a code test of 5 words per minute for at least one minute. If the applicant has within the last five years held any grade radio-telegraph license issued by the Commission he will be exempted from taking the code test. The holder of an operator license for the Technician license issued by the FCC examiner will not have to take the written test for his General class license, this only if he has taken the test before an FCC examiner. Code tests are graded as passed or failed. If the code test is failed, the examination is returned unopened to the FCC. The examination may be taken again in 30 days.

97.35 states that the Commission may require a Novice, Technician, or Conditional Class licensee to appear before them to take a test if there is any evidence of improper operation or failure to follow the rules and regulations. He may also be required to appear for such examination if he is required to restrict the operation of his station for any reason. Failure to pass the test will be cause for revoking the license. Improper operation can also result in fines and forfeiture of their license.

Date .....

Federal Communications Commission,
Gettysburg, Pennsylvania. 17325.
Gentlemen:

I, _____ being at least 21 years of age, by occupation an _____ and residing at _____ do hereby certify this _____ day of _____ that I am acquainted with the below listed applicant, that I am qualified under the Commission's rules to conduct the code test, that I have examined said applicant in the transmission and reception of the International Morse Code, and that within ten (10) days prior to making application said applicant did in my present correctly send and receive text in plain language at the rate of _____ or more words per minute (counting five characters to the word, each numeral and punctuation mark counting as two characters) for a continuous period of at least one (1) minute.

Further, I hold an _____ license with _____ class privileges, which expires on _____. My amateur call letters are _____.

The applicant _____, residing at _____, also has requested that I conduct the written examination necessary to satisfy the requirements of the Commission prior to the issuance of operator privileges in the _____ Class.

Accordingly, please mail a _____ Class written examination to me at my home address. Thank you.

Written Name _____
Name and call _____
Encl: Form 610 Address _____
Filing Fee. City, State and Zip Code _____

Fig. 1—A sample certification to use when giving the test. I want to thank W8KFC for this copy, I have used it 6 times and had no kick-back.

An Answer to Many Questions

Applicants for the General Class, Advanced or Extra Class will be sent to the Commission's Field offices along with the necessary filing fees.

Applications for Conditional or Technician licenses will be sent to the Federal Communications Commission, 334 York Street, Gettysburg, Pennsylvania, 17325, using form 610 and the fee is $4.00. Make check or money order payable to The Federal Communications Commission.

Applications for the modifications of license without renewal will be made on form 610, fee $2.00. Send to Gettysburg.

Application for Modification and renewal of license will be made on form 610, fee $4.00. Application must be filed within the last 60 days of the license term, or within the one year grace period. If the application was sent to the FCC for renewal and the license was not received by expiration date the operator may continue to operate his station. Send to Gettysburg.

Application for Novice license is sent on Form 610 to Gettysburg, there is no fee for Novice license.

To renew a license (except Novice) the applicant must state in the application that he has operated his station a minimum of either 2 hours

operating time within the last 3 months or 5 hours within the last year of the license period. He must also include a statement that he can receive code at a speed equal to that required for his original test. NOTE: Prior to 1935 the code speed was 10 w.p.m.

I hope this has answered many of the questions that you have asked me on the air, through the mails and at many of the meetings that I have attended.

Please note that the above information applies only to applicants living in the United States and Territories. Applicants in other countries may be able to find out the correct procedure for taking the license test from your local postmaster or police department, if not there, and you have a local broadcasting station, ask the engineer for the information.

Help Wanted

Lawrence Richardson, 4906 West Main Street, Belleville, Illinois 62223, operated about three months as a novice and now needs help to get the general or technician license. He says any help would be greatly appreciated. His phone number is AD 3-4595.

Letters

The letter section will be short this month due to the length of the foregoing licensing information gleaned from the latest issue of rules and regulations. I have told you before that this column can get results from its readers. I still need pictures and letters from YOU. You and your station are the life blood of this column. I know that you read it because I have now received letters from 44 countries, the latest being from Formosa. In one of the late columns I asked for some one in the electronics parts business to help out the amateur radio operators overseas who are having difficulty obtaining small parts for circuits published in U.S. magazines. The difficulty was that no one wanted to pack small packages for overseas shipment. Another difficulty was the dollar exchange, some countries allow only a small amount of dollars to leave their country. I have received an answer for them.

"Deal Walt: With reference to your appeal for a distributor who would take orders for merchandise for overseas shipment, we would like to be considered to qualify.

Our firm has been active in the distribution business for over 15 years. We are staffed completely by hams so that we know what they are looking for. Our correspondence can be in either English, French or Spanish. We do not have a minimum order as we realize not only the financial situation of the amateur abroad but they many times just need one small part to finish their project.

This past summer I have personally visited some 13 countries in Europe and talking to the various amateurs this same topic had come up, naturally we are not limiting this to Europe but to all hams anywhere in the world.

Trusting to be of service, Very truly yours, Russell L. Spera, W2UFU."

Thank you Russ, I am sure that you are doing a favor for many of the hams not only here but will be doing plenty for our DX friends, this kind of service could be used by many and will help our public relations with peoples all over the world. We need more like you. I will put your name on my list and if I receive any requests for this service I will include your name with the lists. Russ can be reached at Spera Electronics, 32-20 37th Avenue, Long Island 1, New York, 11101. Attention: Russell L. Spera, W2UFU.

This one tells its own story.

"Dear Walt: I wish to thank you for printing my name in *CQ*, I would have written sooner but I am having trouble with my plane geometry.

I was invited to a ham radio club in Adrian, I met a lot of friendly hams who sincerely wanted to help.

Now all I have to do is polish up on my code and I can take the Novice test.

THANKS A LOT. 73 Don Carter."

Now Don don't forget to send a letter and picture of your station when you get going, I hope to work you on the air. By the way Walter Dodd was down here and wondered why a local boy had to write NOVICE for help, I guess it was for help, it just goes to show that we as amateurs need more publicity for our hobby so that those needing help will know where to go. My thanks to the Adrian gang for helping to prove that amateurs are the nicest people in the world.

Fellows and Gals let's kick this letter around for a while and see what you think of the idea. I would like to hear from some of you about this.

"Dear Walt: The other day a novice friend of mine who has had his license for six months now but has not been able to get on the air because of the lack of equipment came to me to borrow my DX-20. He still lacked a receiver but after a few phone calls I was able to locate one for him. He is now on the air.

The thought came to me, why not a borrowing and lending service, I will offer to act as a clearing house for the service. All I would need to know is who has something to lend and who needs to borrow. The equipment should be in good shape when lent and the novice should promise to either keep it that way or pay for its repair.

We would try to keep the equipment in the same locality as its owner so that it would always be available when needed. I would need to know who has crystals, change-over relays receivers and small transmitters to lend and then the borrower and lender would keep a self addressed envelope at my QTH and I could keep in touch with them. I would know when the equipment was lent out and to whom and also when it was returned. What do you think of the idea? 73. Chuck, K9QIZ." Chuck's address is: Charles

[*Continued on page 93*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

March	6-8	YL/OM C.W.
March	13-14	ARRL DX Phone
March	19-22	YL Int. SSB'ers
March	20-22	B.A.R.T.G. Spring RTTY Contest
March	23	Pakistan DX
March	27-28	ARRL DX C.W.
April	1-15	Goose Bay QSO Party
April	3-4	Helvetia 22
April	3-4	Florida QSO Party
April	**10-11**	**CQ WW DX SSB**
April	10-11	SP DX C.W.
April	24-25	PACC CW/Phone
April	24-26	Missouri QSO Party
May	15-17	Georgia QSO Party

YL/OM Party

Starts: 1800 GMT Saturday, March 6
Ends: 0500 GMT Monday, March 8

This is for the c.w. week-end, the Phone section has already taken place. If you are interested you can check Louisa Sando, W5RZL's YL Column in the January issue.

ARRL DX

Phone—March 13-14. **C.W.**—March 27-28.
Starts: 0000 GMT Saturday, Ends: 2400 GMT Sunday in each instance.

This is the second half of the annual ARRL DX marathon. It's too late to catch up if you missed last month's activities, but you will still find plenty of DX looking for a W/K and VE/VO contact. Full details in the January issue of *QST*. Mailing deadline for your entry is April 24th. The address: ARRL DX Competition, 225 Main Street, Newington, Conn. 06111.

YL Int. SSB'ers QSO Party

Starts: 2300 GMT Friday, March 19
Ends: 0600 GMT Monday, March 22

The YL International SSB'ers with over 4000 members, have decided to run a QSO Party of their own this year. It is open to all amateurs, on all bands and all modes. Activity is not confined to SSB only. Note the list of operating frequencies.

A new contest innovation called "team operation" is being tried. You will find the rules rather complicated and a bit confusing, but perhaps if you concentrate on a single category it will not be too difficult to figure your score.

Categories: There are three categories and you can enter more than one if you wish.

1. DX/W-K Teams. These teams will consist of a DX station and a stateside station. Each will enter the Single Operator section. Scores will be combined for the team score upon receipt of both logs.

2. YL/OM Teams: These teams will comprise of related pairs; husband/wife, father/daughter, mother/son or brother/sister. Operation must be from the same QTH and each will use his or her own call. Contacts with each partner counts separately and each may submit their score for the single operator section.

3. Single Operator: This is the only category open to non-members. Of course members may enter this category too.

Each station must show 6 hours of continuous rest period in each 24 hours. Each log must also show a minimum of 6 hours operation.

Scoring for SSB members: Contacts with members in own country 2 points, DX SSB members 6 points, contacts with non-members 1 point, DX non-members 4 points.

Scoring for non-members: Contacts with SSB member in own country 2 points, DX member 4 points. Contact with DX non-member 3 points. No point credit for non-member contact in own country.

Multiplier: Number of different prefixes, plus countries, plus U. S. states, plus continents, plus team where *each* member of a DX/W-K team has been contacted. (KH & KL count as both state and country.)

The same station may be worked on different bands and modes for additional credit points.

Logs: Must show in this order: Date/time in GMT, your QSO nr., station worked, his QSO nr., RS/RST sent & received, state & country, band, mode, SSB'ers nr., DX partner's call. (If any)

Awards: DX/W-K Teams; 1st, 2nd & 3rd places for world. 1st, 2nd & 3rd place for each continent. (KL and KH in DX category.)

YL/OM Teams: 1st, 2nd & 3rd place for each country and U.S. state.

Single Operator: 1st, 2nd & 3rd place for world, each country and U.S. state. (SSB'ers members and non-members will be scored separately.)

Frequencies: Plus or minus 10 kc.

s.s.b.: 3805, 3995, 7215, 7295, 14131, 14331, 21410, 28440. (DX stns calling on 14131 listen on 14331)

a.m.: 3825, 7205, 14240, 21340.

c.w.: 3565, 7020, 14080, 21080, 28080.

Stations wishing to enter the DX/W-K category should immediately contact W7NKK via

*14 Sherwood Road, Stamford, Conn. 06905.

mail or system control to advise him of your partnership or to get a partner assignment.

Your contest logs must be postmarked within 30 days after the contest and go to: Jim Charlton, W7NKK, 489 N. Larch, East Wenatchee, Wash. 98802.

Pakistan DX

Starts: 0000 GMT Tuesday, March 23
Ends: 2400 GMT Tuesday, March 23

This contest is held on March 23rd each year in celebration of the Republic Day. We have not heard from our friend Mohd, AP5CP, but we are sure that the Tigers Amateur Radio Club is once again sponsoring this activity.

Rules appeared in the March issue last year in case you should work any Pakistan stations.

The address was: Awards Manager, Mr. Mohd, AP5CP, Tigers Amateur Radio Club, Dacca Signals, Dacca 6, East Pakistan.

B.A.R.T.G. Spring RTTY Contest

Starts: 0200 GMT Saturday, March 20
Ends: 0200 GMT Monday, March 22

Bands: 3.5, 7.0, 14.0, 21.0 and 28.0 mc.

Stations: Stations may not be contacted more than once on any one Band. Additional contacts may be made with the same station if a different Band is used.

Country Status: A.R.R.L. Country list—except that KL7; KH6 and VO to be considered as separate Countries.

Messages: Messages exchanged will consist of: (A) Message number, (B) Report (RST), (C) Time in GMT, (D) Country.

Points: (A) All two-way RTTY contacts with stations in one's own Country, will earn two points. (B) All two-way RTTY contacts with stations outside one's own Country will earn ten points. (C) All stations will receive a bonus of 200 points per Country, including their own.

Scoring: (A) Two-way exchange points, times total Countries worked. (B) Total Country points, times number of Continents worked. (C) Add item (A) and (B) together. This is your total test score.

i.e. **Sample Score:**

(A) Exchange points (302) times Countries (10)	=	3,020
(B) Country points (2,000) times Continents (3)	=	6,000
(C) Add item (A) and (B) above	=	9,020
		(Total test score)

Logs and Score Sheets: Logs and Score Sheets should be received by: B.A.R.T.G. Contest Manager, Alan Walmsley, G2H1O, The Woodlands, Bath Lane, Moira, Nr. Burton-on-Trent, Staffordshire, England, not later than 1st May, 1965, to qualify.

Helvetia 22

Starts: 1500 GMT Saturday, April 3
Ends: 1700 GMT Sunday, April 4

The H 22 is a popular little contest, working all 22 Cantons in one week-end is a goal very few W/K stations have been able to accomplish, mostly because conditions have not been favorable the past few years. The HB boys certainly make every effort to put all 22 cantons on the air so that the attractive Helvetia 22 certificate is available to all who will make a good effort.

Rules are the same as they have been the past few years.

1. All bands are allowed. 1.8 thru 29.7 mc, c.w., c.w. or phone, phone.

2. Serial numbers will be the usual five and six digits, signal report plus a progressive 3 figure contact number starting with 001. Swiss stations will also send the abbreviation of their Canton after their number. (Example: 579001/ZH)

3. Each contact with a HB station counts 3 points and the same station can be worked once per band, either on c.w. or phone.

4. The multiplier is the sum of Swiss Cantons worked on each band, making a possible multiplier of 22 per band.

5. Your final score therefore will be your total QSO points multiplied by the sum of Cantons worked on each band.

6. Use a separate log sheet for each band and only one side of the paper.

7. Certificates will be awarded to the highest scorers in each country and each call district in the United States and Canada.

8. Your log must be postmarked no later than April 30th and go to: USKA Traffic Manager, HB9ZY, Meggen—LU, Switzerland.

The abbreviations of the 22 Swiss Cantons are: ZH, BE, LU, UR, SZ, NW, GL, ZG, FR, SO, BS, SH, AR, SG, AG, TG, TI, VD, VS, NE, GE, GR.

Florida QSO Party

Three periods:
0000—0500 GMT Saturday, April 3
1400—2000 GMT Saturday, April 3
0000—0400 GMT Sunday, April 4

Exchange: QSO number, RS/RST, county for Florida stations; all others, state, province or country.

Scoring: Florida stations, 1 point per QSO, multiplied by the total of states, Canadian provinces and countries worked. (Florida stations may be worked for contact points, state multiplier and WAFC)

Other stations: 1 point per QSO with each Florida station, multiplied by the number of Florida counties. Bonus points for working Florida counties as follows: First 20, 50 points, second 20, 200 points, third 20, 500 points and all 67 counties, 1500 points.

Awards: Certificates to the highest scoring station in each state, Canadian province and foreign country. (With 5 or more contacts.) Certificates also to the winners in each Florida county.

Phone and c.w. are to be scored separately. The same station can be worked on each band for contact point credit. Contest contacts will be honored for the WAFC Award. (Worked All Florida Counties.) There are no power restrictions or time limit.

Frequencies: C.W.—1815, 3530, 7030, 14030, 21030, 28030, 145.2.

Phone—3930, 7230, 14230, 21330, 28830, 50230.

Mailing deadline for logs is April 30th and they go to: Florida Skip, Contest Chairman W4WHK, P.O. Box 501, Miami Springs, Fla. 33166.

SP DX C.W.

Starts: 1500 GMT Saturday, April 10
Ends: 2200 GMT Sunday, April 11

This year's contest will be in celebration of the 25th anniversary of the P.Z.K. (Polski Zwiazek Krotkofalowcow)

It's the world working the Polish amateurs on c.w. only.

1. Use all bands, 3.5 through 28 mc.

2. The serial numbers will consist of the usual six figures, RST report plus a progressive 3 digit number starting with 001.

3. Each contact counts 1 point and the same station can be contacted once on each band for contact and multiplier credit.

4. Your multiplier is determined by the number of SP call areas worked on each band, SP1—SP9, a possible maximum of 45.

5. The final score therefore will be the total QSO points multiplied by the sum of the multiplier from all bands.

6. There are two station classifications; single operator and multi-operator. Multi-transmitter operation is *not* permitted.

7. Awards will be made to the highest scoring station in each classification in each country. In countries where the participation is high, awards will be made for 2nd and 3rd place.

8. Use a separate sheet for each band. Also include a summary sheet, showing the scoring, equipment description and your name and address in BLOCK LETTERS. Sign the usual declaration that the contest rules as well as the operating conditions of your license have been observed.

Your logs go to: P.Z.K. Contest Committee, P.O. Box 320, Warsaw 1, Poland. They must be in the hands of the committee no later than May 31st.

CQ WW DX SSB

Starts: 1200 GMT Saturday, April 10
Ends: 2400 GMT Sunday, April 11

Complete details will be found on page 47 of this issue. No changes from last year's rules since they were well received by all who participated.

All the rules except one however. The 12 hour compulsory rest period is still a point of controversy. The all banders complain that this limits their operation on 3.8 and 7 mc. Since the rest period would normally be taken at night when the activity is low, they have a point. The single banders of course have no problem, except maybe on 14 mc, especially with improving conditions now in sight.

[*Continued on page 96*]

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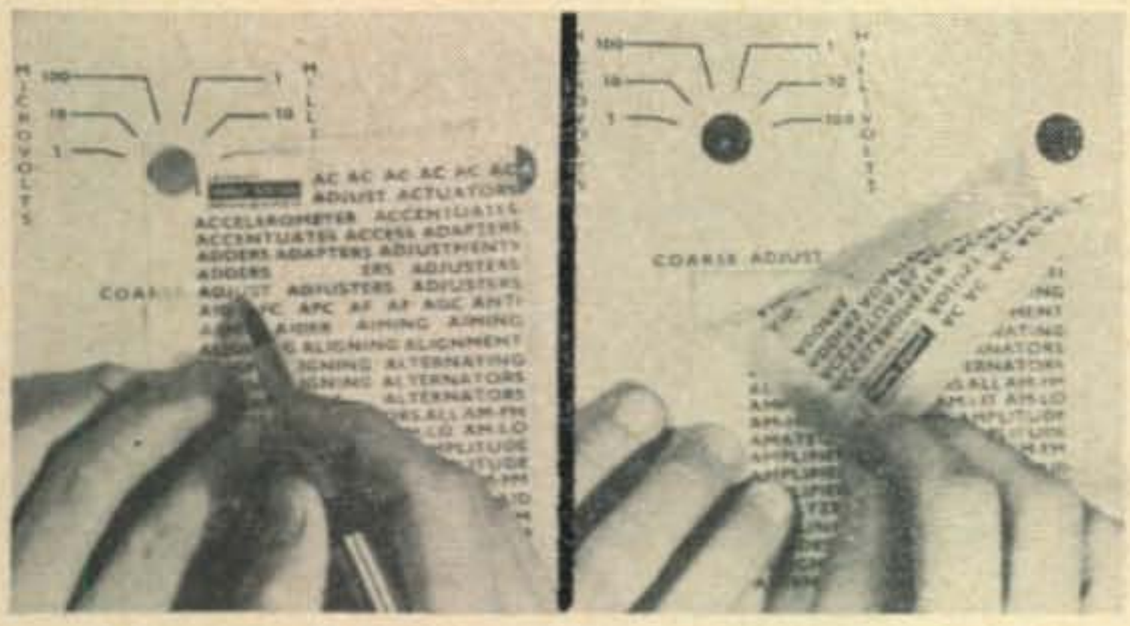

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For further information, check number 35, on page 110

Propagation

BY GEORGE JACOBS,* W3ASK

TWENTY meters is expected to continue to be the best band for DX propagation conditions during the daylight and early evening hours. The band is expected to open at sunrise and remain open to one DX area or another until well past sunset. Good DX propagation conditions are also predicted to many areas of the world for 15 meters during the hours of daylight. Some 10 meter openings may also be possible to southern or tropical areas during this same period.

During the hours of darkness, DX propagation conditions are expected to be optimum on 40 meters. The band is expected to open shortly before sunset and remain open until shortly after sunrise, with signal levels often exceptionally strong. Fairly good DX openings to some areas of the world are also predicted for 80 meters during the hours of darkness, and some 160 meter DX openings may also be possible during this same period.

For specific times of DX openings for each amateur band 10 through 160 meters during March, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for March and April as well as predictions centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for distances between 50 and 2300 miles. See the text following the "Last Minute Forecast" at the beginning of this column for instructions in the use of these Charts.

Spring Equinox

The vernal, or spring equinox, will occur on March 21. This is the day when the sun crosses the equator as it travels northward along its apparent ecliptic. On this day, the hours of daylight and darkness are of equal duration throughout the world.

The vernal equinox is expected to have a noticeable influence on h.f. propagation conditions for a period of several weeks, from late February through early April. During this period propagation conditions on long circuits between the northern and southern hemisphere (for example, to Australia, South America and South Africa, etc.) generally improve considerably. This results from the "equalization" which occurs when the hours of daylight and darkness are approximately the same throughout the world, and when it is early spring in one hemisphere and early fall in the other. A similar situation also occurs during September and October when the autumnal, or late equinox, takes place.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for March

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

How To Use These Charts

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

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

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

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

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

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

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

6—These Propagation Charts are valid through March 31, 1965. These Charts are prepared from basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

VHF Ionospheric Openings

Some meteor-type v.h.f. ionospheric openings may be possible during March 10-12 and on the 20th, when minor meteor showers are expected to take place.

There is often an increase in auroral activity during the equinox period and this is likely to

result in an increase in v.h.f. auroral-type openings. Check the "Last Minute Forecast" for days that are predicted to be "disturbed" or "below normal" during March, since these are the days on which auroral activity is most likely to occur.

Sunspot Cycle

The Zurich Federal Solar Observatory reports a *mean* sunspot number of 15 for December, 1964. This results in a *smoothed* sunspot number of 10, centered on June, 1964.

A number of readers of this column have asked for an explanation of the difference between the *mean* and the *smoothed* sunspot numbers. The mean number is based on the average of the daily numbers observed throughout an entire month by the Zurich Observatory. The following are the mean monthly sunspot numbers observed from December 1963 through December 1964, given to the nearest whole number:

Month	Mean Number
December 1963	12
January 1964	15
February 1964	16
March 1964	15
April 1964	8
May 1964	9
June 1964	9
July 1964	3
August 1964	9
September 1964	4
October 1964	6
November 1964	7
December 1964	15

There is a considerable month-to-month fluctuation in the mean value of sunspot numbers. To smooth-out this fluctuation, a 13 month average is taken of the mean numbers. This results in the *smoothed* sunspot number. The smoothed number is always centered on the middle, or seventh month, for the 13-month period for which it is determined. For example, the smoothed number for the period December, 1963, through December, 1964, shown above would be 10, centered on June, 1964. For this reason, the latest smoothed sunspot number always lags the latest mean monthly number by a 6-month period.

The smoothed sunspot number reduces the wide fluctuation often observed from month-to-month in the mean numbers and results in the familiar sunspot cycle curve. A smoothed number of 7 is predicted for March, 1965.

Anniversary

This month's column marks the beginning of my fifteenth year as Propagation Editor of *CQ*. In the field of radio propagation, time is often measured by sunspot cycles rather than by months or years. By this reckoning, since March, 1951, this column has witnessed the last three years of sunspot cycle 18 and the complete 11-year span of cycle 19. Now, a new sunspot cycle is beginning and I hope that this column will continue to serve as a source of propagation information for radio amateurs throughout its life and beyond.

73, George, W3ASK

CQ SHORT-SKIP PROPAGATION CHART

March-April, 1965

TIME AT PATH MID-POINT
(24-HOUR TIME SYSTEM)
Band Openings Given in Local Standard Time

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	*Nil*	08-20 (0-1)	08-20 (1-0)
15	*Nil*	08-21 (0-1)	08-12 (1) 12-17 (1-2) 17-21 (1) 21-08 (0-1)	09-11 (1) 11-12 (1-2) 12-16 (2-3) 16-17 (2) 17-18 (1-2) 18-21 (1) 21-09 (1-0)
20	*Nil*	07-12 (0-2) 12-16 (0-3) 16-20 (0-2) 20-07 (0-1)	06-07 (1-2) 07-08 (2) 08-10 (2-3) 10-12 (2-4) 12-16 (3-4) 16-20 (2-3) 20-21 (1-2) 21-06 (1)	06-07 (2-0) 07-08 (2-1) 08-10 (3-2) 10-14 (4-3) 14-16 (4) 16-19 (3-4) 19-20 (3) 20-21 (2) 21-22 (1)
40	06-08 (0-1) 08-10 (1-3) 10-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-06 (0-1)	06-08 (1-2) 08-10 (3) 10-15 (4-3) 15-16 (4) 16-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (1)	06-08 (2) 08-15 (3-1) 15-16 (4-2) 16-18 (4-3) 18-20 (3-4) 20-22 (2-4) 22-02 (1-3) 02-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-18 (3-1) 18-20 (4-2) 20-22 (4-3) 22-02 (3-4) 02-05 (2-3) 05-06 (2)
80	06-08 (1-2) 08-10 (3-4) 10-18 (4) 18-20 (3-4) 20-22 (2-3) 22-01 (1-2) 01-06 (1)	06-08 (2) 08-10 (4-1) 10-16 (4-0) 16-18 (4-2) 18-20 (4-3) 20-22 (3-4) 22-01 (2-4) 01-06 (1-2)	06-08 (2-1) 08-10 (1-0) 10-16 (0) 16-18 (2-1) 18-20 (3-2) 20-01 (4) 01-05 (2-3) 05-06 (2)	06-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-01 (4-3) 01-05 (3) 05-06 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

ALASKA
*Openings Given in GMT**

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

[*Continued on page 98*]

*GMT, or Z time is 5 hours *ahead* of EST; 6 hours *ahead* of CST; 7 hours *ahead* of MST; 8 hours *ahead* of PST and 9 hours *ahead* of Alaskan Standard Time in the zone between Skagway and 141 degrees west longitude, etc.
†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT.
§Indicates possible 10 meter openings.
‡Indicates possible 160 meter openings.

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

As mentioned last month, application #1 for USA-CA-3000 was received from Cliff Corne, K9EAB. The application was duly processed and here are some interesting facts: he has QSLs from all counties in all states except California, Colorado, Hawaii, Idaho, Montana, Nebraska, Nevada, Texas (Although he has 236 of the 254), Utah, Washington and Wyoming. He was not fooling when he said, "Let's make USA-CA an institution . . . there is nothing else like it! I have abandoned DX chasing, curtailed activities on my four WPX diplomas, and devoted all energies and interest to the chasing of new counties." It is obvious that Cliff has done a lot of scheduling and promoting of expeditions to "rare" counties. (Editor's note—My Wife said, "Gee, and you can't even work the other 22 hams in our small town.")

K4VOF earned #4 USA-CA-2500 award for mixed operation; All five of the USA-CA-2000 awards were for mixed operations, as were the two USA-CA-1500 awards. Four USA-CA-1000 awards were for mixed operations but KØEJW got endorsements for 7 mc 2XSSB and 7 mc 2XSSB mobiles. Two USA-CA-500 awards were all A1, and two were for mixed operations. In addition to these, "Arcy", K5SGK, earned endorsements for USA-CA-1500 all s.s.b., all 7 mc, all mobile—if this keeps up, a larger award will have to be made to hold all the endorsements for "Arcy" and also for "Mable", K5SGJ.

Letters

Duane, K2PFC, USA-CA-500 #1A, writes, "I have been getting requests to go portable to some of the harder to get New York and Pennsylvania counties. Last summer we made some trial runs and had a ball. From the letters I have received so far, it looks like the boys still want me to go out again.

When the weather breaks, about the end of March, I will take my Zeus generator and rig out *every Saturday*. At first I will hit the nearby counties and if I get a good following I will hit the spots where I will have to camp overnight. So check *every Saturday* 7034 kc and 14068 kc from 1700 GMT to 2200 GMT (Noon EST to 5 PM EST)." He lists New York counties—Allegany, Cattaraugus, Livingston, Yates, Ontario, Seneca, Schuyler, Cortland, and even Essex if enough are interested. In Pennsylvania he lists—Potter, Tioga and Bradford. So fellows, keep him busy so he will enlarge his area.

Chuck, WA9JRS, writes, "There are quite a few hams in Williamson County (Ill.), but it still seems to be a rare one. For those needing Williamson county, look for me or WA9JRR around 7110 kc weekdays starting 2130 GMT and on week ends."

Stuart Meyer, W2GHK, W2GHK/4, President of Hammarlund Manufacturing Company, sponsor of the "DX-pedition of the Month", writes, ". . . With respect to the Counties Caravan and DX-peditions, these usually occur in the summer time when there is an abundance of college fellows eager to go in for this sort of thing and they have their time pretty much to themselves. In any event, we will probably be shaping up some plans for the summer of 1965, and I will see that you are informed. Possibly there will be a 'SKYTOP III'." As you probably remember, K8ITH, K8EJN and K8YOM ran Counties Caravans through Kentucky, Virginia and West Virginia. The "SKYTOP II" featured WA4MIV, K5MPX and K5LYC from Mt. Mitchell, Yancey County, North Carolina.

Rick, WB2MJF, is really keeping me on my toes with all his letters and questions, I enjoyed his last letter which closed like this, "At this time I only need some 2800 odd counties more to get USA-CA-3000."

County Identity

Many many old QSL cards do not mention any county, and many hams still fail to mention their county so it is necessary to check against good road maps, atlas or the Directory of Post Offices (P. O. D. #26) which is the USA-CA official guide. Unfortunately these are difficult for overseas hams to get, so in the past many good USA-CA members and many good members of CHC volunteered their help—I'll be happy to hear from such volunteers.

This was brought to mind by a nice letter from Dick Hade, K9HSK, 132 South Euclid Ave., Princeton, Illinois 61356, advising that he is available for the County Identity Service for DX stations.

Which reminds me of a QSO I had some time ago with "GW" when I was working for an English county award, each time I asked for his county he came back and said, "Wales", as though an ole ham like me did not know that "GW" was Wales. . . .

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

USA-CA HONOR ROLL

3000

K9EAB 1

2500

K4VOF 4

2000

K5SGK 8
WA9AJF 9
WA8EZW 10
K8KOM 11
K8IWI 12

1500

K8IWI 22
K8EUX 23

1000

KØEJW 57
W4VWW 58
K8EUX 59
WB2LZF/W9IOJ 60
KØRTH 61

500

K2KBI 440
W2YVQ 441
K5RBN 442
KØDJC 443

North Dakota State County Award

Grand Turk Amateur Radio Award

Empire Radio Transmission Award

Worked the British Empire (c.w. only) Award

Awards

The WAPUS Award (Worked All Prefixes in the U.S.), sponsored by the Bossier High School is issued in three classes—for working 16, 32 and 46 prefixes. Apply with GCR list and 50¢ or 5 IRCs (Price was 25¢) to Bossier High School Amateur Radio Club, C/O Edwin T. Shell, P.O. Box 5223, Bossier City, Louisiana, U.S.A.

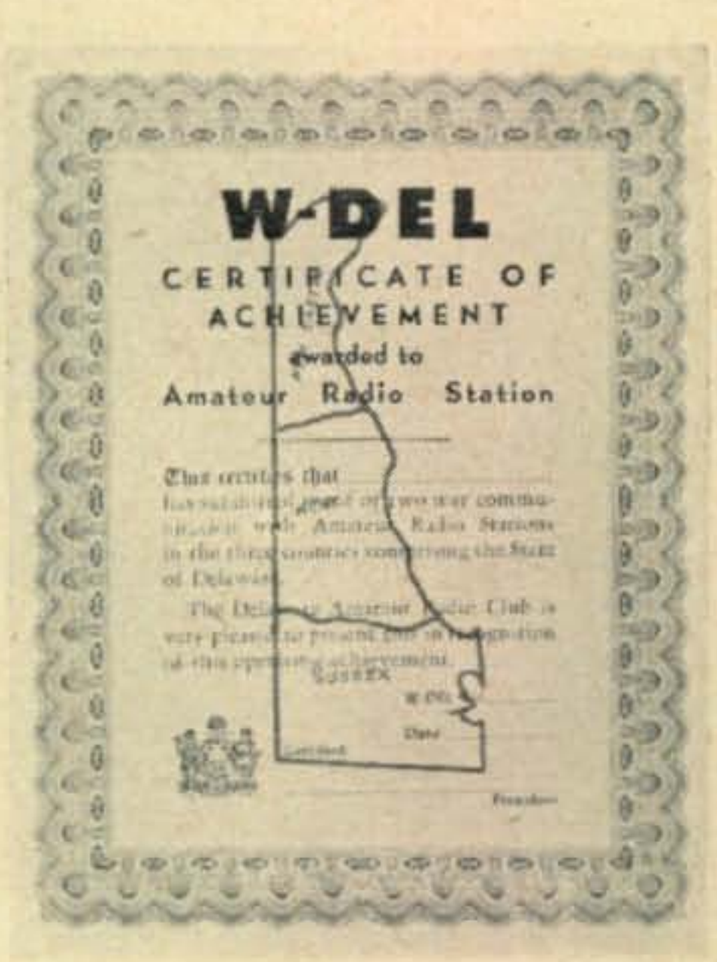
A WAMA (Worked All Military Academies) certificate is in the works and I expect more information shortly from Capt. Billy Stahl, Officer In Charge of the Cadet Radio Club at the United States Air Force Academy in Colorado.

The Radio Society of Great Britain, 28/30 Little Russell Street, London, W.C.1, issues six certificates; Commonwealth DX Cer-

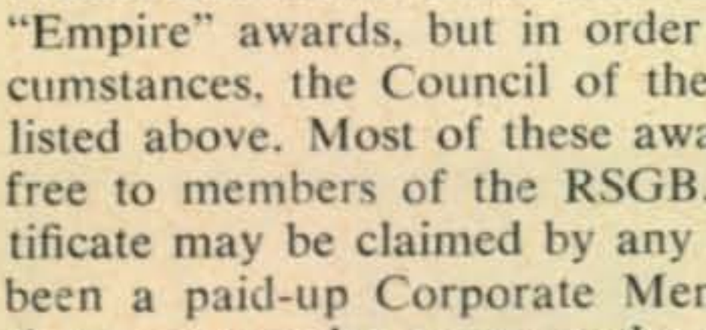
Apple Pie Hill Award

Worked The British Empire Award

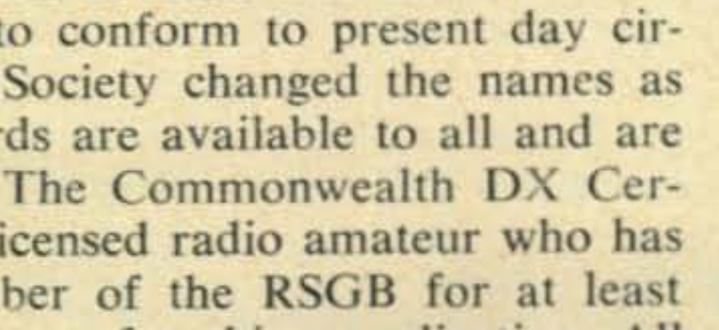
tificate (CDXC), British Commonwealth Radio Transmission Award (BCRTA), Worked British Commonwealth Certificate (WBC), British Commonwealth Radio Reception Award (BCRRA), DX Listeners' Century Award (DXLCA) and Four Meters and Down Certificates. Most of these awards were called "Empire" awards, but in order to conform to present day circumstances, the Council of the Society changed the names as listed above. Most of these awards are available to all and are free to members of the RSGB. The Commonwealth DX Certificate may be claimed by any licensed radio amateur who has been a paid-up Corporate Member of the RSGB for at least three consecutive years at the time of making application. All claims must be made by registered mail direct to RSGB Headquarters, cards are required and will be returned by registered mail if sufficient money is sent with the claim.



Worked Delaware Award (W-DEL)



Empire DX Award



Worked All Eleuthera (W.A.E.)

5 × 9 Award—West Virginia

For the CDXC evidence required of two-way communication with amateur radio stations located in at least 50 call areas on 14 mc and in addition with at least 50 call areas on other amateur frequency bands. These call areas are listed in the RSGB Certificates and Awards leaflet which may be obtained by sending a s.a.s.e. or s.a.e. and IRC to RSGB Headquarters. The BCRTA may be obtained for two-way QSOs with Amateur Radio Stations in at least 50 of the call areas. The WBC is issued for two-way QSOs with at least one British Commonwealth Radio Station located in each of the five recognized Continental areas as defined by the IARU. (North and South America count as one.) Some of the Awards are shown before they were updated, and the new awards will be shown shortly. The charge for non-members is $1 or 7 Shillings.

The Apple Pie Hill Amateur Radio Club, Inc. offers a certificate for working five or more Apple Pie Hillers. There are 34 members, send log data to Jack Hilton, WA2DPR, West Creek, N.J.

The Worked-Delaware (W-DEL) issued for confirmed QSOs with the three counties of Delaware which are New Castle, Kent and Sussex. Send QSLs or GCR list signed by two other amateurs stating QSLs have been seen, send this and 50¢ or 5 IRCs to John B. Wilson, 1005 Greentree Road, Newark, Delaware. There have been 1026 W-DEL certificates issued to date, most of these in the last 3 years due to more activity in the lower part of the state.

The North Dakota State-County Award (NDS-CA) is issued by the North Dakota State University Amateur Society in four classes, each a separate achievement as endorsed on the basic certificate by the use of seals, or with a North Dakota State Flag for Class AA. Also, special endorsements will be made for band and mode operations subject to the rules. Class C requires 10 counties or only 5 counties for DX station; Class B requires 25 and 15; Class A requires 40 and 30 and Class AA requires 53 counties for U.S. station or DX station. Submit alphabetical (By county) list with information necessary for county identity and other log data necessary to satisfy special endorsements (Band-mode) requested. It is mandatory that cities and towns or other specific location be mentioned. Have the list certified by two licensed amateurs or officials of an amateur radio club, verifying that QSL cards for all contacts as listed have been seen. Send the certified list and handling fee of one U.S. dollar ($1.00) or 10 IRCs to North Dakota State University Amateur Radio Society, NDS-CA Custodian, E. E. Dept., Fargo, North Dakota. For later applications for higher class seals, send list per the rules and s.a.s.e. For applications for later special endorsements (Band-mode) where certificate must be returned for endorsements, send certificate and s.a.s.e. Since the start of the NDS-CA program, 81 awards have been issued, twelve of these were issued to DX stations. There have been five class AA awards issued to date.

5 × 9 Award, is issued by the West Virginia Chapter 35 CHC is issued for confirmed QSOs with 5 West Virginia stations and 9 stations each located in a DIFFERENT call-area within Zone 5. Zone 5 consists of VO1, VE1, VE2, FP8, VP9, W1, W2, W3 and Florida, Georgia, South Carolina, North Carolina and Virginia in W4, (And naturally West Virginia in W8). Send GCR list and fee of $1 or 10 IRCs to Carl R. Nelson, K8BIT, Awards Chairman, 4620 Kanawha Ave., S.W., South Charleston, West Virginia 25309.

Also shown are two unusual Awards—their original size is only 3½ inches by 5½ inches. W. A. E. was issued for working all Eleuthera, a small island in the Bahamas and there were only two stations on the island, VP7CW and VP7LG. The Grand Turk Amateur Radio Award was issued by VP5BB for working the three stations on the island.

That's all for this month, and how was your month?

73, Ed, W2GT

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

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

80 meters		3620 kc
40 meters		7040 kc
40 meters	(narrow shift)	7140 kc
20 meters		14,090 kc
15 meters		21,090 kc
6 meters		52.60 mc
2 meters		146.70 mc

LAST month we described a rather simple but neat tone detector which is the heart of our system used to control unattended Teletype machines by RTTY stations transmitting on a v.h.f. channel. This device, called an Autostart Unit, entirely independent from the terminal (converter) unit, is used to operate a larger relay to start and stop the machine motor.

Autostart, Part III

The hook-up shown in last month's RTTY Column gave the connections for simple continuous monitoring. In other words, any RTTY station on the channel, at any time, would be copied; *providing* that each station followed the standard operating procedure (SOP) of beginning each transmission with a steady *mark* of about 7 to 10 seconds. (This SOP is for attended-station operation.)

In crowded metropolitan and suburban areas simple continuous monitoring is not practical—the machine would be running all the time. Some form of clock-controlled monitoring is therefore in order. The clock unit pictured, and diagrammed in Figure 1, used in conjunction with the simple Relay Control Unit (Fig. 2) permits us to set up the first 1½ minutes of any single, or group of hours, as the "key" input times. If no steady *mark* signal is detected by the Autostart Unit, the receiver and TU disconnect until the next pre-set clock time. If the starting signal *is* detected, the motor of the teleprinter machine is started, and stopped, by the stations transmitting on the channel. The receiver and TU disconnect only 1½ minutes after the last RTTY transmission on the channel.

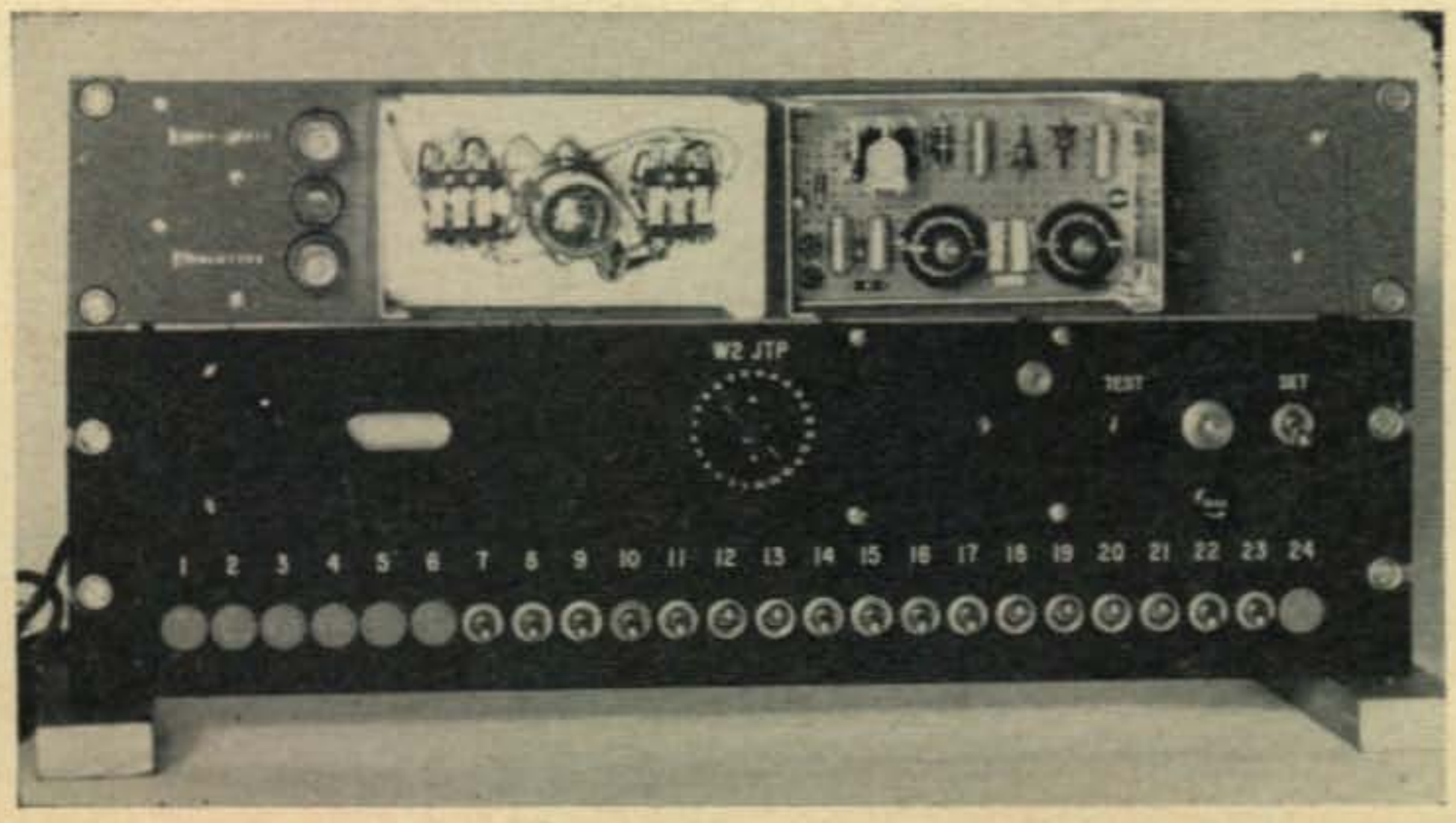
The Clock Unit[1]

If you examine Figure 1, you will see that the basic principle of the clock unit is that of a switch which is closed for just a few seconds at certain times. A one revolution-per-day (one r.p.d.) clock motor drives a readily available 24-position tap switch which, through separate toggle switches, determines the hour. A one revolution-per-hour (one r.p.h.) clock motor operates a microswitch at the desired minute. So, if the 24-position switch, the toggle switch for that hour, and the microswitch, are all closed, this circut-closure locks up the start relay and starts the time delay relay, both in the associated Relay Control Unit.

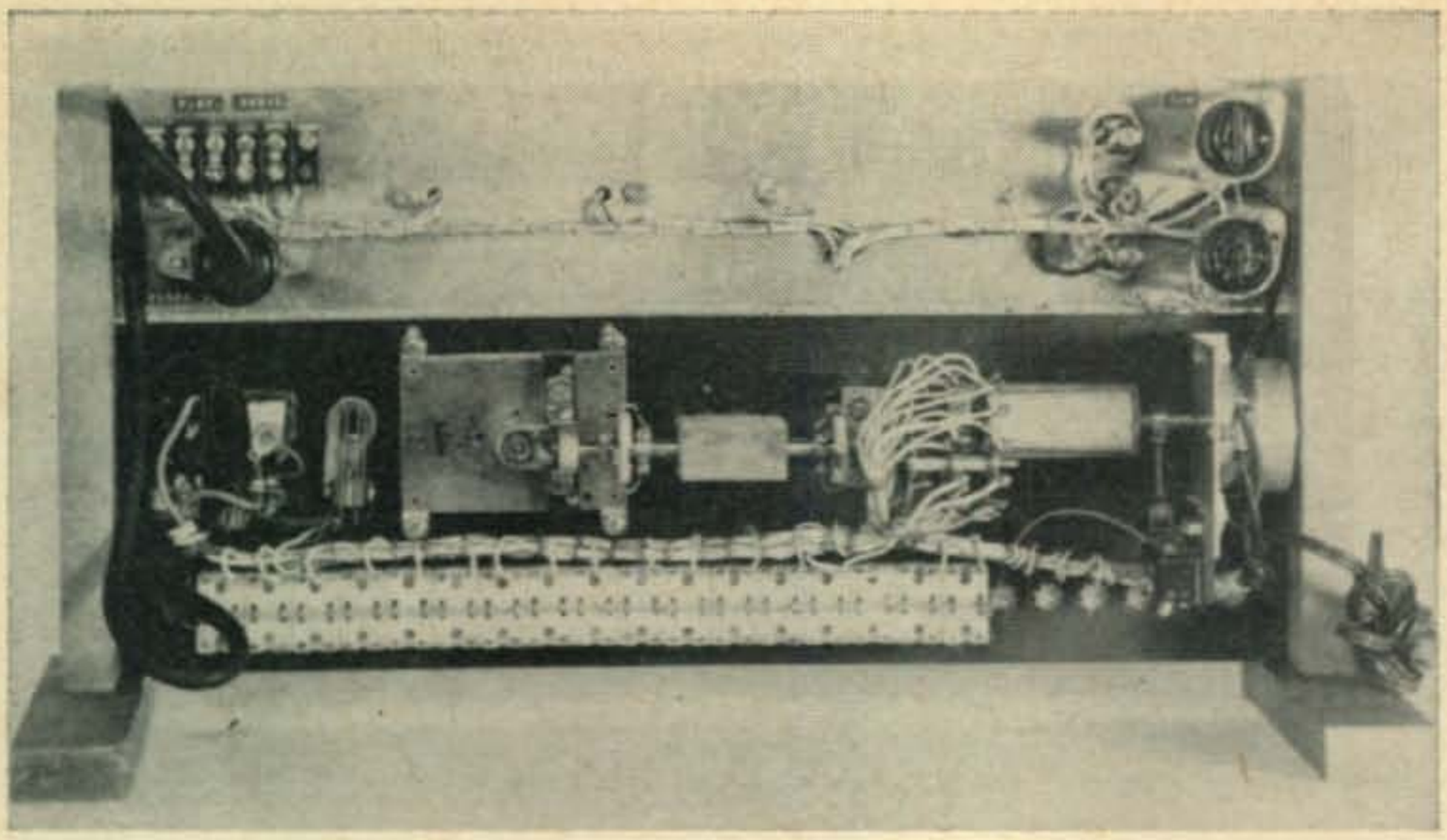
The clock motors came from Herbach & Rademan, 1204 Arch Street, Philadelphia, Pa.; the 24-position tap switch is a Mallory #13124, and the 24-point dial scale comes with the switch. The switch is modified only by removing the two detent rollers. The one r.p.d. clock drives a surplus right-angle gear mechanism to bring the main shaft parallel to the panel. This could have been another Millen #10012, which was used to drive the pointer knob and the 24-position tap switch. The SET switch in the one r.p.h. clock circuit is used to synchronize this clock with any convenient time signal. To synchronize, the clock is stopped just as the microswitch contacts close, then started by the SET switch upon

*431 Woodbury Road, Huntington, N. Y. 11743.

[1]Kretzman, B. H., *The New RTTY Handbook*, CQ, p. 111.



Autostart System of W2JTP. Top panel contains the Autostart Unit on the right, and the Relay Control Unit on the left; covers off.



Rear view of the Autostart Units. Note the a.c. sockets for the TU and Receiver, and for the Teletype machine. Note also the fuse posts, the most vital part of any unattended operation.

reception of the time signal. The TEST switch is a push-button switch used to check lock-up and release operation of the Relay Control Unit in between clock times.

The Relay Control Unit[2]

The Relay Control Unit is built into a *Bud* mini-box (CU-3006A) identical to that used to house the Autostart Unit described last month. A 1⅛" hole is cut in the cover to permit the Amperite Type 115-C120 thermal relay to stick out. (We used the octal base relay instead of the miniature equivalent because it is more ruggedly built.) The relays were Advance 115-v 60 cps three-pole units. These were used only because they were smaller than the P & B Type MR-5A relays used in the *New RTTY Handbook* unit.

When the clock unit comes up to a pre-set time, the circuit between pins 3 and 4 on J_1 is closed for just a second or two. Relay K_1 then locks up through the normally closed contacts of the thermal time delay relay K_3. The contacts of K_1 then apply a.c. power to the receiver and TU plugged into J_2. (It is recommended that the receiver be left on continuously if there is much activity.) If a steady *mark* tone is detected by the Autostart Unit, its sensitive relay closes the circuit to the coil of relay K_2, which starts the motor of the machine plugged into J_3 and disconnects the heater of the thermal relay K_3, preventing "time-out." The sensitive relay in the Autostart unit stays closed during normal teleprinter keying, but should a long *space* or no signal be received, this relay will open K_2 to cut off power to the machine motor. Should no signal be received during the time delay relay operating period of 1½ minutes, the contacts of K_3 open, causing K_1 to drop out, thereby disconnecting the TU (and possibly the receiver) until the next clock time.

[2]*ibid*, p. 112.

Autostart Unit Notes

We found much more reliable operation of our Autostart Unit after we replaced the 5000-ohm sensitive relay originally used with a Potter & Brumfield 2500-ohm RS5D relay. Also, we increased the time delay to about 6 to 8 seconds by replacing the 80 mf capacitor C with a 330

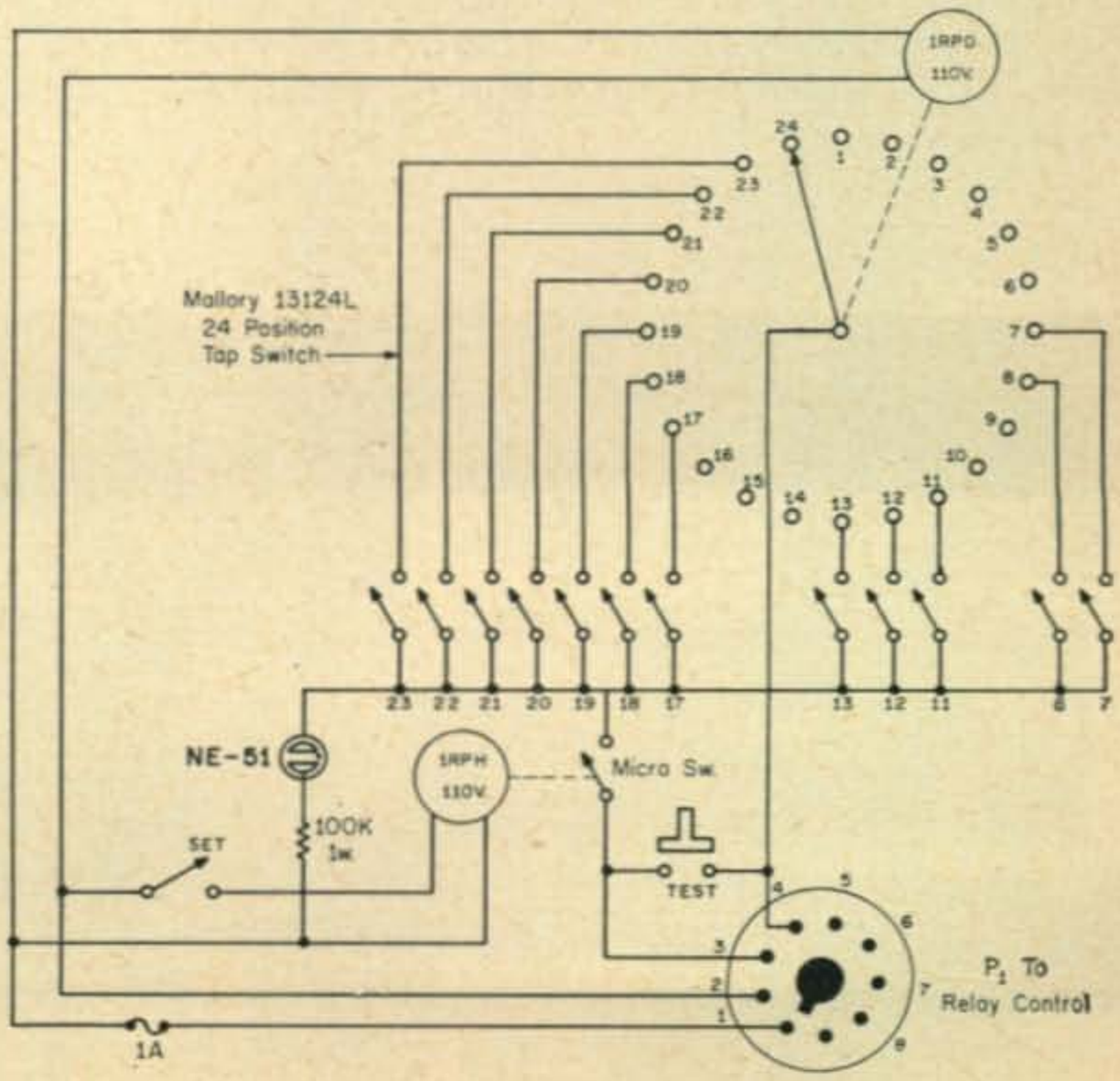


Fig. 1—Autostart Clock Unit Schematic Diagram

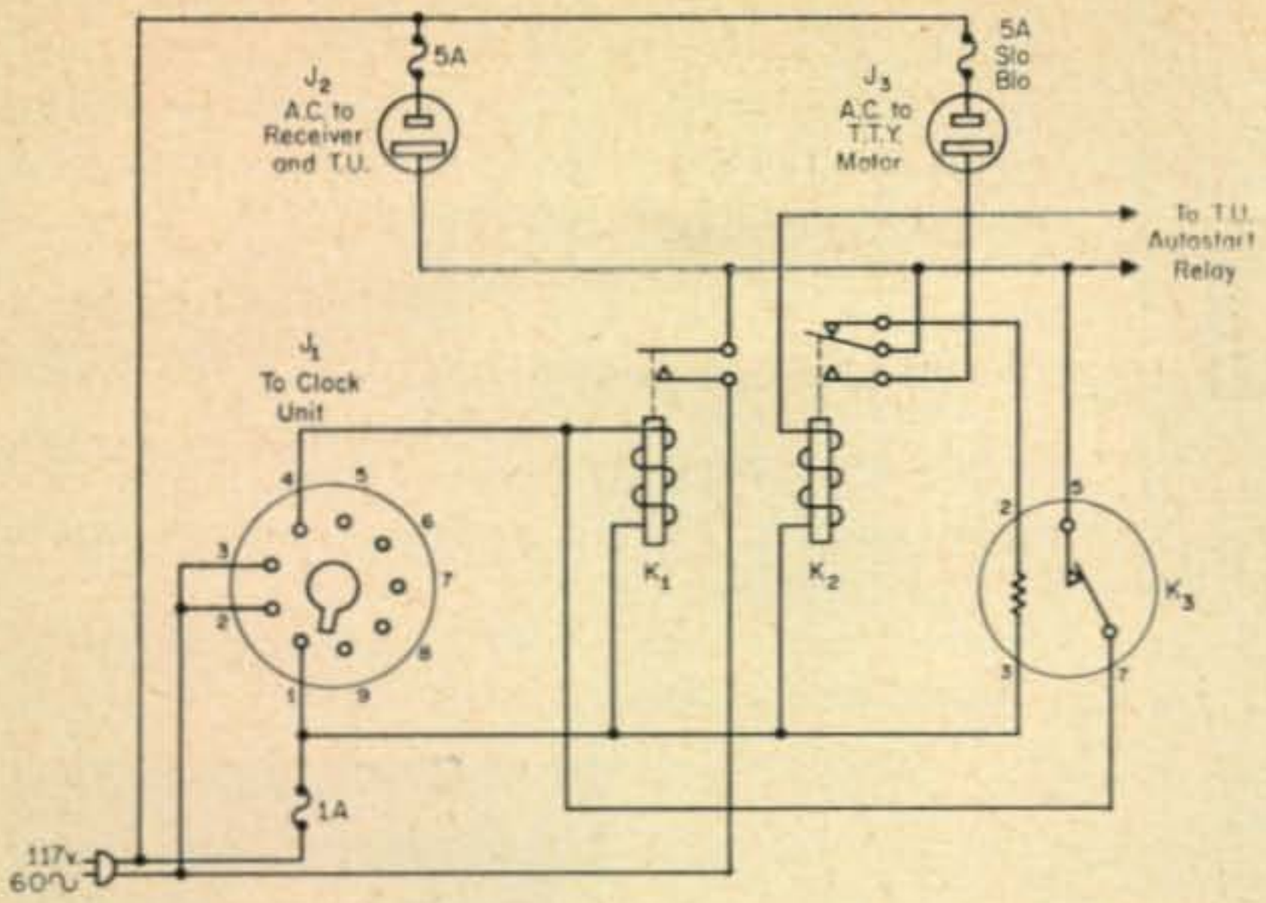


Fig. 2—Relay Control Unit Schematic Diagram

mf 6 volt Sprague unit. This further prevents accidental starting but suggests use of the SOP of one minute transmission of a steady *mark* for unattended operation.

On the Bauds

K1FKO of East Corinth, Maine, is on 80. W2KQP of Huntington, L.I., and W2NQW of Port Jervis, N.Y., are also on 80. WB2TCQ has a Model 14 strip printer and a Model 15 which is operated from a cold cellar. WA2TCK of Watertown, N.Y., works 80 with an Apache, an SP-600JX and RME 4530A, a CV-89 (AN/URA-8A) and a TG-7B machine.

K3YAH of Etters, Pa., W3NNB of Newark, Del., W3ILZ of Philadelphia, Pa., all work 80 meters. W3GJY of Conway, Pa., is building a Twin City TU. K3BYY of Silver Spring, Md., is on 80 with an Apache, and SX-100, a Model 19 tape set, and a W3TUZ terminal unit.

W4YOH of Charleston, S.C., WA4TAI of Dadeville, Ala., and K4PGV of Louisville, Ga., all work 80. W5AGS of New Iberia, La., is also on 80. WA6BBG of Oakland, Calif., has a Model 26 which he "built himself." W6JCZ of Santa Cruz, Calif., is building a W2JAV narrow shift transistorized TU. W7ARS of Tucson, Arizona, is on 7140.

W8QMI of Midland, Mich., uses tape on 80. K9LBA of Indianapolis, Ind., works 7140. W9QKN of Stoughton, Wis., has a Model 19 and needs help with his W5SFT TU. W9BCY of Ashland, Wis., runs 800 watts to an NCL-2000, receiving on a KWM-2, on 20 meters. W9WNB of Ligonier, Ind., runs 300 watts to a quad antenna on 20. WØJRQ of Lakewood (Denver), Colorado, works 7140 also for daytime reliability on scheduled circuits. KØCVT of Des Moines, Iowa, uses tape on 20.

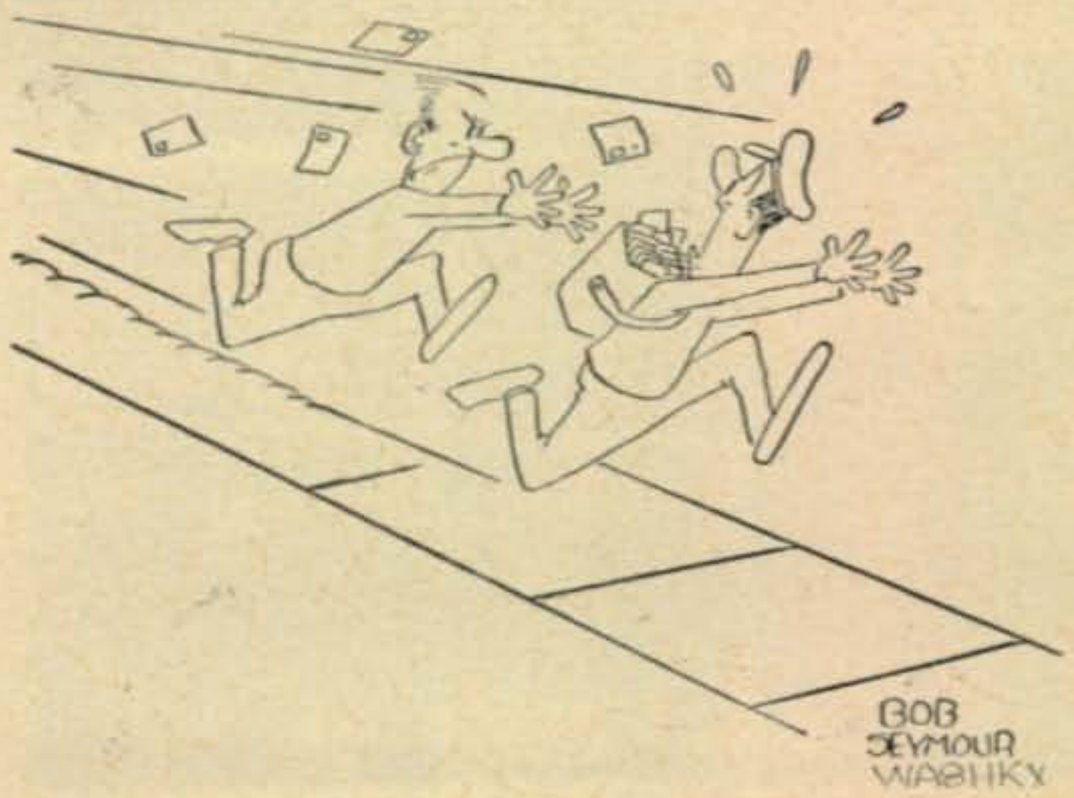
DL3IR worked TI2IO. ZS6UR is the old reliable ZS6 on 20 meters. VE2HY of Montreal is quite active on 7140. ZL1WB has TVI. ZL1AKS is trying to get a machine from the U.S. DJ8NT is on 20. ZS3B is getting ready for RTTY. I1ORS (Box 511, Florence, Italy) uses an HT-32B and a Warrior linear with an SX-115, and a homemade TU, on 20. I1TEO is also on 20.

Comments

Recently we had the opportunity to visit the big transmitting station, out on Long Island, of one of the largest message-communications companies. There were many high power transmitters, up to 50 kw, used on f.s.k., s.s.b. and a.m. 'phone, and on independent sideband, with more than a dozen a.f.s.k. narrow shift tone channels on one sideband and 'phone on the other. Most of the transmissions were on RTTY, all from tape equipment located at a Signal Center in New York City.

It was very significant that not even one of the many transmitters seen was used on c.w.; and, not even one, out of dozens, of the control circuits from the Signal Center was set up for International Morse Code.

What we are trying to say is, *c.w. is obsolete for high volume reliable message communication*. Now, don't misunderstand; as we said in the October '64 RTTY Column, there *is* a place and a need for c.w. proficiency. What we, and many others, would like to know is, *when is W1AW going to recognize progress and put out Official ARRL Bulletins on RTTY?* We have suggested many times that you ask *your* Director just when we can expect this inevitable up-grading of the OBS system, for the benefit of *all*, not just the RTTYers. 73, Byron, W2JTP



"For the last time Mr. Phelps, I DON'T have any QSL cards for you!"

YL

LOUISA B. SANDO,* W5RZJ

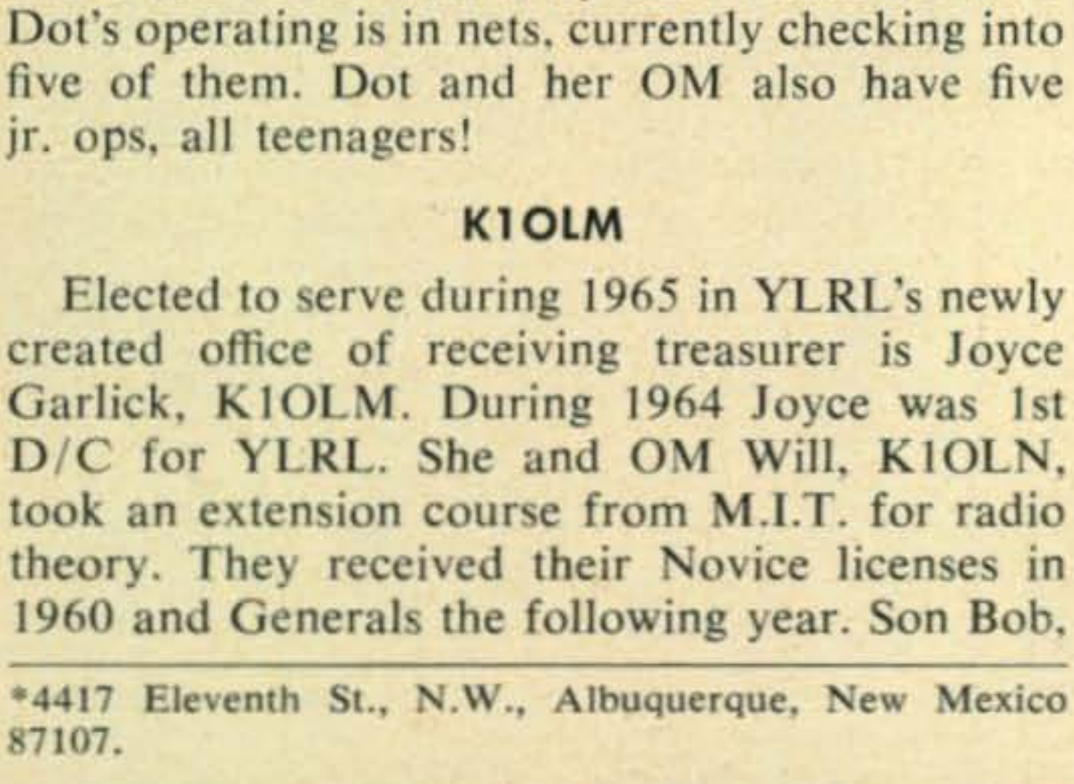
THE greatest joy one can experience in our hobby is providing service to others, not only by handling emergency messages in flood, fire, earthquake, etc. (and there was plenty of opportunity in all these types of disasters in 1964!), but in just *communicating*. Dorothy Baldwin, WØSWK, at Longmont, Colo., found this true during the Christmas holidays when she kept skeds for 16-year old Elizabeth Blum to talk to her father, XE2BM, at Durango, Mexico. Lilly, some 1200 miles from home, is attending a private high school in Canon City, Colo., and while there she has been able to talk to her father three times a week via WØCLI. During the holidays she was a guest of Karole Sudyka, also of Longmont. When she QSOs her Dad, Lilly also can talk to her mother, two brothers, three sisters and a grandmother. Dot hopes to meet the family when they come for Lilly's graduation this spring. Dot, licensed since 1954, and OM, WØRUG, operate s.s.b. using a 32S-1 and 75S-2 with a Hy-Gain beam. Most of Dot's operating is in nets, currently checking into five of them. Dot and her OM also have five jr. ops, all teenagers!

K1OLM

Elected to serve during 1965 in YLRL's newly created office of receiving treasurer is Joyce Garlick, K1OLM. During 1964 Joyce was 1st D/C for YLRL. She and OM Will, K1OLN, took an extension course from M.I.T. for radio theory. They received their Novice licenses in 1960 and Generals the following year. Son Bob, aged 17, is K1RHY, and they have three jr. YLs ages 18, 12 and 5. In 1963 Will bought the only drug store in Harvard, Mass. Joyce says he works 8:30 a.m. to 8:30 p.m. seven days a week and she handles the bookkeeping, deliveries and some clerking, so she hasn't been too active on the air recently. However, she says she loves the YL contests and nets, and her favorite is 20 meter s.s.b. She belongs to WRONE, CHC YL Chap. #4 and Nashoba R.C. Other hobbies are plants, books, knitting, sewing, sailing, camping, swimming and tennis.

Remember to send your YLRL dues to Joyce at Box 243, Harvard, Mass. 01451.

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.



Joyce Garlick, K1OLM, YLRL receiving treasurer for 1965.

Gwen Smith, ZS1NQ

ZS1NQ

CHC'er Gwen Smith, ZS1NQ, became involved in ham radio in a very unsuspecting way. W6GLK, who was attending Heldersberg College in Somerset West, Cape Province, where Gwen teaches (his parents are missionaries), was keen to start a radio club. Such a project required a staff sponsor and, since none of the men were willing to take it on, Gwen volunteered to get a license, if that was all that was required (on the basis of having learned Morse code—flag-wagging—for Girl Scouts). Then she found as trustee of the college station, ZS1HRC, she was responsible to the government for *all* that the club did on the air!

Gwen adds, "Naturally I girded up my skirts, asked innumerable questions, bought a rig—and now I am about all that is left of the venture!" W6GLK is now a doctor taking further studies in Calif.—and their main problem is to replace him with a suitable student as president of the club.

All this started back in 1952 and Gwen adds that she has found hamming a real boon over the years. She operates 14 mc. c.w. only; has been a member of TOPS for 4 years. A member of CHC YL Chap. No. 4, she holds 33 certificates, with several "firsts" for ZS YLs, including WAS, WAZS and ZS-AP5 award. She has worked over 190 countries. The rig is home brew, 100 watts using 807s, with an SX-28 receiver and folded dipole antenna.

Gwen has been an instructor at Helderberg College for 18 years. She teaches piano, music teaching methods, history and form in music, theory of music, harmony and counterpoint. She has done considerable training for the St. John Ambulance Assn. (equivalent to Red Cross). She also loves plants and has a house full of

African violets, gloxinias and cyclamen. Just for the records, Gwen is a YL, not a YF.

Here and There

Please note that the custodian of the Buckeye Belles certificate is W8HWX (on our *CQ YL* page supplements we had W8HUX). For the B.B. certificate, send log information together with membership number of the Belles and 25¢ in coin or stamps (no QSLs) to Lillian Richardson, W8HWX, 3709 Starr Ave., Oregon, Ohio 43616.

According to NCS KØEPE, the YL Tangle Net now meets on 14,265 (instead of 14,240). Everyone welcome—a.m. or s.s.b.—1800 GMT, Thursdays.

Marte, who is chairman for the YLRL Convention in Colorado in '68, also passes along a few tantalizing tidbits re plans for this get-together—including a sightseeing trip to some of Colorado's fabulous beauty spots and plenty of entertainment for the OMs. It's all *talk* now, but the Colorado YLs are fairly bursting with enthusiasm, so count on a program that is tops!

Current officers of the HAWKs of Indiana: Pres., W9RTH, Ada; V.P., W9LYU, Betty; S.-T., K9INM, Margaret; Directors—K9ILK, Fran; K9TOM, Marge; K9IVG, Roberta; K9ZLB, Mildred.

SSB'ers Annual QSO Party

The YL International SSB'ERS have announced their 1965 QSO Party for March 19, 2300 GMT, through March 21, 0600 GMT. There are 3 categories in the contest: 1) DX/W-K Teams (a DX station and Stateside station each enter as single operators with scores to be combined by W7NKK on receipt of both logs); 2) YL/OM Teams (comprised of husband/wife, father/daughter, etc. operators using same QTH but own calls); 3) Single Operator. The contest is for non-members as well as SSB'ERS and there are many prizes in each category. With more than 4000 members in 211 countries, all 6 continents, all 50 U.S. States, the Party provides opportunity to work toward many awards. For full rules and QSO Party form, send s.a.s.e. to V. Mayree Tallman, K4ICA, 428 S.W. 28th Road, Miami, Florida 33129.

Elizabeth Blum (right) talks to her father, XE2BM, via the station of WØSWK, Dorothy (center) at Longmont, Colo., while a schoolmate, Karole Sudyka (left), looks on. Photo courtesy Longmont, Colorado Daily Times-Call.

Annual YL-OM Contest

Just a reminder of the YL-OM Contest: **phone** Feb. 20-21; **c.w.**—Mar. 6-7, 1965. Check January *CQ* for full rules.

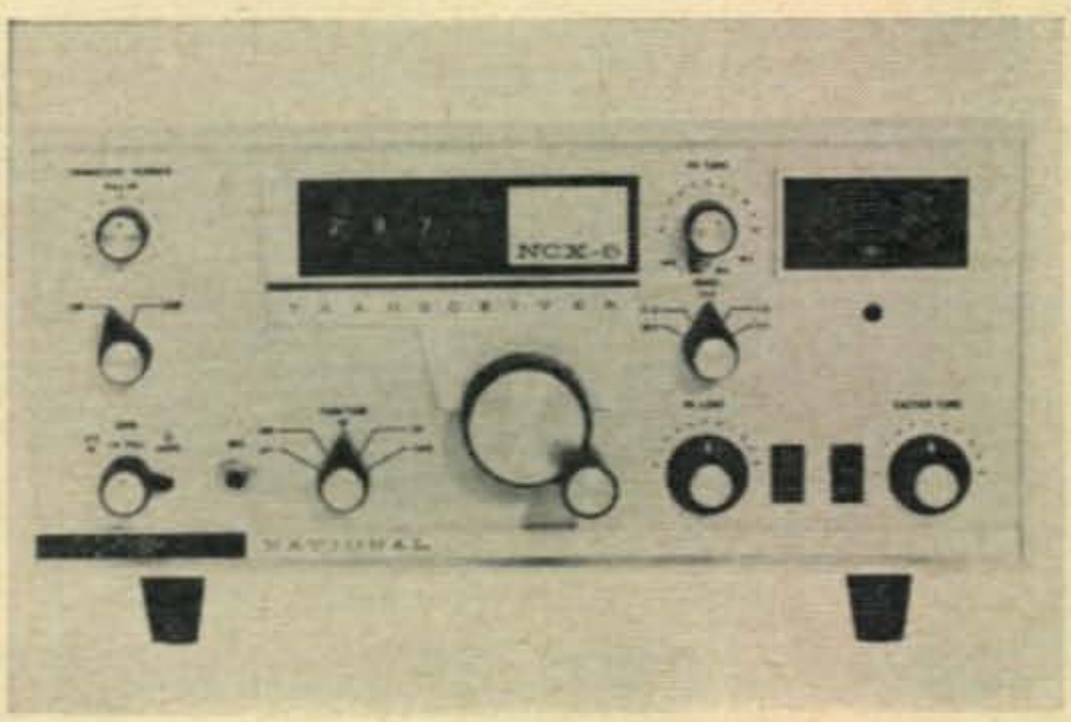
33—W5RZJ

New Amateur Products

National NCX-5

NATIONAL Radio Company, Inc., announces the introduction of the new NCX-5 transceiver, for the 80, 40, 20, 15, and 10 meter bands. The NCX-5 features no warm-up drift, and incorporates a digital dial read-out which is calibrated directly to 100 cycles on each band. Two r.f. stages are provided in the receiver section for added sensitivity, and a Transceive Vernier control is included to allow ± 5 kc. of receiver offset from the transmitter frequency when desired.

Like National's NCX-3 triband transceiver, the NCX-5 incorporates fast attack-slow-decay AGC, an "S"-meter, full VOX or PTT operation, break-in CW keying with adjustable release time, plus ALC (and external ALC input for use with the National NCL-2000 linear amplifier). To further increase the versatility of the NCX-5 as a complete station, an optional console will be made available which provide both



a separate receiver v.f.o. and crystal-controlled transceiver or split frequency capability for novice or net operation. The NCX-5 is priced at $585.00.

For further information on the NCX-5 transceiver, write to: National Radio Company, Inc., Dept. P, 37 Washington Street, Melrose, Massachusetts 02176, or circle 66 on page 110.

Power Supply Reg. [*from page 29*]

done by tuning or resonating the choke to the ripple frequency.[7]

The parallel resonant circuit develops a high impedance at the ripple frequency and as the load current increases it changes the inductance of the choke. Detuning the choke reduces the impedance and brings the circuit closer to capacitor input by not isolating the first filter capacitor as much. As more current is drawn the output voltage of the supply tends to drop. As the isolation impedance of the resonant choke drops the circuit tends to swing to capacitor input raising the voltage back up.

The value of the parallel capacitor can be roughly calculated from the formula $C = 1 \div (4\pi^2F^2L)$ with F at 120 cycles for full wave operation. The choke should be resonated by trial and error following the procedure outlined below.

After determining the value of capacity by formula connect it across the choke and measure the no load output voltage. *Warning: Use extreme care as the voltages are lethal.* Vary the capacitor value up and down by paralleling or series low value capacitors and seeking the *lowest* no-load voltage.

The voltage rating of the capacitor across the choke should be at least equal to the supply voltage. I say this after the sad experience of connecting a voltmeter across the choke to measure the voltage drop. At the instant the high voltage is applied to the filter capacitor it is discharged and the full d.c. is developed across the choke and resonating capacitor. This, needless to say, did the meter no good.

The 3.75% regulation obtained by this method at K7GCO may not be achieved by everyone in all situations. The regulation depends on several other factors such as the d.c. resistance of the choke and power transformer and how heavily it's loaded. In my case the power transformer was a big one and only loaded to half capacity. The power line regulation is also a factor. High current swinging chokes are often expensive and not generally available surplus. The parallel resonant choke method allows one to use any smoothing choke. Another advantage of "tuning" a smoothing choke is that it can be tuned for whatever the "no-load" current happens to be. With aswinging choke the best regulation occurs with minimum "no load" current.

[7]Terman, F.E., p. 601.

RTTY A-Z [*from page 34*]

hundred per cent. This leads up to the point that *interference rejection must be made prior to limiting*. A review of figs. 45 and 46 shows that this converter makes no provision for this as the signals to the converter are fed directly into limiter stages. With this converter you are dependent upon whatever selectivity your receiver has to fight the interference problem. Practice indicates that you not only need a good receiver but also anything else that can help

with the interference problem. For some time there has been a growing demand by the RTTY'ers for a converter with a greater selectivity than the W2JAV readily provides.

The author will cover a number of additional converters later on in this series, especially the better known and more widely publicized ones. However, none of these will be covered in as great detail as was the W2JAV converter. The space that would be required does not warrant this nor do the converters themselves vary sufficiently in basic design to do so. However, for the most part, these converters will be more complicated and some of them will be quite sophisticated. Numerous questions have been raised about the polar relay as well as when the author intends to cover this all important subject. The polar relay will be covered in Part 9 next month.

[*To be continued*]

Product Detector [*from page 41*]

detector through rather long (6") unshielded wires. No ill effects have resulted but it is wise to keep these wires away from 60 cycle carrying conductors as well as other i.f. wiring.

Two IN276's were used for the diodes because they happened to be available. A large variety of germanium diodes will work in the circuit and generally only two parameters need be considered in making a choice. They should have fairly good peak inverse voltage rating (100 volts or greater) and should have fairly high back resistance (greater than 2 megohms).

The only part of construction requiring some degree of patience is the link winding on the b.f.o. coil. To reduce capacitive coupling a single layer of Scotch electrical tape is placed over the b.f.o. winding and the link is wound over it. A terminal strip should be mounted somewhere on the b.f.o. coil assembly for anchoring the two ends of the link. After the winding is finished it can be permanently secured in place by pouring molten wax over it. Leads from the link are twisted to maintain balance to ground and other circuitry.

Adjustment

If the theory of operation is understood, adjustment procedure is so obvious it hardly needs stating. With the wiring completed and the receiver warmed up, place S_1 in the A.M. position and realign the last i.f. transformer for maximum gain. Next, yank out the b.f.o. tube (or disable in some other way) and throw S_1 to the s.s.b. position. Turn up both gain controls and adjust R_3 for a null in receiver noise. It should be sharp and deep. If not, a mistake was made somewhere. With R_3 nulled, stick the b.f.o. tube back in and after it is warmed up reset the frequency with the b.f.o. trimmer (not the front panel control) to where it should be. With a v.t.v.m. measure the d.c. voltage at the junction of C_1 and R_1. It should measure nearly the same at the junction of C_2 and R_2. Balancing can be adjusted by changing the value of C_1 or C_2 although it doesn't seem to be too critical. ■

Lafayette Filter [*from page 44*]

Alignment

The alignment instructions simply specify that the input and output transformers be peaked at 455 kc. It was found that this will produce a satisfactory result, normally, but if suitable alignment equipment is available, you'll do better to use it during alignment of not only the filter transformers, but also of any subsequent 455 kc transformers which, at this low an i.f., often can be tuned to alter the passband ripple, skirts or overall symmetry as shown in fig. 2B.

Applications

The Lafayette mechanical filter can be just the ticket for improving the selectivity of an existing receiver or for new construction involving s.s.b. receivers, transmitters, transceivers, mobile gear, outboard "slicers", etc., in which connection it is adaptable for use with vacuum tubes or transistors.

The MF-455-10Z mechanical filter is priced at $19.95. It is an imported item marketed by Lafayette Radio Electronics, 111 Jericho Turnpike, Syosset, Long Island, N.Y. ■

Volkswagen Mobile [*from page 46*]

punch can be used for the coaxial connector, and a pair of small, sharp, diagonals can be used for the smaller holes. After the smaller holes are rough cut with the diagonals, a rat-tailed file is used to finish them. Mount the jacks and the connector, re-assemble the complete unit and it is now ready to be mounted for the last time.

The only things remaining to be done now are the mounting of the power supply under the rear seat, the installation of the power cable using shielded leads between the supply and the transmitter proper, mounting of an antenna and connecting up the mike. You are now ready to go on the air.

To improve the performance of your mobile transmitter I suggest that you replace the following items.

1) Replace the 6 x 4's with suitable diodes.
2) Replace the filter capacitors and the buffer capacitor.
3) Replace the vibrator.

By replacement of the parts mentioned you not only increase the available output of the transmitter, but you forestall the possibility of early parts failure due to the increased voltages from the power supply. This completes the modification of the Gonset Communicator IIB. The new packaged unit will give you hours of enjoyment. ■

Novice [*from page 77*]

Berg, K9QIZ, 3825 N. Avers Avenue, Chicago, Illinois. 60618.

Chuck, I think this is a grand Idea. I have been lending out my little Ameco AC-1 to just about every one and they have had lots of fun and worked some fairly good DX. It has saved

many of the fellows from giving up ham radio, you know some people just don't have tooooo much money. Let's see what kind of mail we get about the idea.

My gosh, fellows I didn't even get a picture of that reprehensible character CQ DOG XRAY this month and as I have said before YOU are news to others, why don't you want your picture in *CQ?* Any way have a happy new year. That is just about all for this month so the best to you and yours as I am writing this on New Years Day. My best wishes for better DX conditions and less fighting on the air over the many things that we know so little about. 73, Walt, W8ZCV

Ham Cinic [*from page 67*]

tube. Next, check the 6BE6 b.f.o. tube and lastly check for loose connections. A loose alignment capacitor may also be part of the trouble.

Thirty

Next month we will cover the addition of one or two bands to transceivers. This is a subject on which we have received many letters.

Although we cannot personally acknowledge them all, we want to thank the hundreds of hams who sent us personal seasons greetings.

For this month then, 73 to all the fine faithful readers of HAM CLINIC. 73, Chuck, W6QLV

Club Forum [*from page 18*]

service department" of your local radio station on your list. Many radio programs feature such announcements and are very willing to cooperate. As with all forms of publicity be sure it's submitted far in advance and properly typewritten.

It might be brought to your attention that amateur radio is not without a group dedicated to the cause of promoting the "good word" of our fraternity. The Amateur Radio Editors Association (AREA) consists of over one hundred such hams in every field of amateur publicity.

Further information on publicity is available from the ARRL in the form of a packet of typical news releases and other related items. Finally study news items of other organizations. Before long sending out news releases will be second nature.

We hope this will assist the club publicity chairman and if we missed some good ideas why not send them in and we'll print them at a later date. 73, Al, WA2TAQ

Common Ground [*from page 52*]

above the ground. These conductors are insulated from the ground and the connection is made through their capacitance to the earth. When current flows into the counterpoise making it negative, this negative charge repels electrons in the ground immediately below, resulting in a current flow away from the counterpoise in the earth. On the other half cycle when the counterpoise is made positive, electrons are at-

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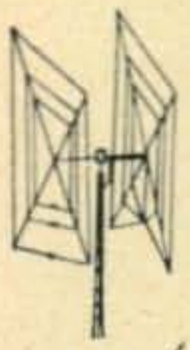
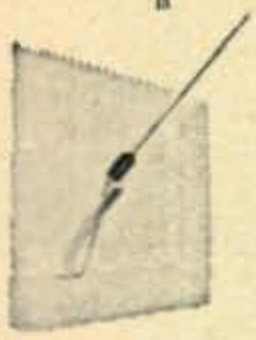
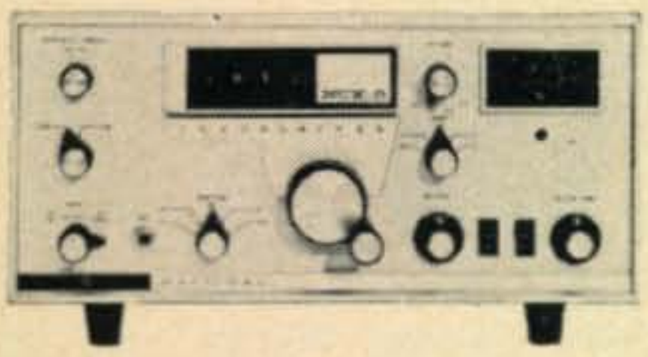


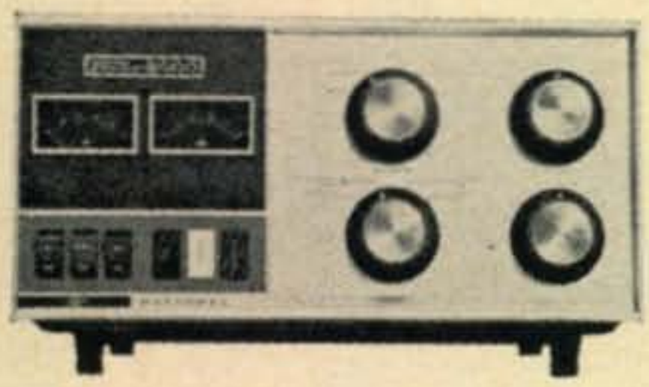
W 2AU SUPER 2 ELEMENT QUAD FROM UNADILLA
A quad for outstanding results, the W 2AU uses 8 selected Korean bamboo spreaders for extreme strength and durability. The 14 gauge copper stranded wire used is extremely wind resistant and will carry a full KW or 2000 watts PEP. Spreaders are fastened to cast aluminum spiders by means of stainless steel strap compression clamps. The F/B ratio of the W 2AU quad is in the neighborhood of 25 to 30 db. Dimensions: 17′ wide, 17′ high; turning radius approx. 9′11″. Weight: 40 lbs.
W 2AU SUPER 2 ELEMENT QUAD $44.95



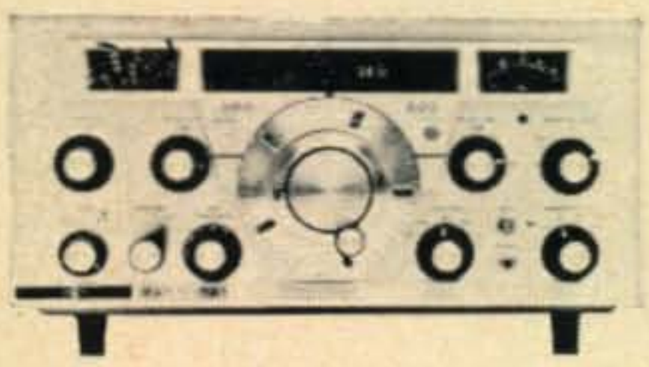
VERSATILE B & W "VACATIONER" PORTABLE ANTENNA
Designed as a highly efficient transmitting and receiving antenna for the travelling amateur. Can be installed and disassembled in minutes. Power rating — SSB, 300 watts input PEP; CW, 180 watts input: Frequency — 20, 15, 10, 6 and 2 meter amateur bands. Maximum extension, 57 inches; minimum, 18½ inches. Weight, 2 lbs. complete with coils and counter-poise.
"VACATIONER" PORTABLE ANTENNA, COMPLETE $19.95



NEW NCX-5 ALL-BAND TRANSCEIVER FROM NATIONAL
The new NCX-5 transceiver represents the finest money can buy at half the cost of closest comparable equipment. Designed as a total amateur station for the 80, 40, 20, 15 and 10 meter bands without compromise for either mobile or fixed station operation. Incorporates a linear solid state VFO with essentially no warmup drift. Dial calibration by means of a digital counter read-out accurate to one kilocycle on each band with additional calibration to 100 cycles. Mobile mount included. One-year warranty. Dimensions: 6$\frac{5}{16}$″ x 13$\frac{5}{8}$″ x 11$\frac{5}{8}$″. Weight: 26 lbs.
NATIONAL NCX-5 ALL-BAND TRANSCEIVER $685.00



NEW NCL-2000 LINEAR AMPLIFIER FROM NATIONAL
National's new 2000 watt linear amplifier is desk-top dynamite. Every component in the NCL-2000 is rated for operation at a "DC" Kilowatt. Adding the NCL-2000 to your desk-top station permits you to run at the maximum power allowed by law. The two 8122 ceramic tetrode output tubes were designed specifically for SSB, and provide 800 watts of plate dissipation to assure conservative operation. Not only does the NCL-2000 deliver the power but it does it cleanly. One-year warranty. Dimensions: 7$\frac{5}{8}$″ x 16½″ x 12¾″. Weight: 62 lbs.
NATIONAL NCL-2000 LINEAR AMPLIFIER $685.00



NEW HRO-500 SOLID STATE RECEIVER FROM NATIONAL
The new HRO-500 receiver by National is the result of 30 years of "improvement of the breed." By all criteria the HRO-500 is extraordinary. In design, it is totally solid state with frequency determined by a phase-locked crystal synthesizer feeding a VFO-controlled tunable IF. Transistors make it extra reliable and compact. The HRO-500 may be operated anywhere — even from flashlight cells. Its frequency coverage encompasses the entire VLF through HF spectrum. It employs a turntable 6-pole filter to meet any selectivity requirement. If your specifications demand the finest amateur receiver obtainable, the National HRO-500 solid state should be your one choice. Dimensions: 7$\frac{5}{8}$″ x 16½″ x 12¾″. Weight: 32 lbs.
NATIONAL HRO-500 SOLID STATE RECEIVER $1295.00

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For further information, check number 38, on page 110

tracted to the ground underneath. The result is an alternating current flow through the earth without making a physical contact to it.

Summary

In a short article such as this it is impossible to do justice to the subject of grounding. There are so many varied aspects to grounding that an entire book could easily be written on the subject. We have touched upon only a few of the many possible examples of proper grounding techniques.

It was our hope that this article might serve to acquaint the uninitiated with some of the problems associated with grounding and also to stress the importance of the common ground.

If we ground properly our equipment will not only perform better but our stations will be much safer. ■

Contest Calendar [*from page 80*]

Should the rest period be reduced to 6 hours? We are reluctant to eliminate it all together, it was well received when it was first instituted.

We would appreciate your comments and suggestions.

PACC

Starts: 1200 GMT Saturday, April 24
Ends: 1800 GMT Sunday, April 25

This is the 9th annual PACC contest and rules are same as in previous years. C.w. and Phone are separate contests even though they are held at the same time. Complete details next month.

Editors Note

Not much to report this month. It's that time of the year when we are up to our necks in contest logs. Could use a few good photos of stations in contest activity.

The listing of K6EVR in the claimed Phone score was in error. It should have been K6ERV with 52,032 points on 14 mc. K6EVR was multi-operator this year and the boys had better than 400,000 points. Sorry Ron.

If you need a Liberian QSL, listen for EL2 stations on Sat., March 15th between 1200—2400 GMT, when the newly formed EL-Two Club will hold a field day. Activity will be on 7010, 14020, 14260, 21030, and 21300 kc. Send QSLs to: Charles Segrest, EL2AI, c/o American Embassy VOA, Monrovia, Liberia.

At this writing all the Top Band buffs are looking forward to the 160 Contest. It promises to be a "humdinger." We had excellent DX conditions on the week-end of January 9/10th. Good luck. 73 for now, Frank, W1WY

Leo I. Meyerson
WØGFQ

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ELECTRICAL SPECS:
Maximum power: 1000 watts AM or CW — 2 KW PEP. Omnidirectional. Vertical polarized.

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Low cost, compact, 6 meter transceiver

Stable superhet receiver. 5 watt transmitter, featuring PTT, using std. (Ft 243) 8 Mc range xtals, non-critical coils, plate modulation, power and modulation indicators, 10 tube performance. Step-by-step manual included. Wt. 9 lbs. 115 VAC Power supply (kit) — **15.95.**

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- **5 Watt input**
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Universal Power Supply: Powers most AM rigs up to 100 watts, SSB units — up to 200 watts, PEP. Silicon rectifiers provide both 300 VDC & 600 VDC @ 300 Ma., ICAS (210 watts total), plus 6 VAC @ 10A or 12 VAC @ 5A, plus 95 VAC @ 10 Ma. Size 11¼″ x 4¾″ x 6″. Wt. 15 lbs. Kit — **24.95,** Wired — **39.95.** Opt'l cabinet — **4.95.**

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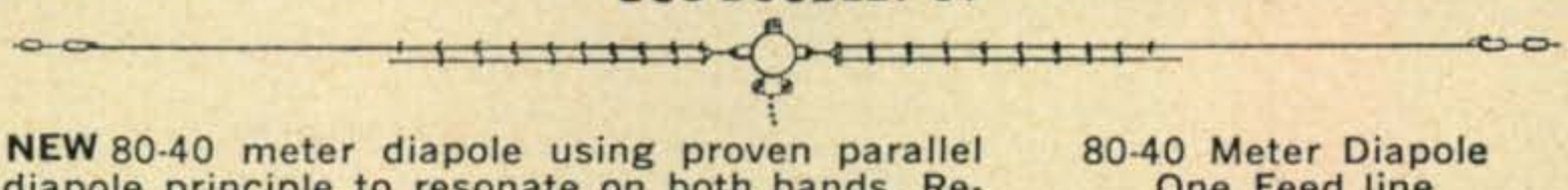

NEW 80-40 meter diapole using proven parallel diapole principle to resonate on both bands. Requires only one 52 ohm feed line (coax not supplied). Kit includes wire, insulators, center connector &full instructions. Complete formula supplied & quick graph chart for easy adjustment. May be used on **15 meters also.** SWR: Better than 2:1 at resonance — 80/40. Max. length — 123 ft.; 140 ft. for lowest CW range. Easy to install. Wt. 4½ lbs. Shipped Parcel Post.

80-40 Meter Diapole
One Feed line

$7.95

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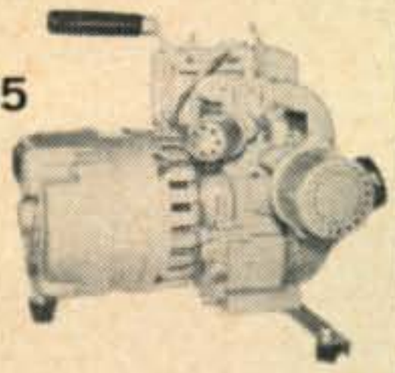
WRL'S 12R GENERATOR

$149.95



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SS-3 "Q" MULTIPLIER

- **Notch and peak**
- **Self Powered**
- **One simple receiver connection**

Int'l 115 VAC P.S. Plugs into Collins 75S-1, KWM-2 & others. Use with receivers having 455KC-IF: AC or DC powered. Adj. selectivity: 300 cy. to 10 KC. Sharp rejection (50DB) null for hetrodynes. 6¼″ x 4¼″ x 4¾″.

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ANTENNA TUNER MM-100

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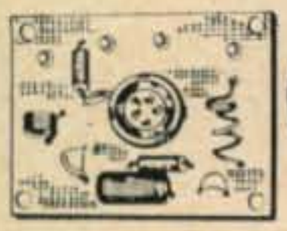
Specifically designed to match end-fed long wire which is ½ wave, or multiples thereof, to 50 ohm transmitters. Panel lamp indicator. For inputs up to 150 watts SSB, 100 watts CW, 75 watts AM. 4 x 5 x 4 steel case. Reduces TV1.



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PA50-2 Stage preamplifier for 6 meters. Use 2 RCA 6CW4 nuvistors. Highest grade glass epoxy board. Assembled and pre-aligned for 50 ohm input-output. Requires 60-120 VDC @ 10 MA. & 6.3 VAC
Size 2¾″ x 2¼″. Wired **$6.37**
PA-144 Same as above except only 1 6CW4 nuvistor & for 2 meters. Wired **$4.98** (less 6CW4 tubes).

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Clip & Mail

For further information, check number 51, on page 110

DX [*from page 64*]

VU2ANI	via W4ANE.
W5VWU/KJ6	Box 1072, Tijeras, New Mexico.
W8BKO/OD5	via W8ZCQ.
XE1FFU	Box 1279, Guadalajara, Jalisco, Mexico.
XE1PFU	Box 1279, Guadalajara, Jalisco, Mexico.
XE0ICS	via K6ICS.
XW8AV	C. Jones, USAID/BPR, APO 152, c/o PM, San Francisco, Calif.
YS1HUKE	via U. S. Embassy, San Salvador, El Salvador.
YS1RRD	Box 517, San Salvador, El Salvador.
YU7LAJ	(OZ5SQ) Klaus Dwinger, Box 35, Korcula, Yugoslavia.
YV8AJ	c/o Hammarlund, Box 7388, N.Y. 1, N.Y.
YV8AS	Box 146, Maturin, Venezuela.
ZD3A	via W4ZRZ.
ZD3P	via G2BVN.
ZD8BB	via W7ZMD.
ZD9RB	via ZS6SI.
ZE4JS	via W3HNK.
ZM7AE	via ZL1AEA.
ZB2B	via RSGB.
ZS6AP/KC4	via SARL.
ZS8G	via W2CTN.
4U1SU	Box 11, Geneva, Switzerland.
5A3TR	via W3HNK.
5A5TR	via W3HNK.
5N2RSB	S. Sgt. R. Briggs, 5 Gough Rd., Catterick Camp., Yorkshire, England.
5W1AZ	George W. Ashton, Private Bag. Faleolo Airport, Western Samoa.
5Z4IV	via W2CTN.
7G1A	via K9BPO.
7G1L	c/o Hammarlund, GPO PO Box 7388, N. Y., N. Y.
7Q7GN	via WB6DDL.
7Z3AB	Box 2486, Dhahran, Saudi Arabia.
9J2MI	Box 175, Lusaka, Republic of Zambia.
9J2VB	Box 38, Mongu, Republic of Zambia.
9M2LO	via WA2WUV.
9M4LS	via K7UCH.
9M4LX	via WA2WUV.
9M8EB	via VE3DFU.
9X5GG	7th Day Adventist Mission, Nyanzar, Ruanda, Africa.

Propagation [*from page 83*]

HAWAII

Openings Given in Hawaiian Standard Time†

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

The CPR Award [*from page 59*]

Zone	Prefil	Country
KH6	Hawaiian I.	
KH6	Kure I.	
KJ6	Johnston I.	
KM6	Midway I.	
KP6	Palmyra. Jarvis I.	
VK9, ZC3	Christmas I.	
VK9	Cocos I.	

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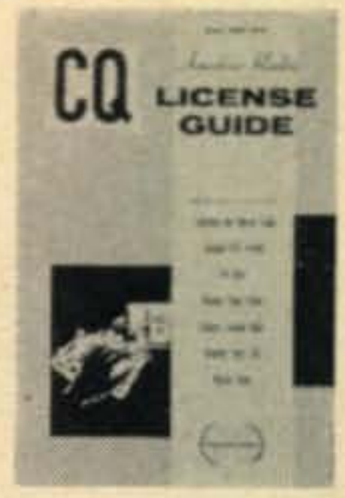

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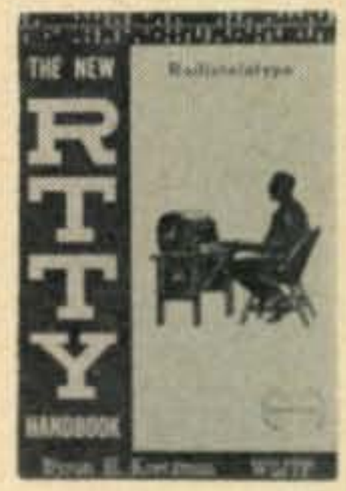

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	VK9	Cocos I.
	VK9	Nauru I.
	VR3	Fanning & Christmas I.
62	FW8	Wallis & Futuna I.
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	KC6	Western Caroline I.
65	KG6	Mariana I.
	KG6	Marcus I.
	KW6	Wake I.
	KX6	Marshall I.
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66	ZD7	St. Helena
	ZD8	Ascension I.
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68	FB8	New Amsterdam, St. Paul I.
	FB8	Kerguelen I.
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70	UA1KAE-1/6, VKØ, FB8, etc.	Antarctica (bet. 60° and 80° S. and bet. 100° and 160° E.)
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72	KC4 etc.	Antarctica (bet. 60° and 80° S. and bet. 80° and 140° W.)
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74	CE9, KC4, LU-Z, VKØ, VP8, ZL5, etc.	Antarctica (bet. 80° and 90° S., South Pole)
75	UA1	Franz Josef Land (bet. 80° and 90° N., North Pole)
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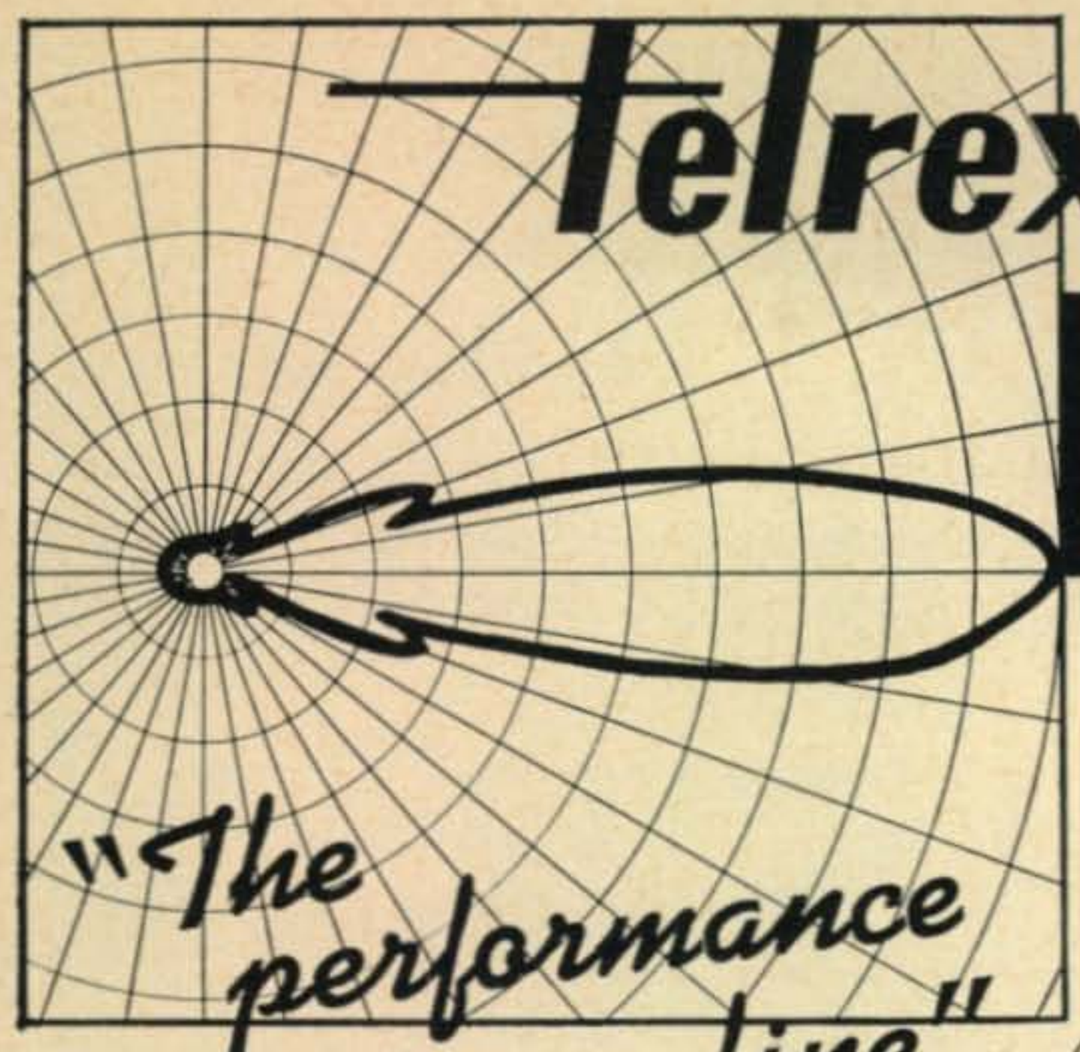

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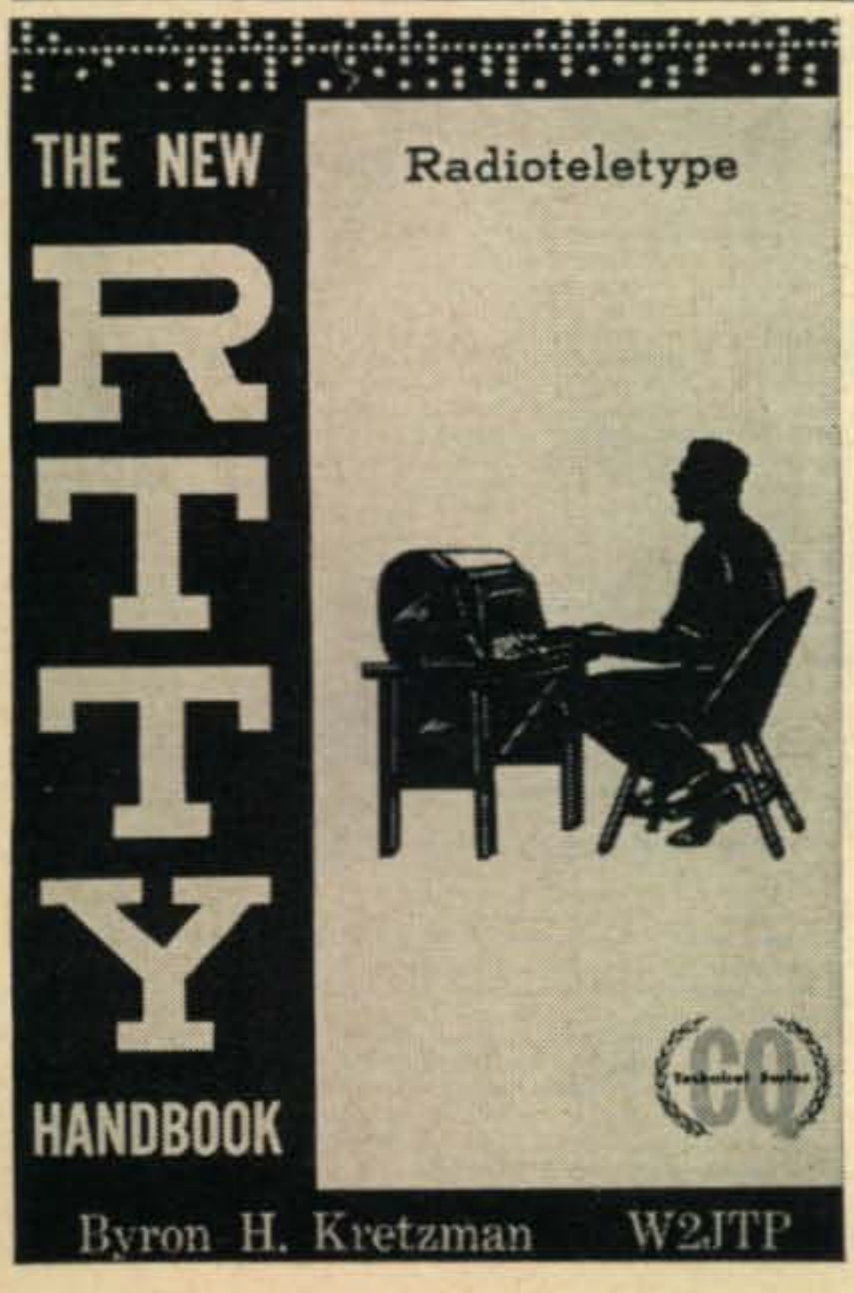

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For further information, check number 52, on page 110

For further information, check number 58, on page 110

Letters [*from page 12*]

flect *not* the thoughts of the business managers of Cowan Publishing, but the thoughts of the readers and editors of *CQ*. You'd be amazed at how often the two don't coincide!

Remember, that *CQ* is the *only* magazine endeavoring to be useful to *all* amateurs, in *all* situations, and of *all* interests. It's a pretty big order, but we do pretty well at it by not taking time out to sound off about someone else's business without thinking first.—*K2MGA*

Editor, *CQ:*

When I first got my Novice ticket, I was rather proud of myself. I had done something that took some practice. When I mastered thirteen w.p.m. and got the theory down, I knew that it *earned* me the privilege of being a real Ham. If I was just too lazy to learn the code and theory, I would have gotten a CB license.

For the people on eleven meters, let them rot there. You suggest putting them on 420 mc and above, where it takes a load of skill just to put a rig on the air. I know, I'm in the process of building a rig for u.h.f. work. Putting CBers on 420 would just bring about a rise in commercial equipment in the u.h.f. area, 420 and up would have QRM worse than 20 meters, with those lids running a gallon. . . .

Rick Cooper, WB2MJF
6 Brook View Terrace
Hillsdale, New Jersey

Rick evidently didn't quite get the point of January ZERO BIAS. We did not suggest transporting CB operators lock, stock, and barrel, up to 420 mc. What we did suggest was creating an engineers class license to permit experimentally-oriented fellows and commercial-license holders to perform experiments above 420 mc, if they can prove they are technically qualified, and without a code-speed requirement.—*K2MGA*

Editor, *CQ*:

. . . Comments on January ZERO BIAS, the technician license grants the privileges you speak of, with only 5 w.p.m. code. I feel anyone who wants a license with any real desiree at all can master 5 w.p.m. . . . about the CB situation, the junk you hear on CB is not legal there, it wouldn't be legal in a Ham band and I don't feel the FCC is obligated to provide a legal space for it . . .

R. L. Treadwell, W2NYH
14 Adams Rush Road
Peekskill, New York 10566

Editor, *CQ:*

With reference to your ZERO BIAS editorial, appearing in the January edition of *CQ*, I get the impression that you are sincerely interested in the best interests of amateur radio, and I agree wholeheartedly with you in this respect. I do, however, feel that acquiring a proper definition of amateur radio, should be the first step in furthering the interests of the fraternity in general.

Amateur radio is defined by the FCC as a service, and it is, I feel, a severe disservice to refer to it as a hobby in a nationally circulated magagine, such as *CQ*. Rest assured, that when the FCC begins to look at amateur radio as a hobby, we will be more than half way out. Admittedly, there are hobby aspects to amateur radio, but, please, let us not forget that our only reason for being is because of the service we can and do render to the general public. I humbly suggest that, in the future, you delete from your vocabulary, with respect to amateur radio, the word *HOBBY*.

The only other exception I would like to take with your article, is the reference to certain individuals, inability to master the code. It is a well established fact that intelligence has practically nothing to do with mastering the code, since it is a purely mechanical acquisition. The only reason for anyone having an inability to master the code is that he is LAZY, NOT JUST STUPID. With all the "Appliance Operators" we have on the bands these days, we can't use that kind of lazyness in amateur radio.

Stan. R. Ball, WØDDV
1227 Tenth St.
Nevada, Iowa

Stan, when we refer to amateur radio as either a service or a hobby, we must be careful to analyze the nature of the reference, for each definition is proper in its

own application. The broad concept that we call "amateur radio" is legally and technically a service, and in all legal and technical applications it should be referred to as such. But can we not speak of a man making the amateur radio service his hobby? A hobby is usually a means of passing free time in a constructive manner, and it is not incorrect to refer to a man who spends his free time in a public or scientific service as a hobbiest. —*K2MGA*

Editor, *CQ:*

First off, congratulations on the twentieth anniversary of your fine magazine and on the twentieth anniversary issue.

Second, in regard to the editorial in this issue, I agree with you on the question of opening part of the 2 meter band to CB operation with one exception. I would not favor 420 mc and up except for the 460 to 461 mc band already in existence. If they are allowed in any portion of any amateur band, it will be like opening another Pandoras' Box similar to the one the FCC opened when this service (?) was given the 11 meter band.

As for the electronics technicians, engineers and other technically oriented people who can't master the code, a small application of the intelligence they used in acquiring their degrees and technical skills would enable them to master a few simple sounds in a short time. They remind me of the people who listen to code and say "I could never learn that," and then never try.

My first Georgia QSO was with a Novice who spent approximately 18 of his 24 years in an iron lung. He had a college degree, a first class commercial license, and he talked with me at a very respectable code speed, both sending and receiving. I am sure many who have the advantages he lacked can do at least as well.

Carl W. Ellis, K1UNQ
630 Piscataquis Street
Rumford, Maine

Editor, *CQ:*

I am surprised and disappointed that such an opinion as appeared in ZERO BIAS should appear in an amateur magazine of the caliber of *CQ*. While many points may be well taken, (*i.e.*, the reason for "incentive licensing"), I cannot help but feel that the compromise suggested will be another step in the erosion of amateur radio.

For those persons whom you speak of that would desire strongly enough to experiment or otherwise contribute something to the state of the art, it would seem little enough to ask them to pass a thirteen word per minute code examination. We do not ask this, but ask that only a *five* word per minute examination be required for two meter privileges. In my opinion anyone having the ability to contribute anything to the state of the art can certainly pass a five word per minute code examination.

I do not mean to infer in any way that either Novice or Technician licenses are not good (as might be taken from the comments), for many of our better operators and technicians were either Novice or Technicians at one time.

Dee D. Wheeler, W8GKN
6388 Roselawn Avenue
Reynoldsburg, Ohio 43068

Editor, *CQ:*

I am in the 8th grade and am soon to get my Novice ticket. I read your January ZERO BIAS and I wholly agree with you. I am entirely against citizen band radio for the purpose used around here. Most of these CB'ers are people just too lazy to learn the code . . .

David B. Dixon
3416 Oaks Road
New Bern, N. C.

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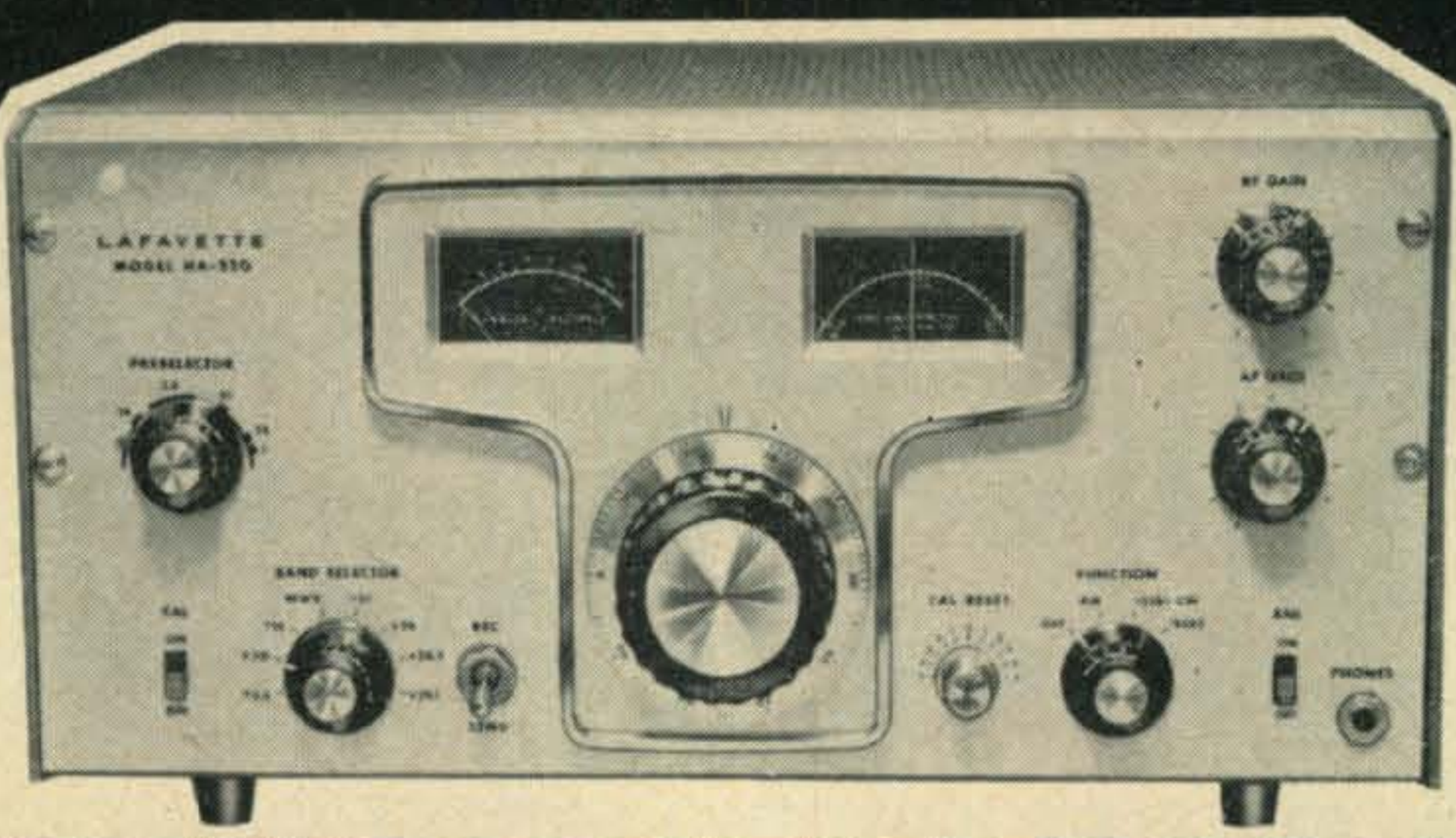

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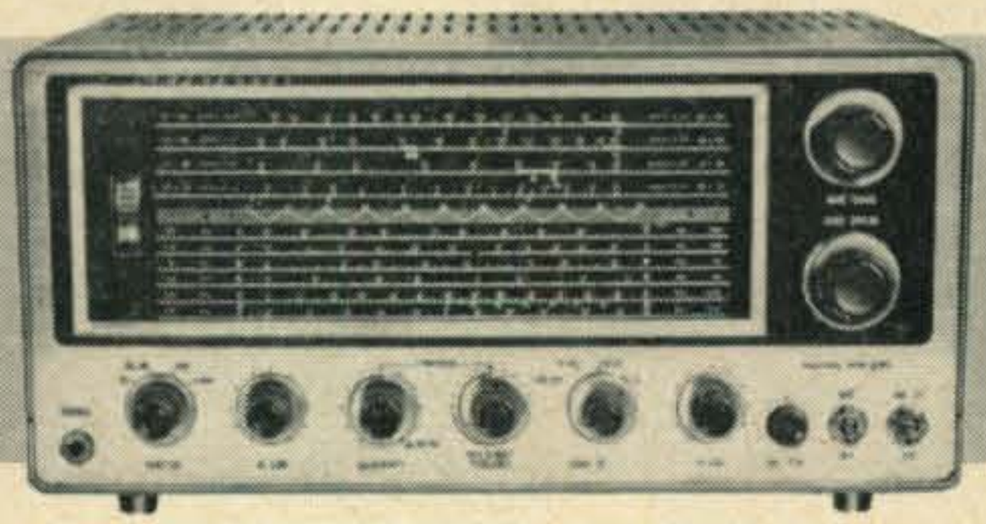

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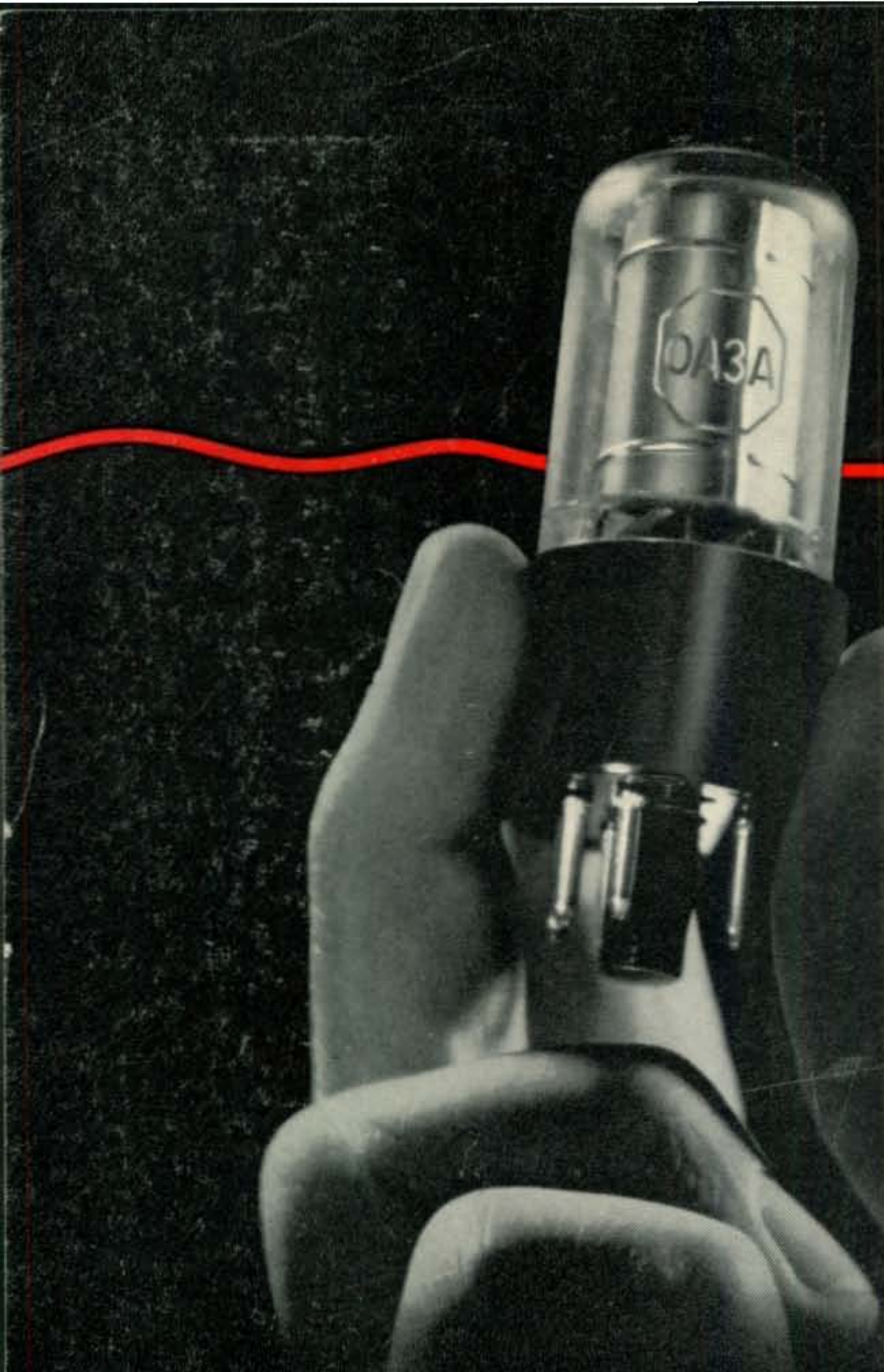

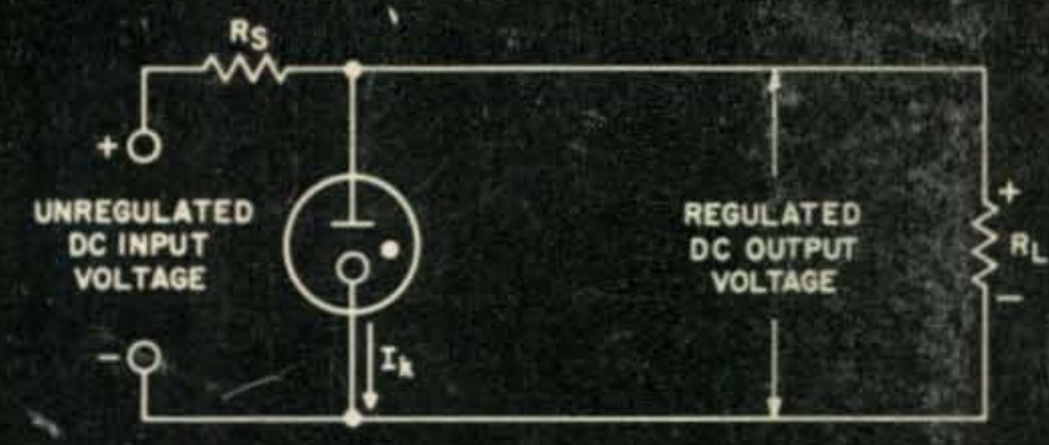

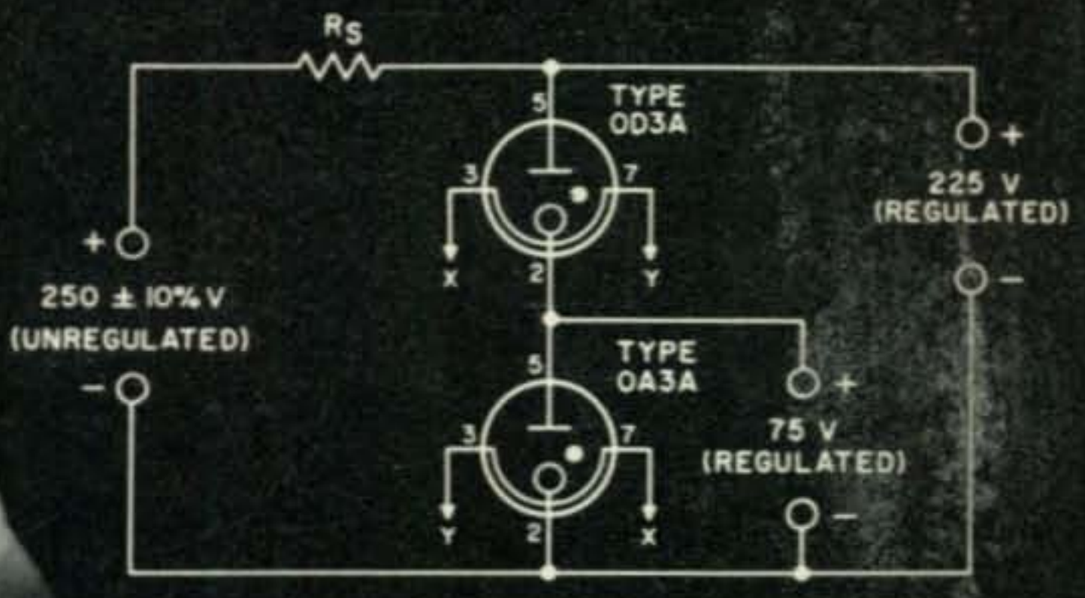

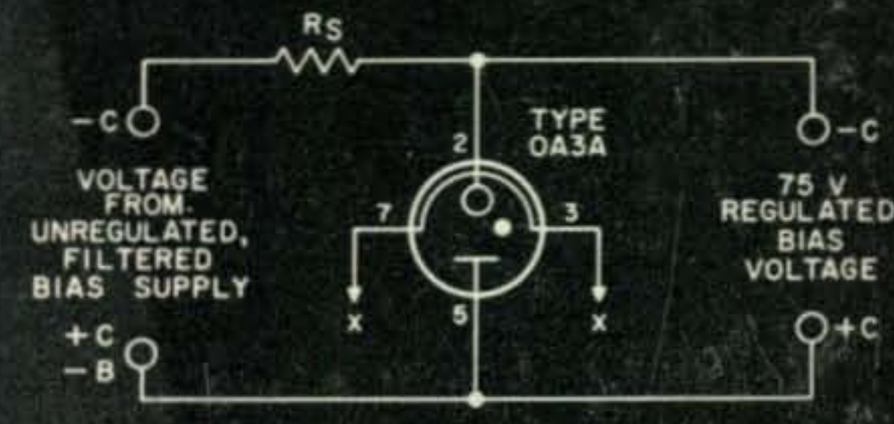

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