June 1966
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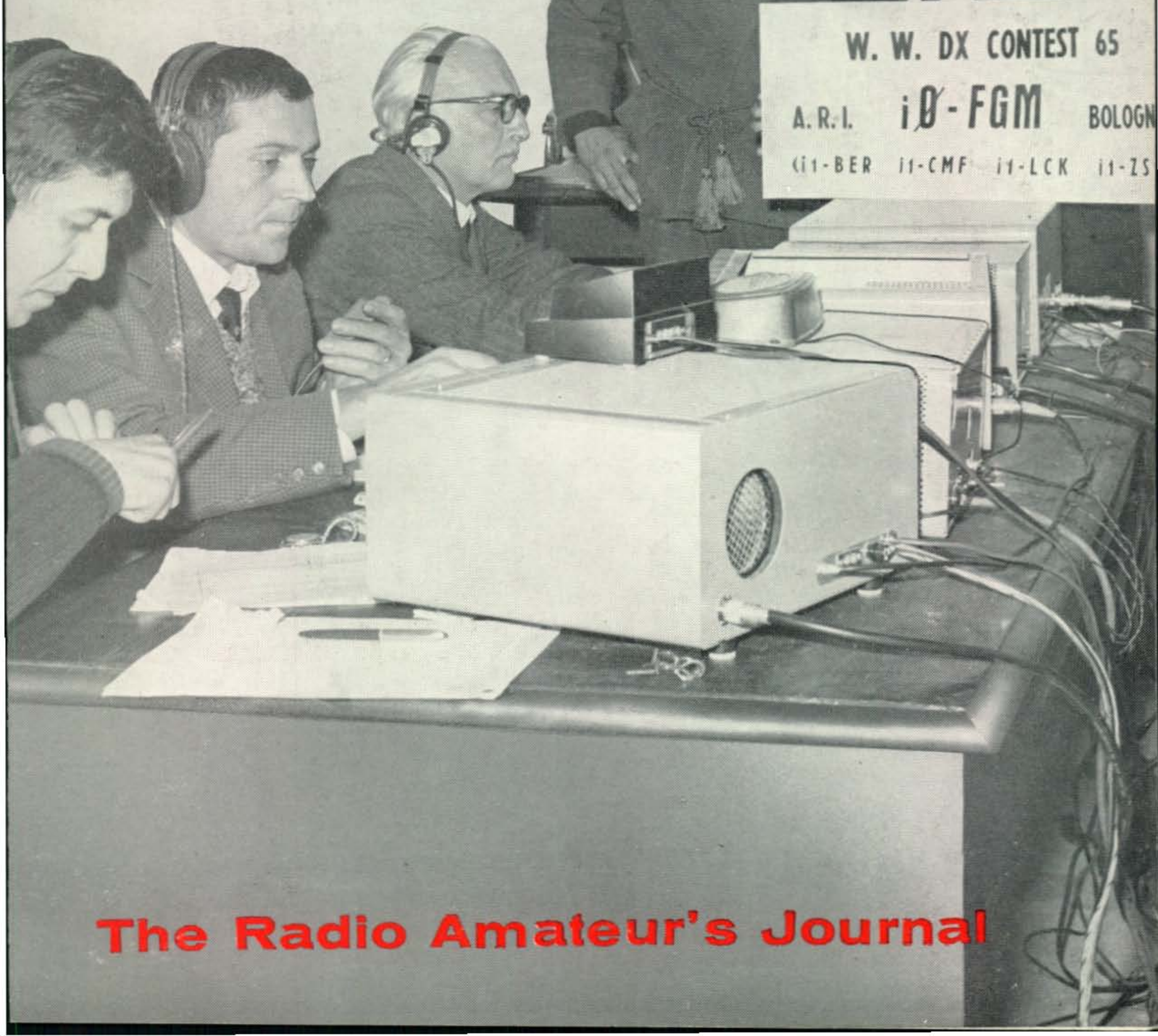
World Wide DX Contest

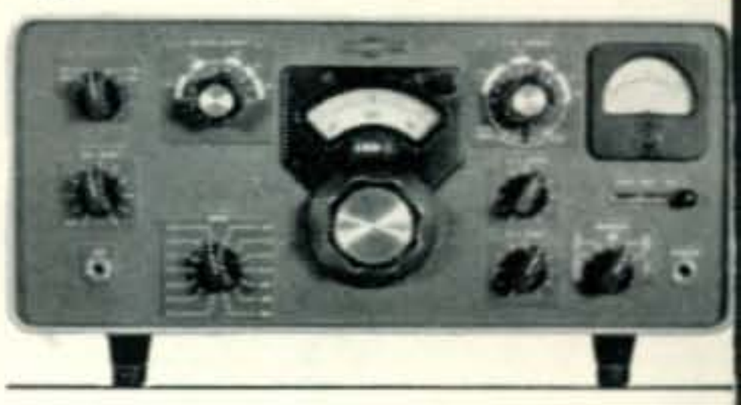
Phone Results - Page 49



The Radio Amateur's Journal

Sjuttio-tre, Gamle Polare!

73, old man! From Sweden or anywhere, the standard sign-off among ham operators. There's another standard with hams — Collins' KWM-2 transceiver. In the development of the KWM-2, Collins produced at least 19 industry firsts. Some have since become standard in all amateur equipment. The KWM-2 is still the only transceiver with all 19 in one unit. If you've ever heard or operated a KWM-2 you'll know what this means in terms of performance. If you haven't, a visit to your Collins distributor will quickly show you what the KWM-2 can do.



COLLINS

For further information check number 3 on page 110

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Hustler quality and reliability with

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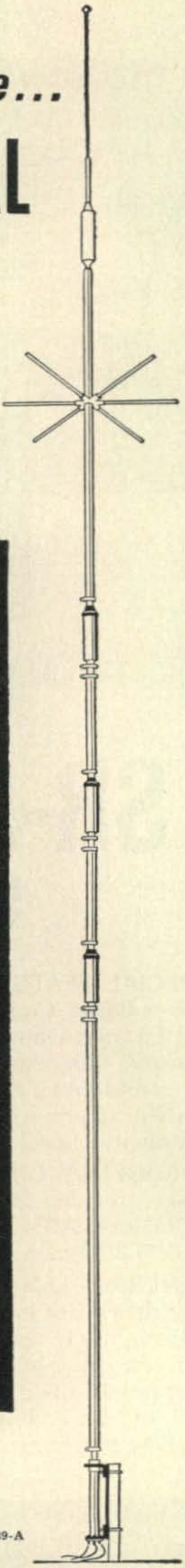
4-BTV... *Only* $32.95



Here's why the Hustler 4-BTV is the best trap vertical for the money.

- You'll get superb operation . . . 40 through 10 meters. (Also 75 meters with a Super Hustler RM-75-S on top.)
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For further information, check number 1, on page 110

hold your ears. hallicrafters has unleashed another brute

SR-2000 "Hurricane"

5-band amateur transceiver

SPECIAL FEATURES: Patented Receiver Offset Control (RIT) permits ±2 ks adjustment of receiver frequency, independent of transmitter, for round-table, net or CW operation. Hallicrafters exclusive Amplified Automatic Level Control.

FREQUENCY COVERAGE: Full coverage provided for 80, 40, 20, 15 and 10 meters. All crystals provided for 28.0 to 30.0 mcs.

GENERAL: Dial cal., 1 kc. Linear gear drive with less than 1 kc readout. Adjustable IF noise blanker. Provision for plug-in external VFO/DX adapter. Built-in VOX plus break-in CW and PTT. Built-in CW sidetone. Hi-Low power switch useable in CW or SSB.* 2.1 kc crystal lattice filter. S-meter-RFO-AALC and final screen metering.* Two-speed blower, 100 kc crystal cal. VFO covers 500 kc.

TRANSMITTER SECTION: Two 8122 output tubes. Variable Pi network. Power input, 2000 watts P.E.P. SSB; 1000 watts CW. Carrier and unwanted SB suppression, 50db; distortion products, 30db. Audio: 500-2600 cps @ 6 db.

RECEIVER SECTION: Sensitivity less than 1 μv for 20 db S/N. Audio output, 2W.; overall gain, 1 μv for ½ W. output.

*Meters for final plate current and voltage built into P-2000AC power supply. Also Hi-Lo power switch.

amateur net: $995

For further information, check number 2, on page 110

the wild ideas are tamed at ... hallicrafters

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CQ

JUNE 1966 VOL. 22, No. 6

The Radio Amateur's Journal

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itle registered U. S. Post Office) is published monthly by Cowan Publishing Corp. Second class postage paid at Port Washington and Garden ew York. Subscription Prices: U. S. A., Canada and Mexico, one year, $5.00; two years, $9.00; three years, $13.00. Pan-American and add one dollar per year. Please allow six weeks for change of address. Printed in the United States of America.

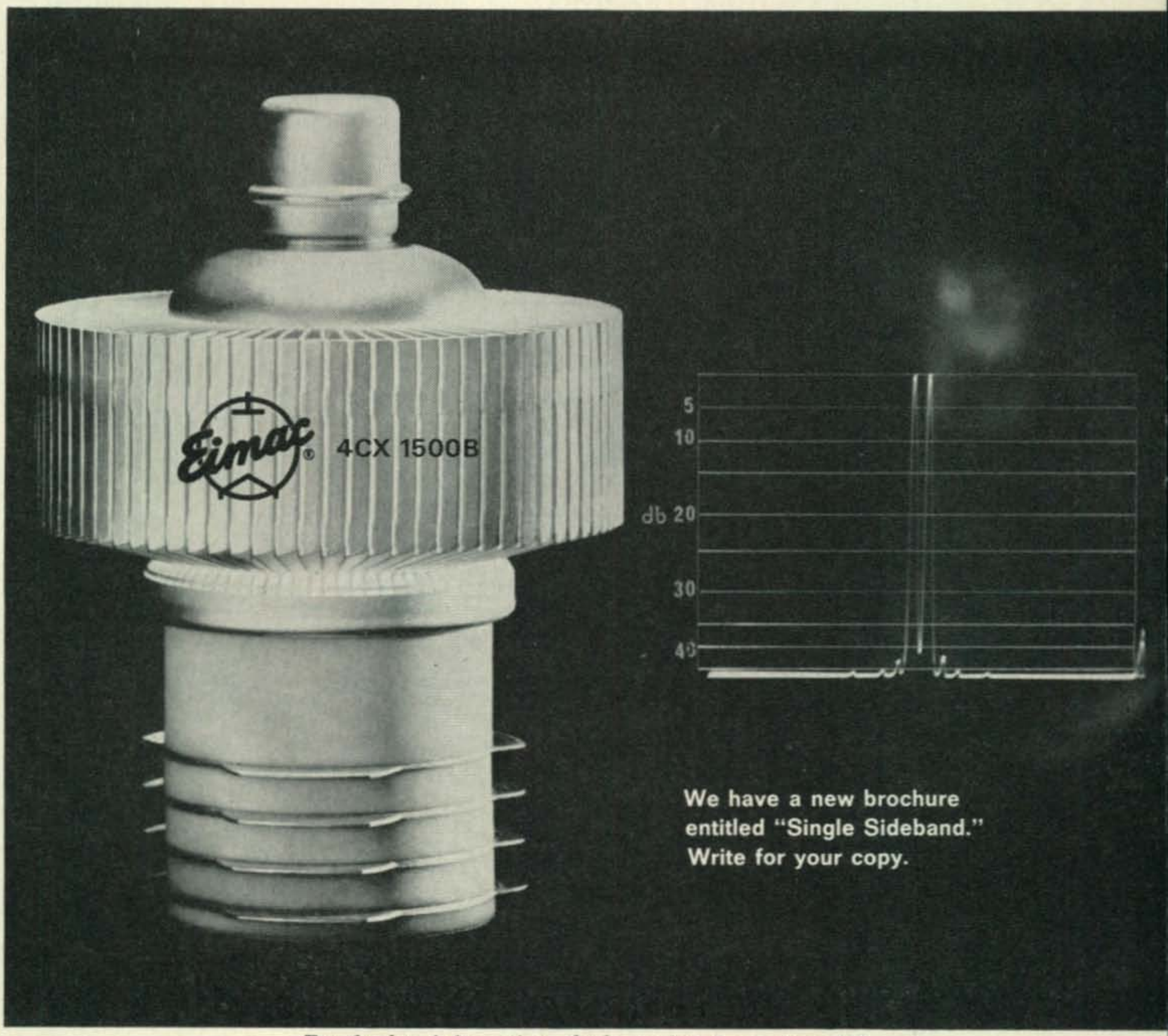
EIMAC offers new 1 kW PEP tetrode for SSB with highest linearity—at least -40 db in typical operation

EIMAC's new 4CX1500B power tetrode is the most linear tube on the market; intermodulation distortion characteristics under typical operating conditions are at least −40db at all drive power levels from zero to maximum. The new tube is ideal for advanced single sideband transmitters demanding high linearity to avoid channel-to-channel interference. The 4CX1500B is the product of a four-year development study which included optimization of internal tube geometry by computer techniques. Rated maximum plate dissipation of this radial beam tetrode is 1500 watts, and control grid dissipation rating is 1 watt maximum. Because the 4CX1500B has very low grid interception (typically less than 1.5 mA grid current), it is possible to drive the grid positive without adverse effects upon the distortion level; the tube is therefore recommended for Class AB_2 linear amplifier service. For further information, write Product Manager, Power Grid Tubes, or contact your nearest EIMAC distributor.

TYPICAL OPERATION (Frequencies Below 30 MHz)

DC Plate Voltage	2500	2750	2900 volts
DC Screen Voltage	225	225	225 volts
DC Grid Voltage	−34	−34	−34 volts
Zero-Signal DC Plate Current	300	300	300 mA
Single-Tone DC Plate Current	720	755	710 mA
Two-Tone DC Plate Current	530	555	542 mA
Driving Power	1.5	1.5	1.5 watts
Useful Output Power	900	1100	1100 watts
Intermodulation Distortion Products			
3rd Order	−38	−40	−40 db
5th Order	−47	−48	−48 db

EIMAC
Division of Varian
San Carlos, California 94070



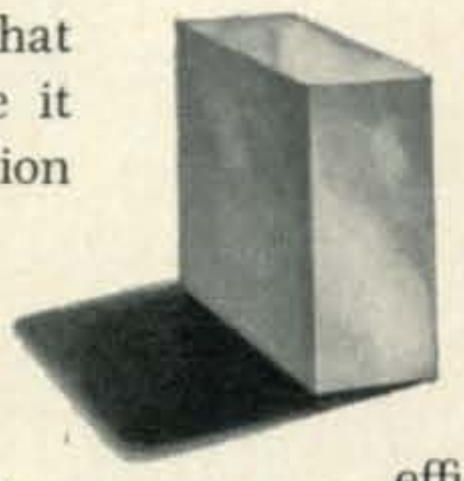
We have a new brochure entitled "Single Sideband." Write for your copy.

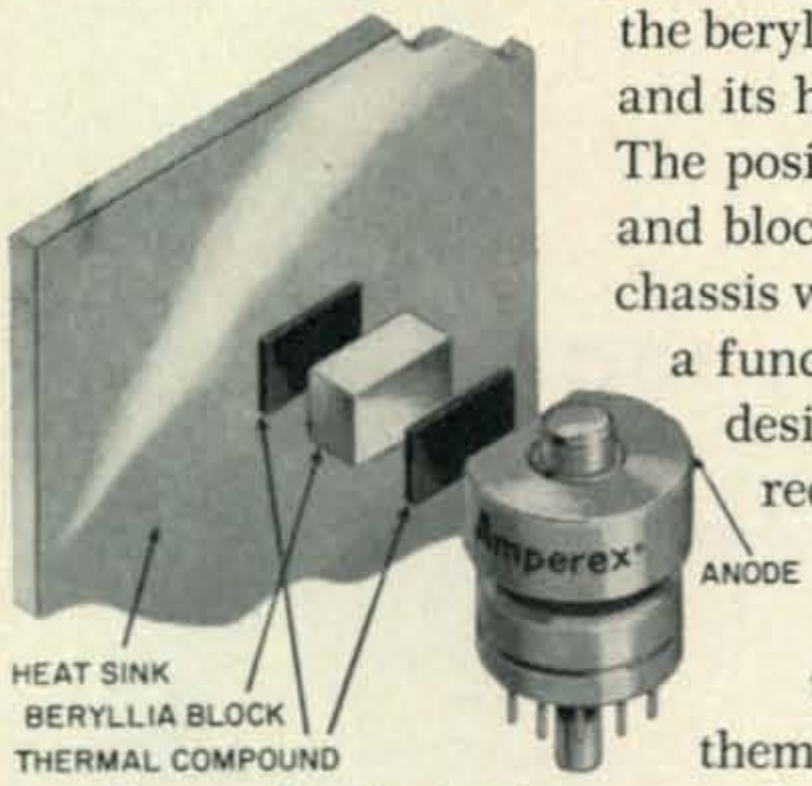
For further information, check number 4, on page 110

Announcing
an unexpected development
in electron tube conduction cooling

To give you maximum design flexibility with reduced equipment size and cost, Amperex, in conjunction with a major equipment manufacturer, has developed an entirely new conduction cooling technique for electron tubes.

The key to the new technique is a beryllia heat-conduction block that is not integral to the power tube it serves. Indeed, its only connection to the tube is through an efficient thermal compound. Thus, for your design purposes, the size of the heat block will be in direct proportion to the power requirements you plan to place upon the tube—the lower the plate dissipation, the smaller the beryllia block and its heat sink. The position of tube and block in the chassis will be largely a function of your design-layout-requirements (rather than determining them as was the case heretofore). In the event of tube failure, the new Amperex cooling method means that the tube is all you replace, the customary inconvenience and additional expense of replacing the block being eliminated.





In addition, the Amperex technique, like other conduction cooling methods, eliminates the cost, space and downtime normally associated with most other approaches to cooling.

To implement its new technique, Amperex has developed a new power tetrode, the type 8560.

This rugged, compact, new ceramic and metal tetrode derives from the "4X" tube series, it therefore can be counted on for exceptional efficiency and reliablity not only for the popular 50, 150 and 470Mc commercial communications bands, but for SSB and point-to-point AM and FM applications as well.

The 8560 is designed for use as a high-efficiency RF power amplifier at frequencies up to 500Mc.

As a Class C amplifier under CCS conditions it can produce 270 watts output at 175Mc from 4 watts drive. The maximum allowable plate dissipation of the 8560 is solely a function of the effectiveness of the conduction cooling system and approaches 500 watts under the most ideal conditions.

Amperex is ready to put its new cooling technique and its unique new power tetrode to work for you. Applications assistance as well as complete data is available. (Data includes all formulas necessary for designing a conduction cooling system to fit your particular applications.)

Wire or write: Amperex Electronic Corporation, Tube Division, Hicksville, Long Island, New York, N. Y. 11802.

Amperex®

For further information, check number 6, on page 110

ZERO BIAS

I NOTICED in the May issue of *73* magazine that their staff takes great pride in the fact that they don't answer their reader's questions! Frankly, we suspected that was the case, but never expected to see them come out and so brazenly tell their readers where to go!

My reason for bringing up someone else's policies is to use it as a comparison for *CQ*. What do we do for our readers? Oh, only a few little things that our readers have come to take for granted. Things such as contests, awards programs, and a free question and answer service.

Hundreds of fellows take advantage of our free services every month, but there are probably thousands of others who don't even know they exist. Allow me to blow our trumpet on at least one point. Did you know that *CQ*'s exclusive HAM CLINIC will answer every legitimate technical question asked by any reader—subscriber or not? Our HAM CLINIC "Doc," Chuck Schauers, W6QLV, ex-W4VZO, F7FE, etc, has made his mark in amateur radio by being "the man with the answer" in a remarkably high percentage of "cases." Chuck has also fielded a few touchy non-technical queries in his eight and one-half years with *CQ*, and his blend of logic, humor, and reason has made him an all-time favorite with readers.

So, next time you have a few questions about modifying that piece of commercial gear, or eliminating that birdy on 7.015, or even keeping peace with the mother-in-law, drop a line to Chuck. He's a mighty knowledgable guy. In fact, he can probably answer the questions that those guys in Peterborough couldn't take the time to answer (even if they do involve an error in their mag!)

MEMTAC

Another popular feature in *CQ* is the occasional article by Doctor Jerzy Ostermond-Tor, which has a funny way of showing up in our April issues. Doctor Ostermond-Tor's most recent discourse on communications appeared in April *CQ*, entitled, "MEMTAC—A New Method of Communication." Tor has been overwhelmed by the enthusiastic response to MEMTAC, and offers of assistance are still arriving daily.

While Doctor Tor sincerely appreciates the good intentions of his followers, he has asked that we clarify the nature of his work, to avoid unnecessary embarrassment to several "volunteers" who have evidently taken his articles a bit too seriously. So, in deference to his wishes, we remind our fanatically enthusiastic readers to take Dr. Tor's April offerings with a rather large grain of salt.

The Ted Thorpe Fund

In April *CQ* we announced the formation by Gay E. Milius, W4NJF, of a fund in the name of the late DXpeditioner, Ted Thorpe, ZL2AWJ. The purpose of the fund is to aid Mrs. Thorpe and her two young daughters overcome the initial financial hardship which resulted from the death of Ted in the tragic *Marrinero* ketch disaster, which also took the lives of Chuck Swain, K7LMU and a crew of three.

Some erroneous reports have been circulating recently, however, regarding the legitimate need for the fund. The rumors have it that Mrs. Thorpe is pretty well off, and not in need of support from amateurs. In addition to the basic inaccuracy of the rumor, we must clarify the fact that the fund was intended more as a token of our gratitude to Ted for his contribution to amateur radio, than it was as an indefinite means of support for the Thorpe family.

With this in mind, we again urge you to contribute whatever amount you can afford to the Ted Thorpe Fund, in care of Gay E. Milius, W4NJF. Incidentally, contributions to date total $535.

A New Look

We're changing *CQ*! Yes, after about seven or eight years of relative stability in our editorial policy, we're going to really shake things up a bit, and in the process, make this book of ours worth more to you than it ever has been before. We're bound to step on a few toes, but before you let loose with a broadside, give us a month or two to prove ourselves.

Here's what's taking place. This month, three of our regular columns have been dropped: VHF, NOVICE, and CLUB FORUM. Why? To make room for more current items of more general interest. In other words, we're going to run more of the same good articles that have made *CQ* the popular magazine it is. But the changes don't stop there. Next month will be marked by the removal of RTTY, YL and SPACE COMMUNICATIONS. You'll also detect changes in USA-CA, DX, and CONTEST CALENDAR, with a minor facelifting for HAM CLINIC (no change in Chuck's good service, though). About the only columns not swept up in the changes will be George Jacob's PROPAGATION column, and Gordon White's SURPLUS SIDELIGHTS.

The authors of all these columns will not be lost to *CQ*, however, because they will continue to be regular contributors. There's just too much talent there to be put out to pasture, and we don't have any intention of letting their Smith-Coronas cool off. So you can look forward to more great features in *CQ* than ever before, with the same authoritative authors leading the way: George Jacobs, Byron Kretzman, Louisa Sando, Walt Burdine, Al Katz, Bill Orr, Frank Jones, Al Smith, Fred Brown, Ed Marriner, Bob Brown, Ron Lumachi, Bill Scherer, Chuck Schauers, Ronald Ives, Durward Tucker, Judge Glanzer, and a few hundred others. These are the *leaders* in amateur radio journalism. We're proud to have them as loyal and regular contributors, and we promise more of the same "good thing" in months to come.

We also promise that absolutely *no* special interest group will suffer by the deletion of the columns, but will benefit instead by a few dozen more pages of solid news, technical and otherwise. Tune in and see!

73, Dick, K2MGA

LETTERS TO THE EDITOR

The Dwindling Newcomers

Dear Sir:

I have read with interest your ZERO BIAS in the March issue of *CQ*, especially the part regarding the influx of newcomers to our ranks. ARRL has also taken note of this fact.

The answer is very simple. As long as little, or no attempt is made to enforce the CB Regulations this condition will continue, and may even get worse. The experience with recent code and theory classes is, most of those who start out find that they cannot learn the code in ten minutes, so they drop out and get CB sets. The CB'ers exchange QSL cards, have nets in operation, run linears, ignore the silent regulation, and in general operate as though there were no regulations other than their own personal desires.

I am not against CB'ers if they operate according to regulations, neither am I criticizing FCC for their lack of enforcement of the regulations. CB has a place and use if handled according to regulations, and FCC has neither the funds or personnel for the proper enforcement of the regulations.

There is also another side of the picture which needs looking at. It is long past time when we amateurs should wake up and put our house in order. What impression are we making on those foreign officials who are eyeing our bands for their own use, when so often our bands sound like a bunch of CB'er kids? If we continue on our present course, what of the future? What may very well happen is that we will lose most of our bands and what ones are left to us will be taken over by the CB'ers.

It is up to each and every amateur to see he stays strictly within our regulations and that he makes proper use of his privileges as an Amateur.

Harley D. Harriss, W8DCT
111 Pine Street
Manistee, Michigan

Dear Dick,

I agree with your ZERO BIAS in the March issue.

Attached is one of the many articles on amateur radio I have had published in local newspapers. (I am a retired infantry-officer who was a PIO—Public Information Officer—and do some freelance writing.)

Each week I write a two or three paragraph story on the meeting of the Hunstville Amateur Radio Club. It is printed in both morning and evening papers and broadcast on the three radio stations in Hunstville (in their "bulletin board" or "around the town" spots at no charge).

How do I do it? Who do I know?

I don't know anybody. I just drop off, or mail the story in without comment, cover letter, interview or anything else.

The moral is: Write something worth reading and it will get printed—and broadcast.

The Latest Advance in Long Range Radio Communication

MOBILE

BASE STATION

BOAT

PORTABLE

LIST PRICE $385.00

THE NEW RF COMMUNICATIONS Co-Pilot Single Sideband Transceiver!

The RF Communications CO-PILOT SSB Transceiver was designed for long range communications in INDUSTRIAL, GOVERNMENT, POLICE, SEMI-MILITARY and PRIVATE applications.

HIGH PERFORMANCE—The Co-Pilot provides single channel operation. The channel can be specified anywhere between 2 to 12 Mc. Power output is 50 watts (can be reduced to 10 watts with rear panel switch for reduced battery consumption).

TRANSISTORIZED—All circuits except high power stages are transistorized. Instant heat tubes available for low battery consumption applications.

SIMPLE OPERATION—Only three front panel controls. An untrained operator can use the Co-Pilot with less than 5 minutes of instruction.

LOW POWER INPUT—The Co-Pilot operates from 12 volt D.C. power. Power consumption in receiver is about one watt (80 ma).

SMALL SIZE—The Co-Pilot measures 10x10x4 inches and weighs under 12 pounds.

QUALITY CONSTRUCTION—All materials and construction of highest commercial quality. Can be used in regions of high temperature and humidity, and under conditions of high shock and vibration.

FULL LINE OF ACCESSORIES—Including base station and mobile antennas, rechargable battery kit, transceiver carrying case, battery carrying case, direction finding antenna, and others.

High Performance Commercial Grade Communications At a Reasonable Price!

Please write for details

rf **R F COMMUNICATIONS, INC.**
1680 UNIVERSITY AVENUE • ROCHESTER, NEW YORK 14610

For further information, check number 9, on page 110

Now as to your suggestion that ARRL (and *QST*) *do* something.

I'd like to challenge *CQ* to do something.

At the top (or bottom) of each article in your magazine which is the type you'd like to see printed in the newspapers (such as the one on the Eye Bank Net) print the following squib:

"Reprinting, in part or whole, by any publication not in the amateur radio field is granted and encouraged."

You may come up with better wording, but the idea is this. You buy all rights in articles, including reprint rights. Therefore, for public relations purposes, grant those rights without cost to newspapers and magazines in non-competing media.

In ZERO BIAS urge your readers to clip and mail such cleared articles to their local newspapers, together with the information as to where the paper may get copies of the pictures illustrating it (hopefully—free from *CQ*)

Going even further: Prior to publication, release such stories, together with the pictures, to the wire services. It won't detract from your newsstand sales. In fact, with a credit line to *CQ* in the story, it should prompt non-readers to seek out a copy, or, seeing it on the stands and remembering the newspaper article, buy a copy out of curiosity. In other words, you'd be publicizing both amateur radio and *CQ* in the best type of advertising there is: free and related to public interest.

Ross A. Sheldon, K4HKD
3313 Avery
Huntsville, Alabama 35805

Dear Editor:

I just bought my March issue of *CQ* at the B.X. yesterday and have already read it from cover to cover. I read . . . ZERO BIAS . . . and I agree . . . whole heartedly about the ARRL doing something to help the advancement of amateur radio in the public eye. It has gotten to the point that if you tell someone that you are a ham they say "Oh, you mean a CB operator." Well, I don't appreciate that one bit. I worked and studied hard to get my General ticket and it cost me about $50 by the time I went to Winston Salem and took the exam and returned.

I have a CB license, in fact, two of them and I hold the call's KAI8007 and KCJ8507 but I don't let too many people know it. I think the ARRL should get on the ball and do something more for the hams now. We put them in a new building and gave them a nice expense account or bank account (however you want to look at it). I may be wrong but from what I can gather from what I have read in *QST* over the past 18 months the ARRL is looking out for old 1st first and then if they have the time they will think about us. They want all the engineers in the ham world to hold most of the privileges. Well, in my opinion, I had to work just as hard at the time if not harder to pass my General exam as any of the brains would have to work to get an advanced ticket.

I am not an engineer yet, but I plan on getting my degree before it's all over with. I still don't go all the way with this incentive licensing program.

The ARRL should devote their efforts to helping all of us not making it harder for a person to get started in ham radio.

Robert C. Maynard III, WA4KXX
Keesler AFB, Miss.

Dear Sir:

We should like to make a brief comment re: ZERO BIAS, in the March issue.

The station at this location has been active for approximately seven years. It is our opinion that ham radio will continue on the decline until such time that our lawmakers wake up to the fact that, to be a good short wave operator one must be an expert "Brass Pounder." We see little common sense reasoning behind this requirement. This operator has paid careful attention to communications in the Vietnam conflict, and have as yet not seen, on our TV screen a single instance of communication by telegraph.

The slow, laborious method of communication by Morse International Code is as dead as the proverbial Dodo Bird, and should be buried alongside it.

We should not blame the FCC for this shortsighted policy, as their function is to enforce the present law, not amend it.

Perhaps one of our Senators or member of the House of Representatives will get around to this subject at some future date. We have the matter up with our District Representative, at the present time. Perhaps he may be able to get some favorable action on the matter. At least we hope so.

W. W. Warner, K8RSC
432 East Summit Street
Kent, Ohio.

The letters above are typical of many more comments received about the declining number of newcomers to amateur radio. Each expresses a slightly different view on the problem. First is the feeling that the Citizen's Band is tapping a great number of our potential amateurs. Second is the feeling that amateurs themselves aren't doing enough to promote the hobby—and neither is *CQ*. Third is the opinion that ARRL has become more concerned with its internal structure than it is with doing something substantial to promote the hobby. The fourth view is that code is an antiquity which is standing in the way of many fellows becoming amateurs.

Our feeling: 1. Yes, CB is hindering the growth of amateur radio by dead-ending many prospective amateurs. 2. Yes, amateurs as a group, (and *CQ* as a magazine) have not done enough solid, high pressure promotion of amateur radio to the public. We *intend* to; how about you? 3. ARRL is only as dynamic as the ideas of the people who run it: The Board of Directors. Do you want to see more dynamic action by ARRL? Write *your* Director. Believe it or not, he actually moves and votes as *you* direct. 4. We strongly disagree that code is a thing of the past, and each year we see our feelings reinforced by the *CQ* World Wide DX Contest: c.w. returns still hold a 100% margin over phone. C.w. not being used by the military?—Not so! But the military *is* being forced to develop visual code read-out devices. Our thoughts on code: Undoubtedly the simplest, most efficient and reliable mode of radio communication—when you've acquired the knack, but undoubtedly the greatest hinderance to new and prospective amateurs. We'll have more to say on the subject in next month's ZERO BIAS. In the meantime, what are your thoughts?—*K2MGA*.

W9WNV Supported

Dear Dick,

I am not one of the big DX boys but do work my share of it.

By reading ZERO BIAS I think you are doing Don & Chuck wrong, because I just don't believe that Don denied any contacts to some of the big DX boys, as I have contacted him just about on all stops including on Spratly Island and I have not donated any money except the postage for the QSL's. If some of us have not made contact with Don it may have been for many reasons; condx or QRM and so on.

But Don is the finest operator I have worked and I am sure most hams will agree with me.

There is some very rude operators amongst us and some of them will do anything to stop others from getting the contact if they do not make it. I have been on Don's freq. for a long time listening and so have most of us. His freq. was in general clear of VE's and QRM to give the W's a chance to contact Don.

I personally go along with your cover picture and text in Feb. *CQ* from W9AC es W4AK it certainly does not look so among the W & K's hams as there is a lot of court actions ham against hams; Don via *CQ* or K6BX via NAHC and so on.

I was a CHCer and I also have 210 countries confirmed but would not waste my time to send for DXCC as in the future we may have to go through court to get the DXCC. There just is too much fighting among hams.

Ever listen around 14204 kc or 14105 or 3800 kc? It sure does not give the hams a good name among the other DX countries.

Having lived in DL land for a long time with quite a few countries around I have never heard that kind of fight.

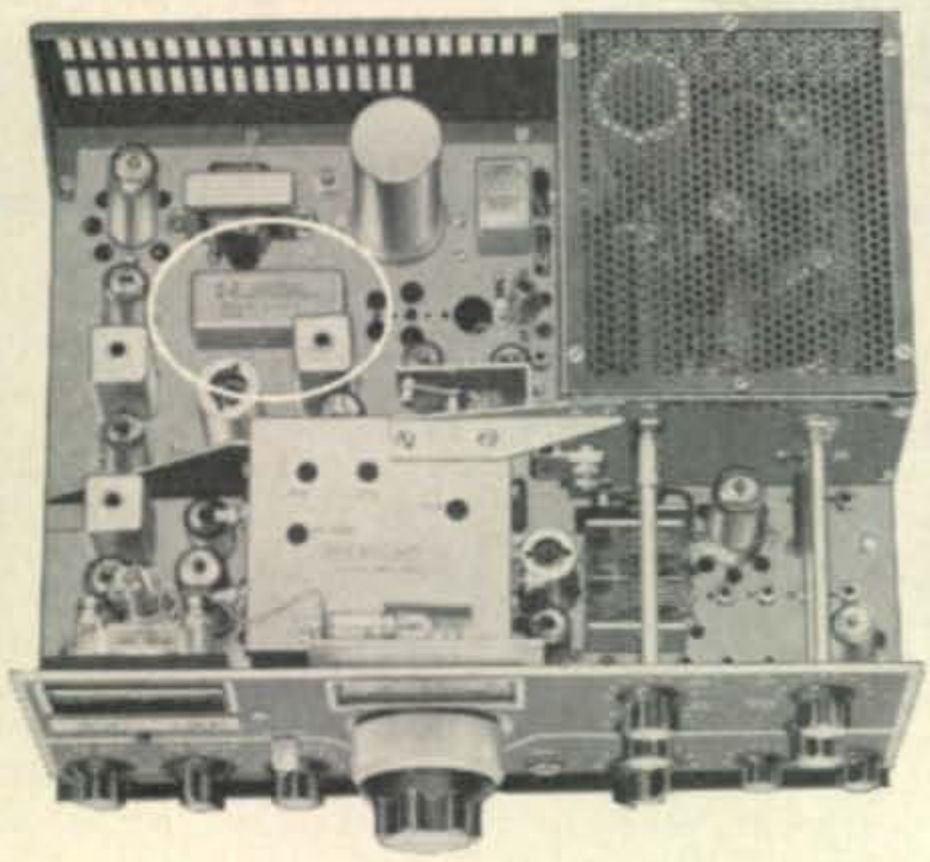
Certainly hope things will improve among us so we set the example and earn the prestige we North Americans like to have.

Olaf von Sivers, VE7AON
1029 Winslow Avenue
New Westminster, B.C.
Canada

IF YOU'RE LOOKING FOR *SELECTIVITY*

LOOK INTO THE SWAN-350

AND ITS HIGH FREQUENCY CRYSTAL LATTICE FILTER

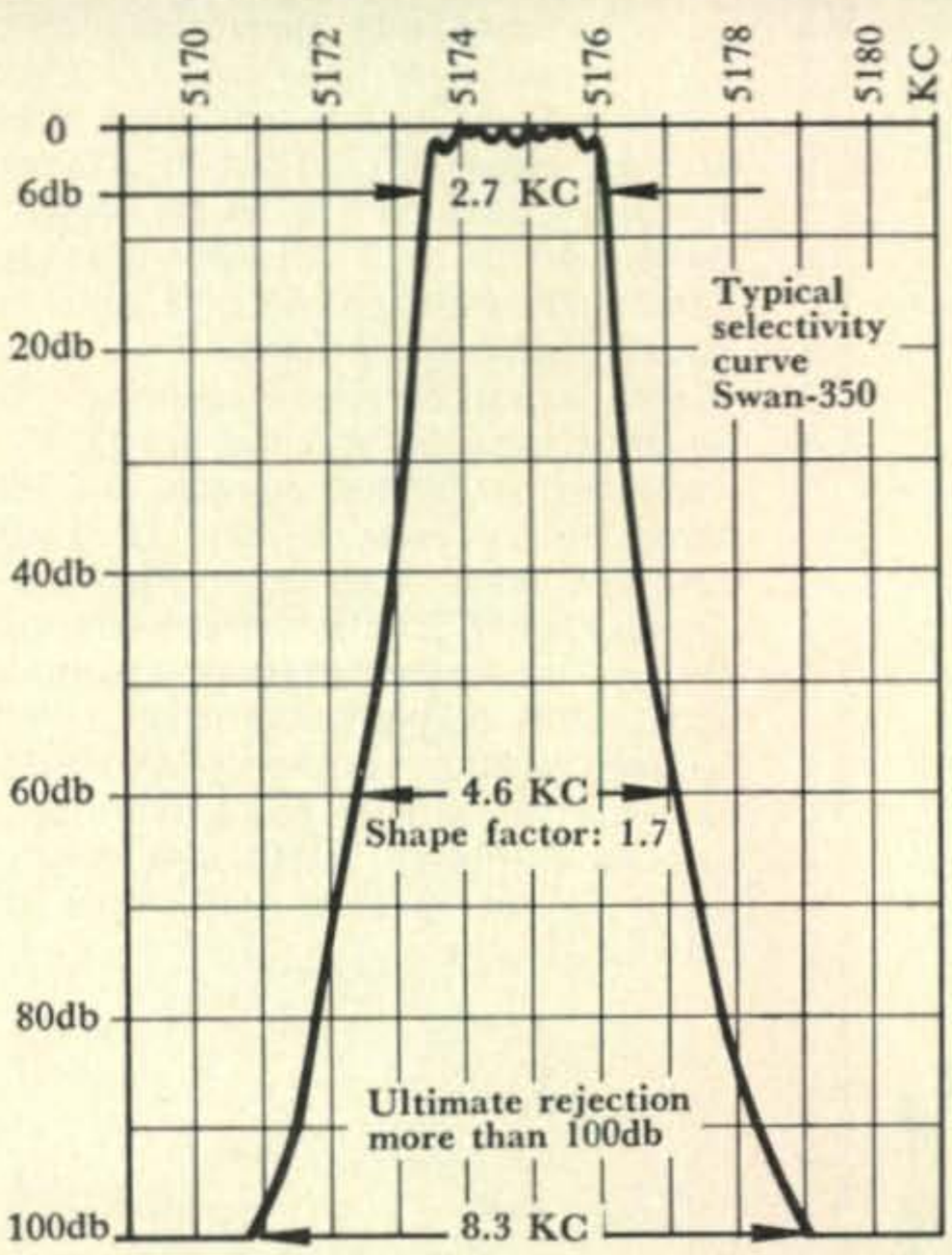


One of the reasons why the Swan-350 is the top selling transceiver today is its exceptional selectivity provided by a new crystal filter which we began installing in all production units a few months ago. This amazing little gem is made exclusively for Swan by C-F Networks. The selectivity it provides for voice communication is as good or better than the selectivity provided in any other sideband equipment, regardless of price.

There are 3 important factors about a filter which determine what the overall selectivity will be. One of these is its *bandwidth* at the 6 db points, and here we have carefully selected 2.7 KC in order to give you good channel separation, and still retain the smooth, natural audio for which Swan transceivers are so well known.

The next consideration is *shape factor*, or the ratio between bandwidths at 6 and 60 db. In this respect the Swan filter gives you a "shape factor" of 1.7 to 1. This is substantially better than the 2 to 1 ratio of the mechanical filter, or 3 to 1 of the average 9 mc crystal filter. Best shape factors are achieved right around 5 mc, and this is one of the main reasons for selecting 5175 KC for the Swan I.F. (This choice of I.F. also permits single conversion design which results in fewer images and spurious signals. The only thing better than single conversion is no conversion at all.)

The third important factor, but by no means the least, is the measure of *ultimate rejection*, or how far the skirts fall before flaring out. Take a look at the graph and you'll see that this is better than 100 db with the Swan filter! Ultimate rejection determines how well your receiver attenuates those strong adjacent channel



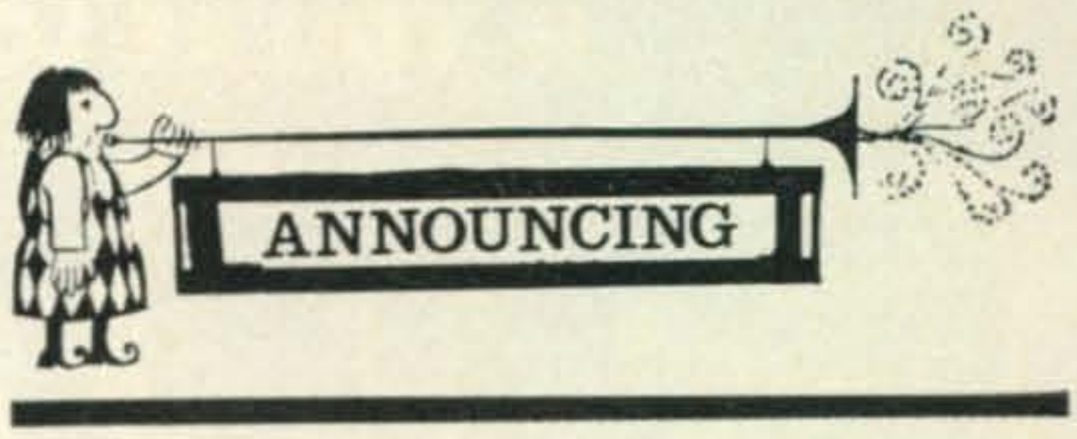
signals, especially the guy down the street with the big linear. In this respect, the Swan filter is superior to others being used in amateur sideband gear.

In Swan transceivers, the filter is also used when transmitting, of course, and in this mode the shape factor determines what your unwanted sideband suppression will be. We have been advertising 40 db, but this is a conservative figure, since it is really better than 50 db. Also, we've been advertising only 400 watts PEP input to the 350, but actually the average production unit peaks over 500 watts before flat-topping, which is why the 350 gets out so well, and sounds so good. Compare these features with any other sideband transceiver, and they all sell for more money!

73 Herb Johnson W6QKI

SWAN ELECTRONICS
Oceanside, California

For further information, check number 13, on page 110



Rome, New York

Rome Radio Club is sponsoring a Ham Family Day on June 5th at Beck's Grove in Rome, N.Y. Full day of activities. Reservations in advance $4.25, $4.75 at gate. For more details write to Ralph S. Kerstetter, Box 721, Rome, N.Y.

Ottawa, Illinois

Starved Rock Radio Club Hamfest will be held June at the La Salle County 4-H Home and Picnic Area SW of Ottawa. Advance Registration $1.50, $2.00 at gate. Contact W9MKS, RFD 1, Box 171, Oglesby, Ill. for additional details.

Atlanta, Georgia

Atlanta Amateur Radio Club, Inc. will hold its 38th annual Hamfest in conjunction with the Ga. State ARRL Convention on June 4 and 5. Sat. eve. will be a banquet and dancing till 1. For information and details contact Johnny Fearon, W4WKP, 4165 Club Fr. NE, Atlanta, Ga.

Streator, Illinois

6th Annual Streator Radio Club Pre-Starved Rock Hamfest dinner-dance. New location Grove Supper Club. June 4, 1966 at 7 P.M. Tickets $3.50 each. Reservations for dinner must be made by May 21. Write, WN9OMG, M. Van Duzer, Rt. 1, Streator, Ill. 61364.

Rhode Island Amateur Radio Week

Amateur Radio Clubs of R. I. invite all amateurs to join in the 1st R. I. Recognition Award. Time: 0400 GMT June 4 to 0400 GMT June 11. General call "CQ R.I." All stations except R.I., Mass. and Conn. must contact 3 R.I. stations. Mass. and Conn. Stations must contact 5 R.I. stations. Mail logs to R.I. Amateur Radio Week, P.O. Box 1662, Providence, R.I.

Salina, Kansas

Central Kansas Radio Club will hold its 18th annual hamfest at Kenwood Park in Salina on June 5. Bring a covered dish, drinks are free. Plenty of contests and prizes. For more info, write to Norm Johnson, WØAMJ, 101 W. Ray, Salina, Kansas 67401.

Quincy, Illinois

The Western Illinois Radio Club Hamfest will be held on June 19, at Eagles Alps, Quincy, Ill. Door prizes and entertainment. Tickets $2.00, $2.50 at gate. Write to Pat Hardin, 2040 Payson St., Quincy, Ill. 62301.

Atlanta, Georgia

The Atlanta Radio Club will hold its 38th annual Hamfest on June 4th and 5th. Biggest hamfest ever! For more details write to James R. Russell, WA4MDT, 921 Hall St. S.W., Atlanta, Ga.

Rare Counties

Carl WØVFE with Sherm, K9BLX and Pat, W9LKB, hopes to make mobile trips through Nebraska, South Dakota, Wyoming, Montana, N. Dakota and possibly Idaho and Colorado. The proposed date of the trip is June 5.

Ft. Wainwright, Alaska

The Forty-Niners Amateur Radio Club of Ft. Wainwright, will conduct a field day contest on the 25th and

THE HOT LINES

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GSB-201 RF LINEAR AMPLIFIER

- Covers 80, 40, 20, 15, and 10 Meter Bands
- Input 2000 Watts PEP, 1000 Watts CW, 400 Watts AM
- Controlled Avalanche Silicon Rectifiers
- Built-in Antenna Changeover Relay

The GSB-201 Linear Amplifier makes an ideal fit into any high frequency system. It provides high performance in a compact handsome package at a comfortable price.

Gain — 10 db worth on the 80, 40, 20, 15 and 10 meter bands.

Input — Maximum power ratings are 2000 watts PEP, SSB, 1000 watts on CW, 400 on AM.

Exciter — Any SSB unit capable of delivering 65 to 100 watts output.

Circuits — Grounded-grid for max stability — low cost 811A tubes — silicon rectifiers for dependability.

Plus — A built-in antenna changeover relay, switchable panel meter to indicate plate current or power output, and a switch facility for preliminary tuning at low power.

For VHFers

G-50 COMMUNICATOR

- 6-Meter Fixed Station Transceiver
- 48 Watt Transmitter
- Built-in Power Supply
- VFO or Optional Crystal
- Dual Conversion Receiver

Here's a complete 6-meter amateur station in a compact, smoothly operating package. Look at these features:

Full Band Frequency Coverage — 50 to 54 Mc with a built-in low pass filter to attenuate harmonics and spurious signals over 65 Mc. 48 watts at your fingertips, with VFO or crystal, pi network, and ganged multiplier stages.

Reception, Plus — RF receiver stage provides high S/N ratio and top sensitivity. Dual conversion means excellent image rejection, 7 Kc selectivity.

With Full Control — Adjustable squelch; "S" meter; calibrated, planetary vernier dial tuning; VFO spotting switch; meter conversion switch for amplifier grid or plate currents, or modulator plate current.

The Gonset G-50 has all the dependability and performance that goes with the name Gonset, for over 25 years the leader in VHF amateur radio gear.

Complete specifications on the G-50 Communicator and GSB-201 Linear Amplifier are included in Gonset's Amateur Equipment Catalog AG-1303 — yours on request from your local Gonset distributor, or write —

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For further information, check number 15, on page 110

26th of June. 2 through 80 meters will be covered. Special QSL's commemorating the "Longest Day of the Year" will be awarded. For more info write Jack W. Nelson, KL7FGM, P.O. Box 17, Ft. Wainwright, Alaska.

Colorado Springs, Colorado

The ARRL Rocky Mt. Division Convention will be held in the City Auditorium, Colorado Springs, Saturday and Sun., June 18-19. Many unusual activities which include Chuckwagon style dinner, tours, and many well known guest speakers. Registration: $4.00; Dinner and show: $3.00. For more information and registration contact ARRL Committee, 4 Chula Vista, Manitou Springs, Colorado.

American Field Service

The American Field Service is a student exchange program, which brings over 3500 foreign students to the U.S. for a year of study. Anyone connected with the A.F.S. program and wishing to organize a net among these students, please get in touch with Christopher S. Thomas, 2515 N. Vermant Ave., Los Angeles, Calif. 90027.

Korean QSO Party

There will be a Korean QSO Party from 2400 GMT, July 2 to 2400 GMT, July 4, 1966. The party will be held on all bands and all modes. An award (Kimchi) will be made to the station outside Korea with the most HL9 and HM contacts. Logs should be sent to: Eighth Army Radio Club, Electronics Craft Shop, 19th Gen. Support Group, APO San Francisco, Calif. 96301.

Huntington W. Virginia

The third annual picnic of the Tri-State A.R.A. will be at Camden Park, U.S. 60 West, Huntington, at 12 noon until 6 P.M. Sunday, June 19th. Prizes galore. Tickets; $1.00 each; $2.00—Family. Contact W8VA, Tri-State Amateur Radio Assoc. 2937 Auburn Rd. for more details.

Totah Amateur Radio Club

The Totah ARC will make its annual trip to the four corners on June 4 and 5, 1966. This gives amateurs a chance to work a station which is common to three call areas (5,Ø,7) and 4 states; N. Mex., Ariz., Utah & Colo. Any amateur working a station at the four corners receives a 5Ø7 award issued by the club. Contact Loren Black, W5SB, 2705 Mossman Dr., Farmington, N.Mex. 87401.

Harris Hill, New York

The Penn-York Hamfest Assn. is holding its 8th annual Hamfest, Sat. June 18, 1966 at Harris Hill (near Big-Flats). Regis. at 11:30 A.M. Many activities planned. Banquet and awards at 6:30 P.M. Regis: $5.00 in advance, $6.00 at door. For tickets write to W.P.I. Lightfoot, RD 1, Corning, N.Y. 14830.

Information Requested

Robert Zeiter, W6NAA, 1637 Bender Ave., Glendora, Calif. 91740 wishes material on Governmental Disaster Communication for a publication. Any information from a member of an organization providing Disaster Communications to their local government would be appreciated. All answers will be held in confidence.

Corrections

In the April VHF COLUMN on page 91, the petition to amend Section 97.61 (10) of the FCC's Rules and Regulations submitted by Everett Taylor, K7YSE/W7BYF and Jerry M. DuBois, K7JUE, was misquoted. The proposal should be considered as allowing s.s.b. operation from 50.05 to 54 mc, and retaining the lower 50 kc strictly for c.w. operation.

The bus with portable/mobile station pictured on page 37 (Results of Aug. 1965 12-Hour V.H.F. Contest), belongs to Ike Sprenkle, K3MPN. K3AAR/3 worked from this station during the contest.

Super-combination for transceiving...

The new Receiver-controlled Exciter...

DRAKE T-4 RECITER + **DRAKE R-4A RECEIVER** = The ultimate in transceiving

Model T-4 **$299.95** Amateur Net

T-4 Features

Covers all Ham Bands 160 thru 10 meters.

Covers MARS and Other Frequencies between ham bands.

Upper and Lower Sideband on all frequencies.

Automatic Transmit Receive Switching on CW (semi break-in).

Controlled Carrier Modulation for AM is completely compatible with SSB linear amplifiers

VOX or PTT on SSB and AM built-in.

Adjustable Pi-Network Output.

Two Crystal Lattice Filters for sideband selection, 2.4 Kc bandwidth.

Transmitting AGC prevents flat topping.

Shaped Grid Block Keying with side tone output.

200 Watts PEP Input on SSB—180 watts input CW.

Meter indicates plate current and relative output.

Compact size; rugged construction.

Model R-4A **$399.95** Amateur Net

R-4A Features

Solid State Linear permeability tuned VFO with 1 Kc divisions. Gear driven circular dial. High mechanical, electrical, and temperature stability.

Covers ham bands 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished.

Any ten 500 Kc ranges between 1.5 and 30 Mc can be covered with accessory crystals... (160 meters, MARS, etc 5.0-6.0 Mc not recommended).

Four bandwidths of selectivity, 0.4 Kc, 1 2 Kc. 2.4 Kc and 4.8 Kc.

Passband tuning gives sideband selection without retuning.

Noise blanker that works on CW, SSB, and AM is built-in.

Notch filter is built-in.

100 Kc crystal calibrator is built-in.

Product detector for SSB/CW, **diode detector** for AM.

Crystal Lattice Filter gives superior cross modulation and overload characteristics.

Compact size; rugged construction.

Complete Transmitter

(LESS POWER SUPPLY)

DRAKE T-4X

All T-4 features plus

- Solid State VFO and
- XTAL Oscillators...

Give:

Separate control of receive and transmit frequencies

Transceiver operation with frequency control by either Rcvr or Xmtr

Coverage on 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished

Four extra 500 Kc ranges can be covered with accessory crystals (160 meters, other 10 meter ranges, MARS, etc.)

Model T-4X, Amateur Net: **$399.95**

AC-3 Power Supply for T-4 and T-4X: **$99.95**

R. L. DRAKE COMPANY MIAMISBURG, OHIO 45342

Mfrs. of the famous Drake TR-4 Transceiver—$599.95 Amateur Net.

For further information, check number 17, on page 110

Peak-up your operating performance with Waters "Convenience-Engineered" gear...!

Perfection... in a PHONE PATCH

UNIVERSAL HYBRID COUPLER & PHONE PATCH

Mod. 3002 (less battery)
$69.95
Mod. 3001 (Without Compreamp)
$49.50

Enjoy the ultimate in phone patches with this compact coupler, precision-engineered at Waters. Designed for effortless VOX operation, it is the only patch with its own speech processor (Model 3002). Its built-in Compreamp maintains correct out-going levels eliminating all manual switching and whenever needed, the Compreamp may be used independently of the patch. Provision is included for switching a tape recorder in and out for both recording and playback.

Waters REFLECTOMETER

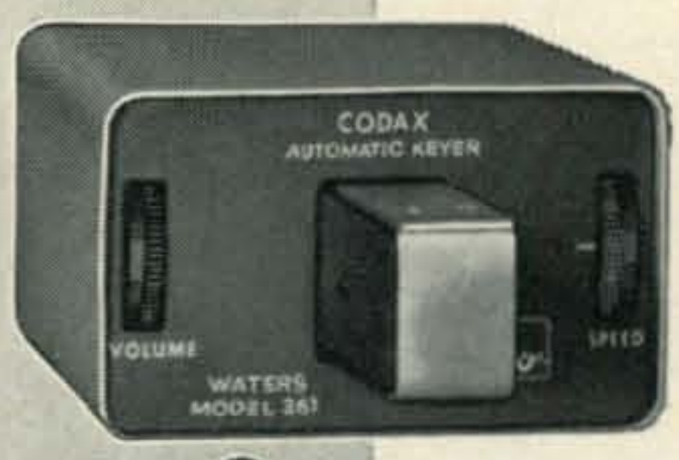
Amazing new Reflectometer with its unique dual meter tells at a glance both forward and reflected power of your rig in RF watts. Two separately set forward scales of 200 and 1000 watts (20 and 200 watts reflected) insure accurate readings. VSWR can be immediately determined from the calibrated reference chart. Comes complete with remotely located Directional Coupler and connecting cable.

Model 369 ..... $115.

Waters COMPREAMP™

Get more "talk power" into your signal with a Compreamp! Solid state, self-powered and compact it installs in a jiffy in the mike line of either fixed or mobile rig. Great for that added punch when QRM and band conditions are tough.

Model 359 $27.95 (less battery)



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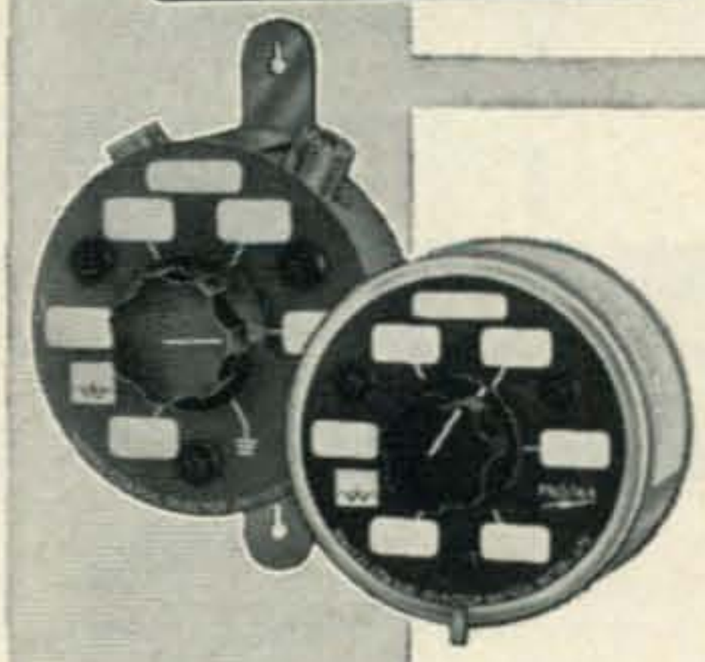
CODAX — the automatic keyer that puts rhythm-smooth CW at your fingertips. Never anything like it! Feather-touch double paddle is automatically timed for 5 to 50 WPM. Operates block grid or into mike jack for VOX CW on either sideband. Monitors the signal, too!

Model 361. $92.50 (less batteries)



Waters PROTAX™

A must! Brand new Coaxial Antenna Switch that automatically grounds the antenna system when the shack is shut down. Handles a full 1000 watts...comes complete with knob, escutcheon plate with erasable marking panels and mounting bracket on Model 376.

Model 375.
6-position rear axial connectors $13.95
Model 376.
5-position side radial connectors $12.50

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WATERS PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

For further information, check number 18, on page 110

OW! A 3-BAND SSB TRANSCEIVER KIT FOR 189.95

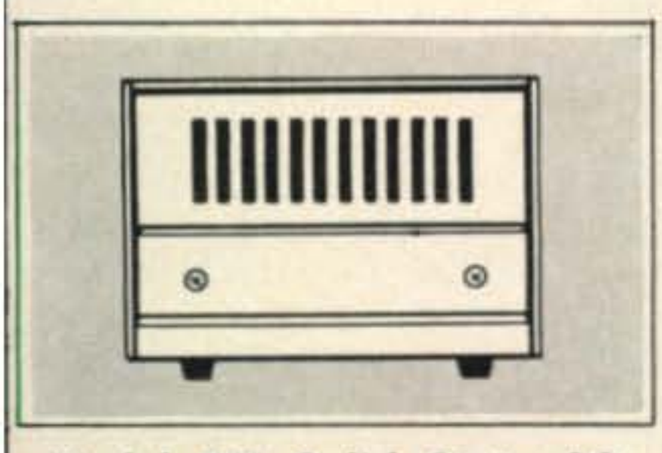
NEW EICO 753 SSB/AM/CW 3-BAND TRANSCEIVER

WITH SILICON SOLID STATE VFO

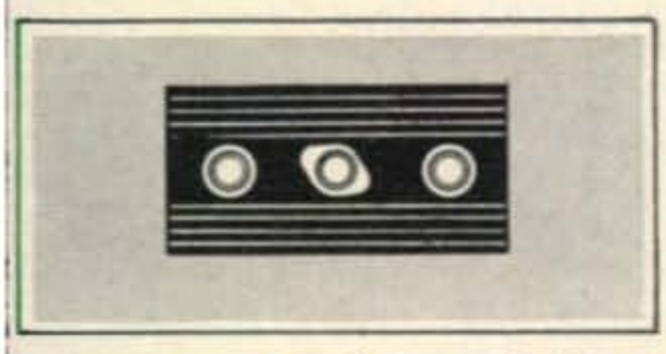
Build the finest of SSB/AM/CW 3-band transceivers with 200 watts of SSB punch and every wanted operating facility, plus the extra reliability and maintenance ease inherent in kit design. Assembly is made faster and easier by VFO and IF circuit boards, plus preassembled crystal lattice filter. Rigid construction, compact size, and superb styling make this rig equally suited for mobile and fixed station use. The new EICO 753 is at your dealer now, in kit form and factory-wired. Compare, and you will find that **only the 753 has all these important features:**

■ Full band coverage on 80, 40 and 20 meters. ■ Receiver offset tuning (up to ±10kc) without altering transmitter frequency. ■ SILICON SOLID-STATE VFO for drift-free and voltage stable operation in both fixed and mobile installations. ■ Built-in VOX. ■ Panel selected VOX, PTT & STANDBY. ■ High level dynamic ALC to prevent flat-topping or splatter and permit the use of a linear amplifier. ■ Automatic carrier level adjustment on CW and AM. ■ Dual ratio ball drive permits single knob 6:1 rapid tuning and 30:1 vernier bandspread (over 10 degrees of scale). ■ Position of hairline adjustable on panel. ■ Illuminated S-meter/PA Cathode Current Meter and tuning dial. ■ Fast attack, slow decay AGC. ■ Grid-block break-in CW keying. ■ Product detector for SSB and CW, triode detector for AM. ■ TR relay with auxiliary contacts for use with high power linear amplifier. ■ Includes mobile mounting bracket.

Power Supplies Tailored for Optimum Performance of the 753.



Model 751 Solid State AC Supply/Speaker Console.
Matching table-top companion unit. Built-in PM speaker.
Kit $79.95 Wired $109.95



Model 752 Solid State Mobile Supply.
For use with 12 volt positive or negative ground systems. Fully protected against polarity reversal or overload.
Kit $79.95 Wired $109.95

ADDITIONAL SPECIFICATIONS

FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal lattice filter; bandwidth 2.7kc at 6db. STABILITY: 400 cps after warm-up. SUPPRESSION: Carrier-50db; unwanted sideband-40db. RECEIVER: Sensitivity 1uv for 10db S/N ratio: selectivity 2.7kc at 6db; audio output over 2 watts (3.2 ohms). PANEL CONTROLS & CONNECTORS: Tuning, Band Selector, AF Gain, RF Gain, MIC Gain with calibrator switch at extreme CCW rotation, Hairline Set (capped), Mode (SSB, AM, CW, Tune), Function (Off, Standby, PTT, VOX), Carrier Balance, Exciter Tune, PA Tune, PA Load, Receiver Offset Tune, MIC input, phone jack. REAR CONTROLS & CONNECTORS: VOX Threshold, VOX delay, VOX sensitivity, Anti-VOX sensitivity, PA Bias adjust, S-Meter zero adjust, power socket, external relay, antenna connector, key jack, accessory calibrator socket. METERING: PA cathode on transmit, S-Meter on receive. SIZE (HWD): 5 13/16" x 14¼" x 11¼". POWER REQUIREMENTS: 750 VDC at 300 ma, 250 VDC at 170 ma, -100 VDC at 5 ma, 12.6 VAC at 3.8 amps.

The Model 753 is an outstanding value factory-wired at $299.95.

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-6
131-01 39th Ave., Flushing, N. Y. 11352

for further information, check number 19, on page 110

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International's "FLYING SHOWROOM 66"

will visit your area soon.

Welcome aboard this fabulous electronic flying display.

During 1966, International's Martin 202 Flying Showroom will tour cities throughout the United States, bringing with it displays of International electronic equipment and products, plus a technical staff available for consultation. ■ A space age electronic show for Amateur Radio operators, radio experimenters, hobbyists, Citizens Radio dealers and users, commercial 2-way radio operators and manufacturers requiring special electronic products. ■ If you are a manufacturer, radio equipment dealer, Amateur or Citizens Radio Club, or other interested groups, we will attempt to schedule a specific time and date to visit your area. Watch for announcement or write International Crystal Manufacturing Co., Inc. for details.

Discuss your technical and engineering requirements with International's staff. See how International electronic products can work for you.

INTERNATIONAL

CRYSTAL MFG. CO., INC.
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Oklahoma City, Okla. 73102

For further information, check number 20, on page 110

Now...Complete Your SB-Series Station With These Heathkit® Accessories

Heathkit SB-600 Speaker . . . Matches SB-Series Gear

• Speaker cabinet matches SB-Series equipment—gives your completed rig a truly professional appearance • Cabinet enclosure includes space for mounting HP-23 AC Power Supply for fixed-station installations of SB-100 & SB-110 • 6″ x 9″ oval communications quality speaker (82 cps open air resonant frequency—300 to 3000 cps response) • Speaker impedance: 8 ohms • Gray wrinkle "SB-Series" finish • Cabinet dimensions: 10″ W x 6½″ H x 10½″ D.

SB-600, 6 lbs. **$17.95**

Heathkit Electronic Keyer

• Novice or old timer, if you operate cw, buy an HD-10 • All solid-state circuitry, providing exceptionally clean keying—no relays to chatter and punch holes in characters • Two speed ranges—15 to 60 words per min., and 10 to 20 wpm slow speed option • Built-in paddle—"feel" is adjustable to your fist during assembly • Adaptable to either right or left handed operators • Variable dot-space ratio, self-completing dashes & convertible to semi-automatic operation • Sealed switches on paddle—no contacts to require cleaning & adjustment • "Hold" switch for transmitter tuning • Built-in transformer-operated power supply • Fused for protection • For use with grid-block keyed transmitters only

Kit HD-10, 6 lbs. **$39.95**

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Prices & specifications subject to change without notice. AM-164R

For further information, check number 21, on page 110

Front view of the 40 meter transceiver. The controls are, top row l. to r., ANTENNA TUNE, AUDIO, LOADING. Beneath, straddling the final P.A. meter are P.A. TUNING and transmitter CRYSTAL CHANNEL. Beneath the receiver tuning dial we have the KEY JACK, OPERATE-MONITOR, ANTENNA-P.A. CURRENT, (discarded as unnecessary after operating a while), LIMITER, AUDIO SHARP-NARROW, PHONE JACK. Affixed to the top of the cabinet is a receiver tuning calibration chart and a listing of the transmitter channel crystal frequencies. The TUNE-OPERATE switch was added after construction and is in the rear of the cabinet.

A COMPACT 40 Meter Transceiver

BY JOHN S. HILL,* K4QJZ

This low cost compact transceiver for c.w. is completely transistorized and contains some unusual circuitry. The receiver has a sensitivity of a tenth of a microvolt and when compared to a Collins 75A-4 with a 500 cycle filter no detectable difference was noted in sensitivity or selectivity. The transmitter has an output of 23 watts with a 29 watt input. Designed for break-in operation, the circuitry provides receiver muting and a side tone generator.

SEVERAL years ago a change in jobs increased my travel and reduced the time available to operate the home rig. Having spent over ten years in communications equipment design I was aware of the possibility of building a small transistorized transmitter-receiver at less cost than any vacuum tube unit. Most ham junk boxes ar not blessed with an abundance of transistors and I decided to try to design a unit that would cost less than $65.00 if every item had to be purchased from a local distributor. With careful hunting in mail order surplus catalogs actually about $20.00 was invested in the unit described.

General Description

Forty meters appeared to be the ideal band considering antenna size, current conditions, practical power and available devices. A goal of 25 watts output, approximately equal to a 40 watt input vacuum tube rig, is practical with low cost devices. Single Signal selectivity and break-in capability are mandatory with today's crowded bands. Crystal control was used to permit return to specific frequencies for schedules, reduce cost, simplify adjustment, and eliminate the possibility of out of band operation. Ten crystals are mounted internally and chosen by a selector switch. The power supply was built separately to eliminate heat, possible hum pick-up, and permit the use of external batteries during portable operation. The entire rig is designed to operate from 28 volts d.c. since past experience indicated that r.f. power transistors capable of over 5 watts power output need at least 25 volts to obtain reasonable efficiency, power gain and power output over about 2 mc.

The size of the unit, 5" × 9" × 6", is many times that necessary and adequate room is available to include a power supply, v.f.o., speaker, etc. The entire transmitter and receiver with the exception of the transmitter ouput stage are built on one piece of perforated board mounted on the bottom cover and occupy less than 1/9th of the available space.

Receiver

At first glance the receiver schematic is confusing since only four coils are used and only one of these is at the i.f. frequency. The receiver is a conventional single conversion superhet with several unusual circuit techniques.

No r.f. stage is included since at 7 mc a transistor mixer is capable of reaching the antenna noise level, and image rejection is no problem with the high i.f. used. Two tuned circuits at 7 mc are used before the mixer to form a band pass filter. Do not attempt to use only one tuned

*2114 Buckingham Road, Raleigh, North Carolina.

circuit or you will have trouble obtaining equal sensitivity over the band, eliminating image and other spurious responses and intermodulation from strong local stations on other frequencies.

The oscillator is unusual in three respects; very high *C* values are used, it is Zener regulated, and a buffer stage is included. All of these were found necessary to reduce drift and give good stability with inexpensive components. There is zero warm-up drift and less than 10 c.p.s. drift with 20% supply voltage variation or 30°*F* temperature change. The oscillator operates at approximately 5 mc. A very low inductance oscillator coil is used and should be on a ceramic form with the winding space-wound under tension. After winding a thin coat of epoxy cement should be used to lock the turns in place. Micas must be used where shown or severe temperature drift can result. The 400 mmf N750 is used for temperature compensation and should be mounted adjacent to the oscillator coil for best results. If greater or less bandspread is desired the capacitor in series with the oscillator tuning capacitor may be changed in value. The value shown will permit tuning from 7000 kc to about 7230 kc.

An i.f. of 2105 kc was used in the unit constructed but any i.f. from 1.8 mc to 5 mc can be used. The choice can be based on the availability of several crystals in the range on the same frequency. The i.f. is resistance coupled with only one tuned circuit in the mixer collector circuit used for matching and suppression of crystal overtone modes. Selectivity is obtained by using three crystals as series resonant circuits. Two are used as emitter bypass elements. No i.f. tuning or adjustment is required other than peaking one coil for maximum gain. The resulting selectivity is about 250 c.p.s., —3 db and 700 c.p.s. —50 db.

The second detector is actually a crystal oscillator-mixer combination using only one transistor. In the second detector the crystal is operated in parallel mode and exactly the same crystal as used in the i.f. may be used since parallel mode operation will result in oscillation slightly above series resonance. This separation and the resulting audio output frequency may be adjusted within wide limits by varying the value of the 100 mmf capacitor across the 15K collector load resistor in the second detector. A value of 100 mmf will give about 735 c.p.s. output at the center of the i.f. bandpass. Smaller values will give a higher frequency and vice-versa.

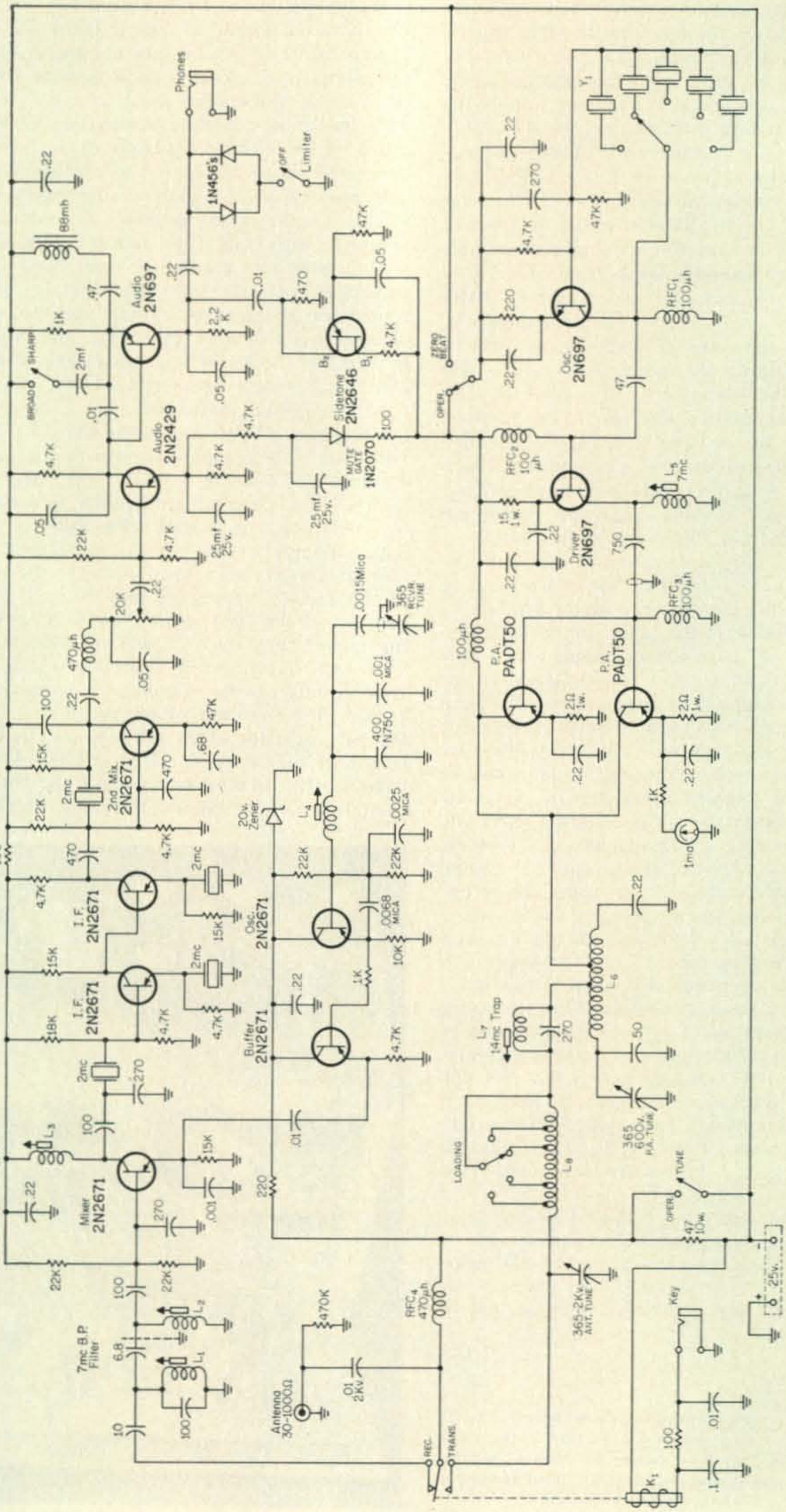
The second detector is followed by two direct coupled audio stages and includes provisions for muting, side-tone injection, and additional selectivity. Relatively small coupling capacitors are used to reduce low frequency response and reduced high frequency response is provided by 0.01-0.05 mf shunt capacitors.

A diode gate fed from transmit B— thru an *R-C* network is used to disable the audio stages during transmit. The values chosen give rapid muting but the release is such that the receiver comes on only between words above 15 w.p.m. This results in complete elimination of keying clicks. A back-to-back silicon diode limiter is connected across the output to prevent over 1.5 volt peak to peak signals during heavy QRN. It also eliminates any necessity for volume adjustments with QSB if the gain is advanced.

Only one gain control is used. No r.f. gain control is necessary since the i.f. stages are designed for progressive limiting and the second detector has a definite limiting action. No a.g.c. is used but checks with a signal generator indicated that signals between 1-10,000 microvolts were compressed to about a 40:1 range. The measured sensitivity was better than 0.1 microvolt. An A-B comparison was made with a Collins 75A-4 using a 500 cycle mechanical filter with no detectable difference in sensitivity or selectivity but a noticeable lack of initial a.g.c. thumps in the transistor receiver. The switch selected audio tuned circuit in the emitter of the audio output stage may be used for the addition of the "last resort" selectivity but ringing makes copy over 25 w.p.m. difficult.

If s.s.b. reception is desired on l.s.b. only, good results can be obtained by bypassing the crystal in the emitter of the second i.f. with a 0.1 mf capacitor. This reduces selectivity but it is still too sharp for best results. A better technique is to substitute two of the three i.f. crystals with ones about 500 c.p.s. above and

Interior bottom view showing the Vector board construction. The power amp chassis can be seen in the upper left corner. Of the three power transistors, two are used for the power amplifier and the third is used as the filter in the power supply.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1N456's
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Limiter
.22
86mh
.47
1K
SHARP
BROAD
2mf
.01
Audio
2N697
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K
.05
.22
.01
470
47K
.05
Sidetone
2N2646
B2
B1
4.7K
ZERO BEAT
OPER.
Osc.
2N697
.22
270
47K
4.7K
220
47
RFC1
100µh
Audio
2N2429
4.7K
4.7K
.05
22K
4.7K
25mf
25v.
MUTE GATE
1N2070
100
RFC2
100
µh
L5
7mc
15
1w.
.22
Driver
2N697
750
RFC3
100µh
20K
.22
.05
470µh
.0015Mica
365
RCVR TUNE
.001
MICA
400
N750
100µh
P.A.
PADT50
2Ω
1w.
.22
P.A.
PADT50
2Ω
1w.
.22
100
15K
.22
Mix.
2N2671
.68
47K
2mc
2nd Mix.
2N2671
22K
470
4.7K
1K
1ma
100
4.7K
470
2mc
20v.
Zener
L4
.0025
MICA
22K
22K
I.F.
2N2671
15K
2mc
.0068
MICA
15K
I.F.
2N2671
10K
2mc
Buffer
2N2671
.22
1K
18K
4.7K
4.7K
4.7K
2mc
270
100
.01
L7
14mc Trap
270
.22
L6
50
2mc
L3
220
365
600v.
P.A. TUNE
LOADING
L8
OPER.
TUNE
47
10w.
Mixer
2N2671
.22
270
.001
22K
22K
100
L2
7mc B.P.
Filter
6.8
L1
10
100
470K
.01
2Kv
Antenna
30-1000Ω
RFC4
470µh
365-2Kv.
ANT. TUNE
REC.
TRANS.
Key
.01
100
.1
K1
25v.

below the frequency of the third. This will give an 1800-2000 c.p.s. bandpass with some gain reduction. The progressive limiting gives some distortion on very strong locals but they are completely readable on s.s.b.

A unijunction sidetone oscillator is used to reduce components and produce enough output so loose coupling can be used directly to the output.

Adequate output is available for phones or small speaker if a matching transformer of about 200 ohms to speaker is used.

Transmitter

For some reason the transistor equivalent of the Pierce oscillator has been seldom used. It is capable of high output and does not require the use of any tuned circuits. In this unit it is operated at a relatively low level, about 50 mw, to permit the use of small metal can CR18/U crystals which will only withstand about 5 mw drive. Higher crystal drive results in drift or destruction. Many transistor and vacuum tube circuits designed for FT243 pressure mounted crystals will destroy the small military units. A silicon 2N697 was used as the oscillator since it was the lowest cost n.p.n. device available locally but the new epoxy units work equally well. Make sure that the device used has at least 50 volts V_{ceo} and a cutoff frequency over 40 mc.

The oscillator is coupled to another 2N697 used as a Class B driver. No tuned circuits are used between the oscillator and driver. The driver delivers about 3 watts to the parallel PADT 50 germanium output transistors. The input to the driver is about 4.5 watts so a small heat sink, "push-on type" is used. (10 square inches).

Matching at the impedance levels involved in transistor r.f. power stages can be a severe problem. The base input impedance to the final is very low and apparently inductive. The driver collector tuned-circuit is coupled with about 750 mmf to the final base which has a d.c. return through an r.f. choke. The Q is very low and losses are low; no tuning is required over the entire band. The driver collector tuned-circuit should be tuned for minimum driver emitter current through the 15 ohm emitter resistor since this indication is much sharper than maximum output. The driver transistor must be capable of dissipating 1.5 watts with a small heat sink and should have a V_{ceo} rating of 50 volts or more. The 2N697 seems to be the least expensive standard device.

Obtaining high r.f. output at reasonable cost is the biggest problem. A second and related

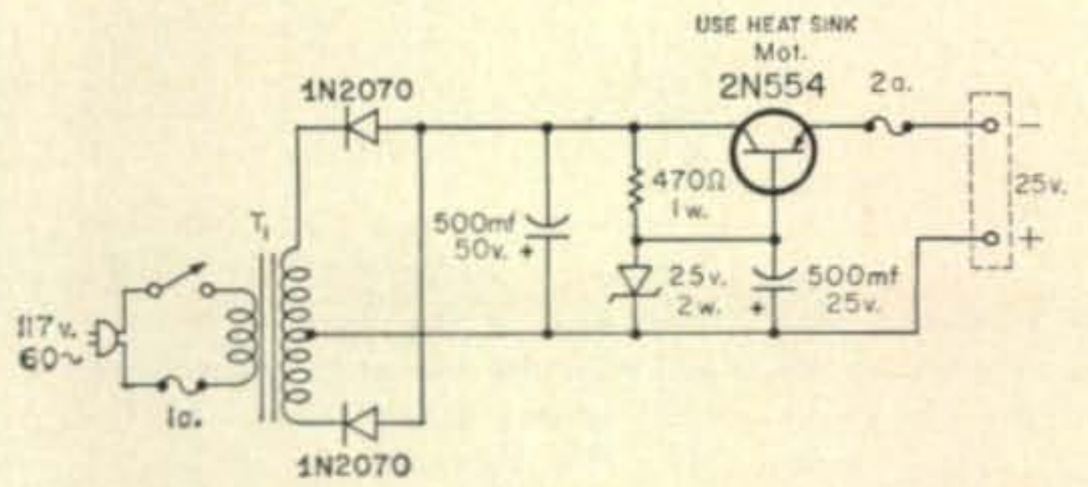


Fig. 2—Power supply circuit suitable for the 40 meter c.w. transceiver. Transformer T_1 is rated at 55 volts c.t. at 1 amp for ½ wave operation. A bridge operated circuit is discussed in the text.

problem is that of "secondary breakdown." Modern r.f. power silicon transistors will fail in microseconds if any one of a number of ratings is exceeded. The failure is permanent and takes place so fast that protection requires complex transistor "crow-bar" circuits.

Germanium transistors are much more tolerant since they do not have such abrupt breakdown characteristics and tend to be self-protecting in simple, properly designed circuits. The only r.f. power germanium device with adequate dissipation, voltage ratings, frequency response and price is the PADT 50. It is capable of reasonable gain up to 30 mc at power levels of 10 watts or more output and best of all costs about the same as a 2E26.

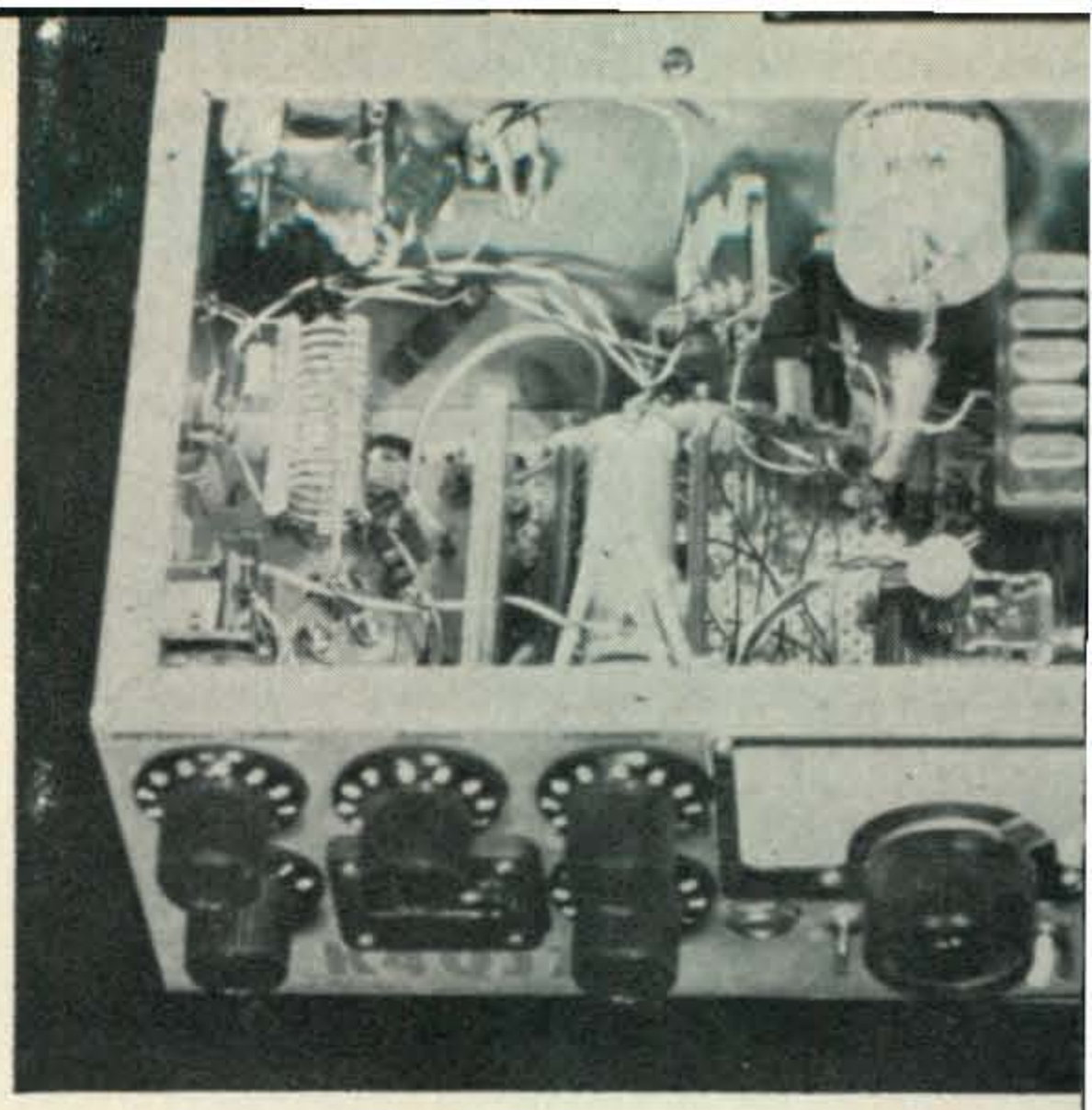
Many other transistors were tried: 2N1907, too low in gain and efficiency; 2N3297, 2N2947, cost too much and could not be protected; same for the 100 watt monster 2N1900. I was actually able to obtain over 60 watts output with a single 2N1900 but it took a second mortgage to replace the borrowed unit that failed while running well within its ratings (on a huge heat sink) due to a small change in loading.

The PADT 50 is remarkably tolerant; the transmitter can be keyed with no load, run with the final detuned, or overloaded, any one of which would result in certain death for any silicon device used at a fraction of its ratings. Although "secondary breakdown" occurred several times during initial circuit design no permanent damage resulted and the same transistors are being used today. To prevent too much abuse the transmitter has been modified to include a TUNE switch which in the TUNE position places a 47 ohm 10 watt resistor in series with the collector supply so if secondary breakdown does occur current and voltage are limited. Once the transmitter is roughly loaded the resistor can be shorted out.

The final output circuit is the result of much

Fig. 1—Circuit of the 40 meter c.w. transceiver. All capacitors greater than one in value are in mmf, those less than one are in mf. All capacitors are rated at 25 volts unless otherwise noted. All resistors are ¼ watt unless otherwise noted.

K_1—S.p.d.t. relay 24 v.d.c. Potter Brumfield RS5D or equiv.
L_1, L_2—5 μh (approx.) Millen #4308 or equiv.
L_3—70 μh (approx.) Millen #4313 or equiv.
L_4, L_5—1 μh (approx.) Millen #4304 or equiv.
L_6—15 Air Dux 808T or B&W 3014 tapped at 4t and 7t from cold end.
L_7—0.55 μh (approx.) Millen #4303 or equiv.
L_8—40 μh (approx.) 30t of Air Dux 832T, 32 tt.p.i. 1" dia. tapped at 100%, 50%, 20% and 5%.
RFC_1, RFC_2, RFC_3—100 microhenries.
RFC_4—470 microhenries with a maximum d.c. resistance of 1 ohm. See text.
Y_1—7 mc crystals of the CR-18 series.



Interior view of the 40 meter transceiver. The transmitter crystals are in the upper right corner. Just to the left, mounted on the backwall, is the 88 mh inductor. The antenna loading coil is in the center of the cabinet and the P.A. tank circuit is on the extreme left. The antenna relay is in the lower left corner.

trial and error and should be followed rather closely if random length antennas are used. The collector circuit is a conventional parallel-tuned circuit with the collector tapped down to preserve loaded *Q* with reasonable component values. Moving the collector closer to ground results in little improvement in harmonic suppression and reduces output efficiency. Moving further from ground increases harmonic output and reduces the tuning range. The collector circuit is tapped at about the 300 ohm point and fed into the "L" network in which both *C* and *L* are variable to permit matching any load from a coathanger to the farm electric fence. Even with the additional *L* network it was found necessary to include a small 14 mc slug-tuned trap to reduce the second harmonic to a point that locals could not detect it. I might add that the same cure was necessary on a well known commercial transmitter with a 6146 final.

The measured output of the transmitter is 23 watts with 29 watts final input and 4.5 watts driver input. Apparently a good deal of the driver power feeds through the final resulting in very high overall efficiency. The emitter resistors in the final, in addition to helping balance final transistors, produce reverse bias so that the final operates closer to Class C rather than Class B.

Final tuning and loading are just like any vacuum tube rig with the exception that tuning the collector tank slightly off the minimum point results in about 15% more output with a few percent more input. The no load dip is somewhat higher than that of a vacuum tube; about 30% of the loaded value.

As a final check on the design, the transmitter was operated key down for over 5 hours into a dummy load. To permit this the output transistors were mounted on an aluminum block which was insulated from the aluminum cabinet with a thin mica sheet. In normal c.w. operation the block becomes barely detectably warm and is far more heat sink than actually needed.

Components

A few words about the components used. The coils should be wound and checked for resonance with their associated capacitors before installation since the grid dipper cannot be used due to circuit loading. They can be checked in circuit only by removing their associated transistors.

The transistors used in the receiver r.f., i.f., oscillator, *etc.*, are not critical. The Amperex units listed were the cheapest found in a large mail order catalog. RCA 2N371's or similar drift-field units work equally well but avoid any units with less than 25 volt V_{cbo} ratings and cut-off frequencies below 30 mc. Any audio transistors may be used but remember that the output transistor must be an n.p.n. unit and handle a fair amount of current; silicon units are probably best.

For capacitors through 0.01 mf I would suggest using ceramic; above that use small mylar units except for the large electrolytics in the audio stages and power supply.

The coils used were small ceramic form assemblies from various pieces of surplus equipment which were checked for resonance with a g.d.o. before installation. For those who do not have a bottomless junk box the parts list indicates commercial coils that may be used.

The r.f. chokes may also pose something of a problem. The 100 microhenry chokes are made by Wilco and are not available from distributor stocks. Suitable substitutes are Ohmite Z27 or Miller J300-100.

The 470 microhenry choke in the final collector circuit (RFC_4) should have a maximum d.c. resistance of one ohm. A resistance of several ohms could be permitted with a resultant lowering of the d.c. input to the final amplifier. The inductance value is not really critical and any value of over 100 microhenries could be used. The choke used in my unit was a hash suppressor pulled from an old vibrator supply of unknown origin. It is wound on a ferrite core and contains about 100 turns of #28 enamelled wire. A small piece of ferrite "loop stick" material would probably make a satisfactory core.

The receiver tuning capacitor is a miniature type. (Calrad CR2230 or equiv.). This type of capacitor is also used for the P.A. TUNE function. However, the 365 mmf ANTENNA TUNE capacitor must be a 2KV type. The receiver type broke down when short antennas were used. A Hammarlund MC325M or equivalent may be used for this purpose.

The power transformer happened to be avail-

able from the junk box. A satisfactory substitute would be any 28 volt unit rated at one amp or more. A bridge rectifier will have to be used to obtain 28 volts d.c. with such a transformer. A Knight 64G145 or Triad F-40X may be used with the bridge circuit.

If you can afford it I would recommend purchasing commercial grade CR-18/U crystals for the receiver i.f. crystals. Surplus units are usually FT-243 units and very poor in frequency calibration. A few of the small metal can units are becoming available on the surplus market and they work fine.

Construction Points

The transceiver is housed in a 5×9×6 inch aluminum cabinet (Bud AU1040 or equiv.) and as noted before is more than ample.

The complete receiver and the oscillator and driver section of the transmitter is wired on a Vector board (type 85F24EP) with T28 clips.

The two PADT50 final transistors are mounted on a heat sink and the heat sink is in turn mounted on the metal cabinet. The combination provides more than adequate cooling. A block of aluminum ⅛" thick and the dimensions of one wall of the cabinet (5"×6") will be very adequate. The transistors may be insulated from the block with mica washers (don't forget the silicon paste) or the block insulated from the cabinet with mica. Then the transistors may be clamped directly to the heat sink.

The heat sink for the driver was pulled from the junk box but a suitable unit would be a Wakefield #NF207.

Use of coax is required at two points only. The first is the connection of the receiver tuning capacitor to the Vector board. The second point is from the driver to the final. The final is mounted against a cabinet wall above the board assembly. Miniature coax is used in both cases as the shunt capacity of the cable is not critical due to the high circuit capacities.

Due to the low impedance circuitry, layout and lead placement are not critical.

V.F.O. Operation

If v.f.o. operation is desired a duplicate of the receiver oscillator-buffer circuit can be built with appropriate value changes to raise the frequency to 7 mc. The coupling capacitor from the emitter of the buffer stage should be connected to the base of the existing transmitter crystal oscillator and the 270 mmf capacitor from base to r.f. ground on the transmitter oscillator removed. Crystal control is still retained by disabling v.f.o. power and plugging in a crystal in its original location. No other circuit changes are necessary.

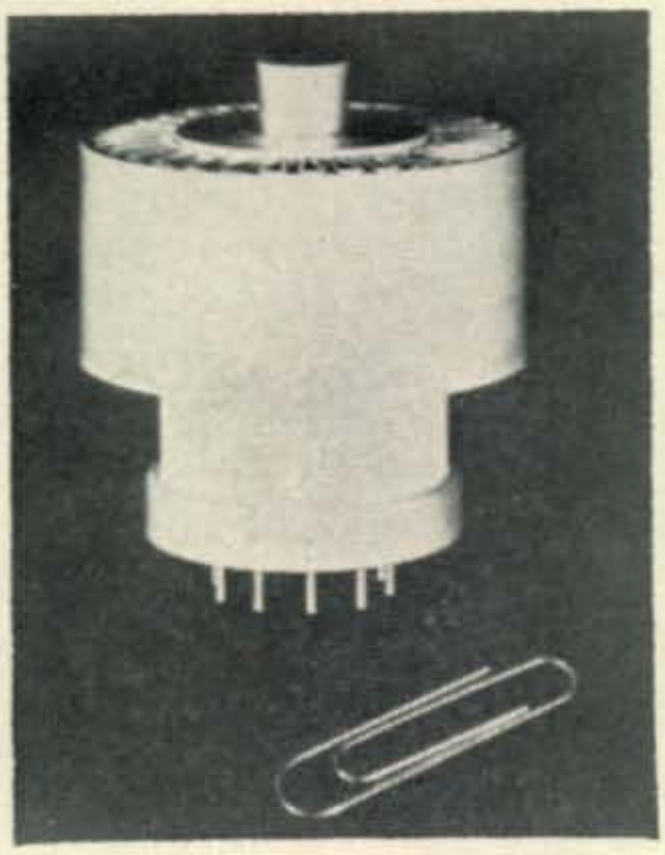
Other Bands

No changes other than coils are required to operate on 80-40-20 meters. Operation on 15 is possible but a transmitter doubler stage would have to be used and final efficiency will be only about 55%. Another unit is being constructed for 80 and 40 using a 2.8 mc i.f. The receiver oscillator operates on 2.15 mc plus or minus 50 kc which is doubled for 40 meter injection and tripled for 80 injection thus permitting one oscillator to cover the entire 80 and 40 meter c.w. bands. A mixer is used to develop the transmitter frequency for full transceive operation.

Results

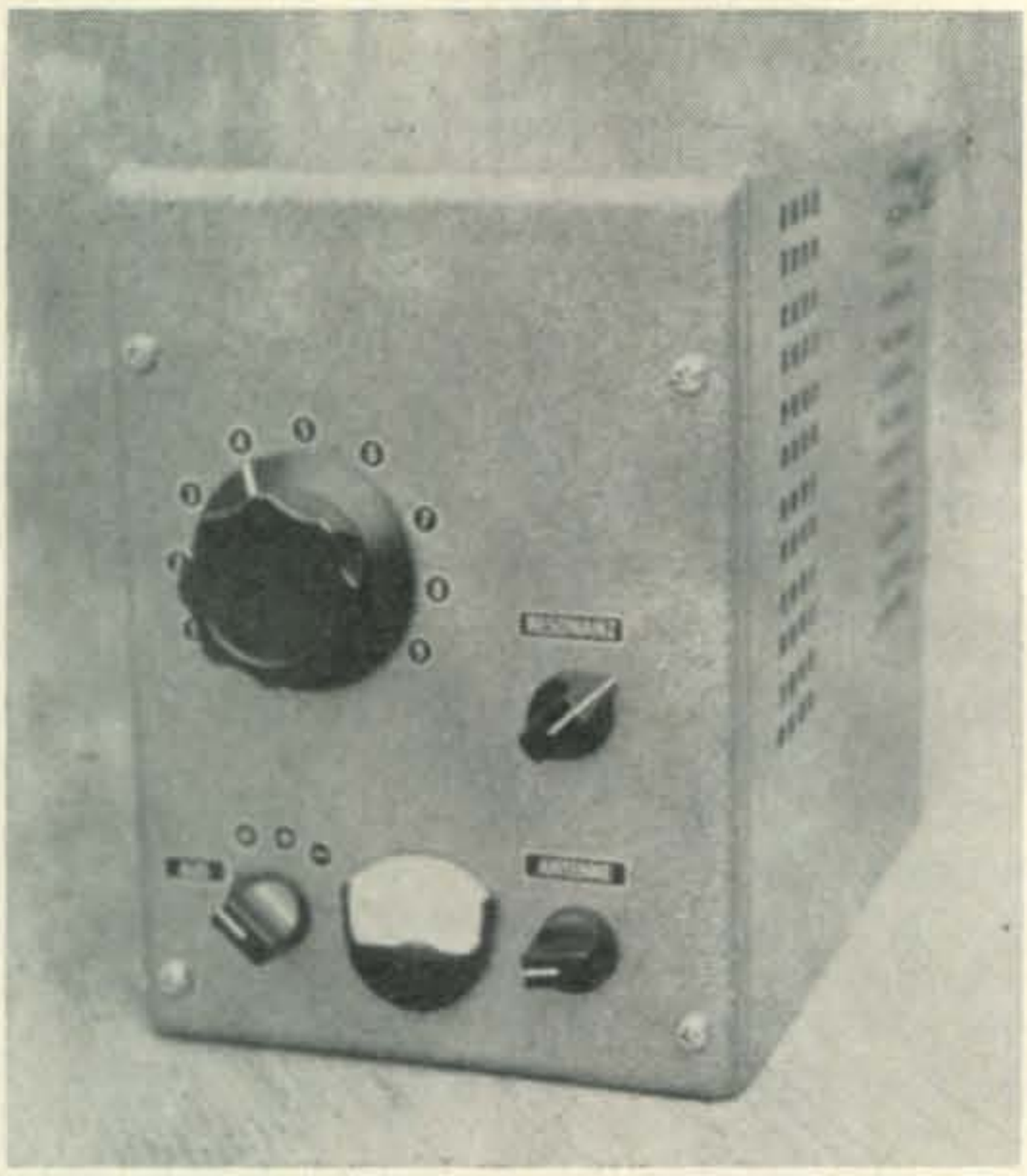
The transmitter-receiver have been in use for over a year without a single problem. During that time it has been operated mobile, from motels, from a picnic ground on batteries using a mobile whip, and, of course, from the home QTH. Numerous 599 reports have been received including a number of DX stations. One of the high points was an answer to my CQ from a PY2 while I was operating portable with a 20 foot wire hanging out a hotel window. None of the DX contacts were prearranged nor was initial contact made on higher power. Drain is low enough so that over 8 hours operation can be obtained from a 7 pound rechargable Ni-Cad battery. QRP can be fun! ■

New Amateur Product



Penta PL-8583/267

RAYTHEON/MACHLETT announce a new beam pentode with a third order intermodulation distortion level of at least —40 db at 350 watts useful power output, class AB_1. The tube is only 2.16 inches long and 1.75 inches in diameter. At full rated plate dissipation (300 watts), the forced air cooled tube requires an air flow of 8 c.f.m. at a pressure drop of 0.2 inches of water. Required filament voltage is 26.5 volts at 1.0 ampere. Maximum plate voltage is 2000; maximum plate current is 350 ma. Transconductance is 40,000 micromhos. The companion socket is the PL-271A, available from Penta. A four page data sheet is available from the manufacturer. Write to: A. Newell Garden, Machlett Laboratories, Penta Plant, 312 North Nopal St., Santa Barbara, California, or circle 72 on page 110.



Front view of the linear. BANDSWITCH and METER switch are on the left of the meter and PLATE TUNING and LOADING capacitors are on the right.

The Expandable Linear

BY JOHN J. SCHULTZ,* W2EEY

This linear can be up-graded in power by changing the sub-chassis that contains the tubes. The control circuitry remains unchanged and all that needs to be done is adjust the taps on the pi-network.

PRACTICALLY all linears today use grounded-grid circuitry and pi-network output circuits. The only thing that makes linears different, practically, are the tubes used. This linear was designed with the idea in mind that it could be used with a variety of tubes to suit the pocketbook and power level desires of almost any constructor now *and* in the future.

After building several linears, I realized that aside from minor circuit changes, I was really building the same thing over and over again with different tubes. So this time around, I decided to build a linear with a separate chassis for the tubes which could be removed and a new chassis inserted with the mounting for whatever different tube I wanted to try. The control circuitry remains the same for any tube and the variation in load impedance of different tubes can, in almost any case of not more than 4 tubes in parallel, be accommodated by changing the band taps on the coil of a standard pi-network output circuit. The power supply, plate and filament, is housed separately to facilitate changes and also because I wanted the size of the linear kept as small as possible for desk-top placement.

The construction in this article describes a 837 to 572B conversion of the linear. Such a sequence is ideally suited for someone starting on s.s.b. who might first use 837's (or debased 1625's) to obtain a few hundred watts input with a relatively simple power supply and then later progress to up to two or three 572B's, with appropriate power supply, for maximum legal power. The 837's can be run to 800 watts p.e.p. with a 1200 volt power supply and exemplify just about the ultimate simplicity in grounded-grid linear circuitry. Types such as 6BJ6's or similar TV tubes suited for linear service also make a good starting choice. The 572B's with a 2500 volt power supply will easily provide inputs of up to 2 kw p.e.p. A pair of 7094's also fit well into the linear's layout when the conversion to high-power is made. Tubes such as 4-400's or similar types could also be used but construction is then made more difficult by the necessity for forced-air cooling.

*1829 Cornelia Street, Brooklyn, N.Y.

Construction

The linear shown is constructed in a German housing which is very similar to and almost the same size as the Bud Portacab cabinet No. WA1541. The chassis used with the Bud cabinet

Shown above is a sub chassis with four 837 tubes mounted. This is all the mechanical work needed to adapt the linear to different tubes.

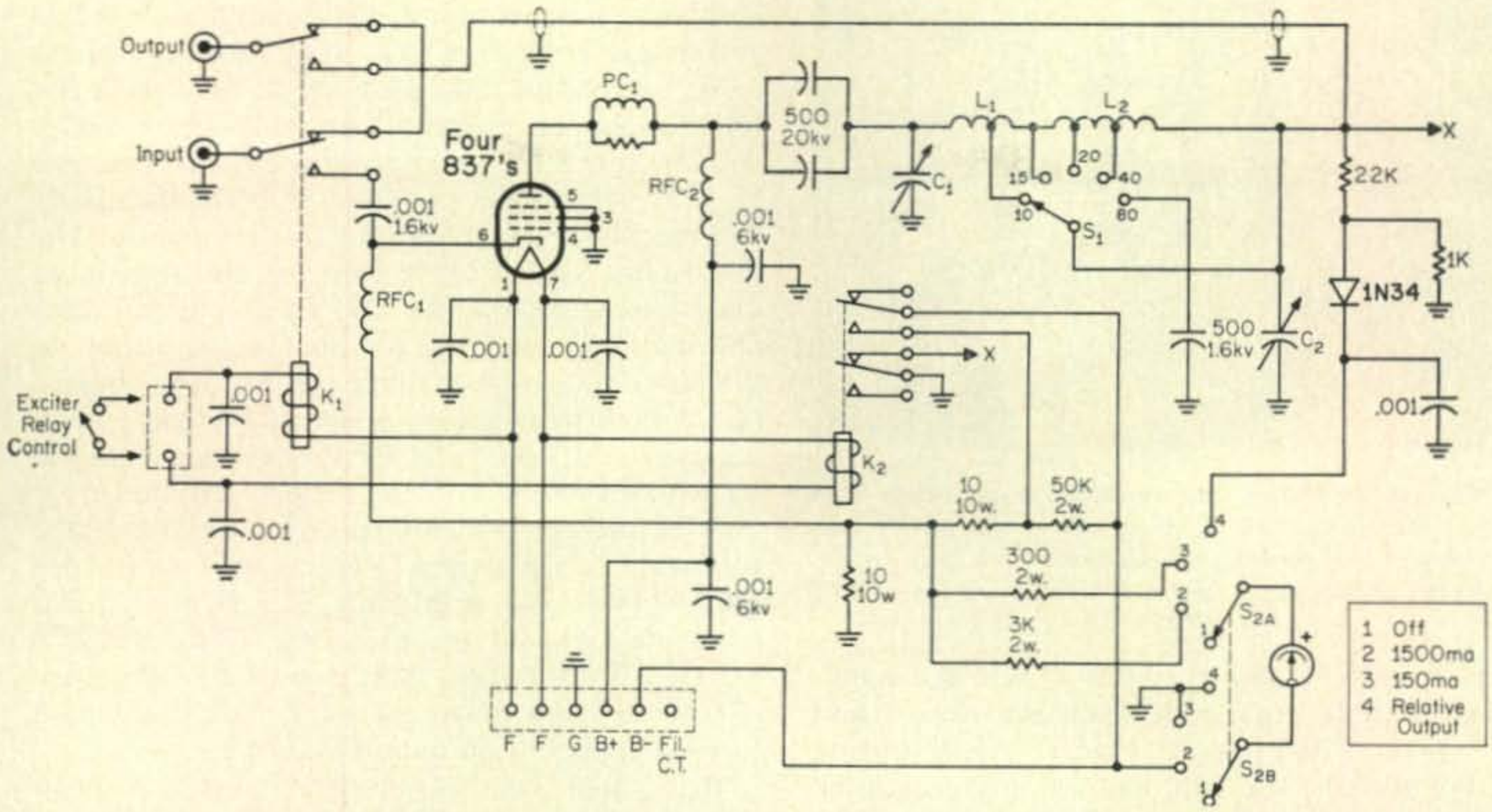


Fig. 1—Linear amplifier using four 837's. All resistors are ½ watt and all capacitors are 600 volt disc ceramics unless otherwise noted. See text for the tap locations on L_1 and L_2.

C_1—200 mmf variable, 2.5 kv.
C_2—1000 mmf variable.
K_1, K_2—D.p.d.t. relay, 6 v.a.c. coils, general purpose types.
L_1—6 t ¼" copper tubing (silver plated), 1" inside dia.
L_2—18 microhenry pi-net coil, Air Dux 2019, or equiv.
M_1—0-5 ma movement meter.
PC_1—4 t #18 on a 47 ohm 2 watt non-inductive resistor. (One for each 837).
RFC_1—two 2.5 mh 300 ma chokes in parallel.
RFC_2—B&W 800 r.f. choke or equiv.

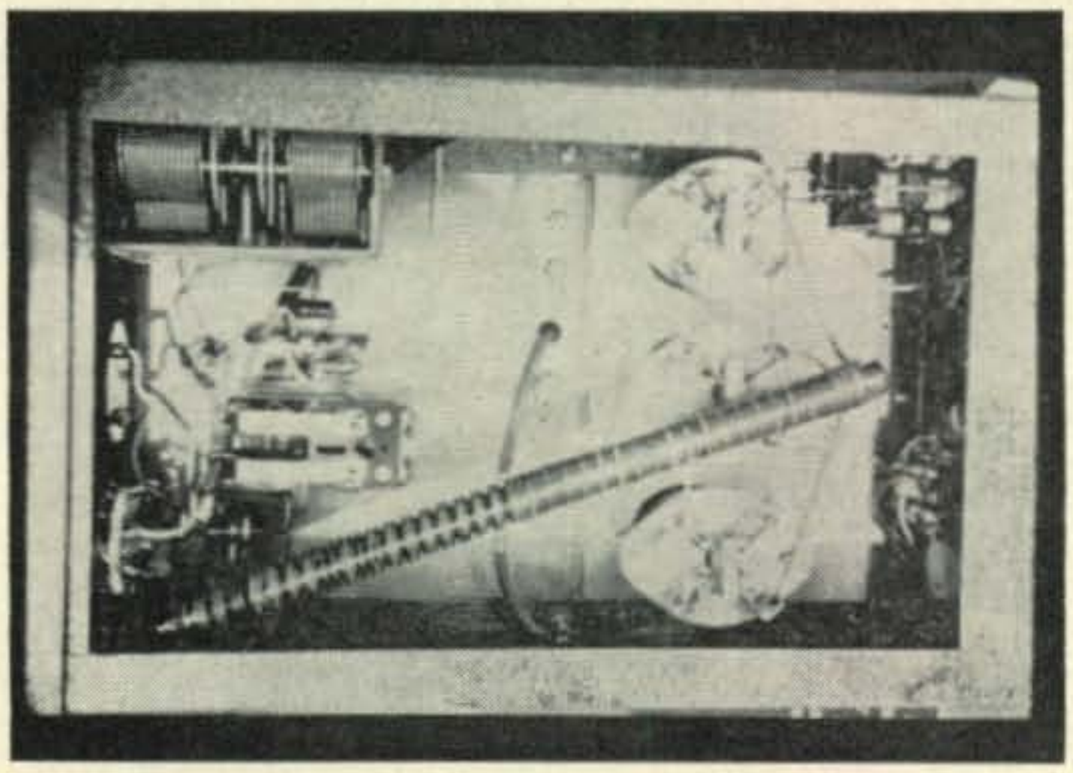
would have to be mounted upside-down with the aluminum plates for the output circuitry and the tube sockets mounted on the bottom of the chassis. The output circuit plate need only be large enough to accommodate the pi-network components and the tube socket plate chosen to fit the largest size tube it is anticipated to use. In my model, the plates measured 5½" × 8" and 5½" × 3½", respectively. Both plates are ⅛" aluminum. If use of a different housing is contemplated, it is suggested that the components for the pi-network circuit be assembled first in a mock up and a tube manual carefully checked for the dimensions of the largest tube you contemplate using before the chassis dimensions are fixed.

A small low voltage a.c. fan, not visible in the photographs, is mounted on the rear inside wall of the cabinet and connected across the filament supply line. There is not enough space for the fan when using four smaller tubes, such as 837's, but the air circulation provided by the lowered cabinet seems to suffice for these types. In the case of 572B's or other larger tubes, the fan is a necessity since the tube filaments alone are generating considerable amounts of heat.

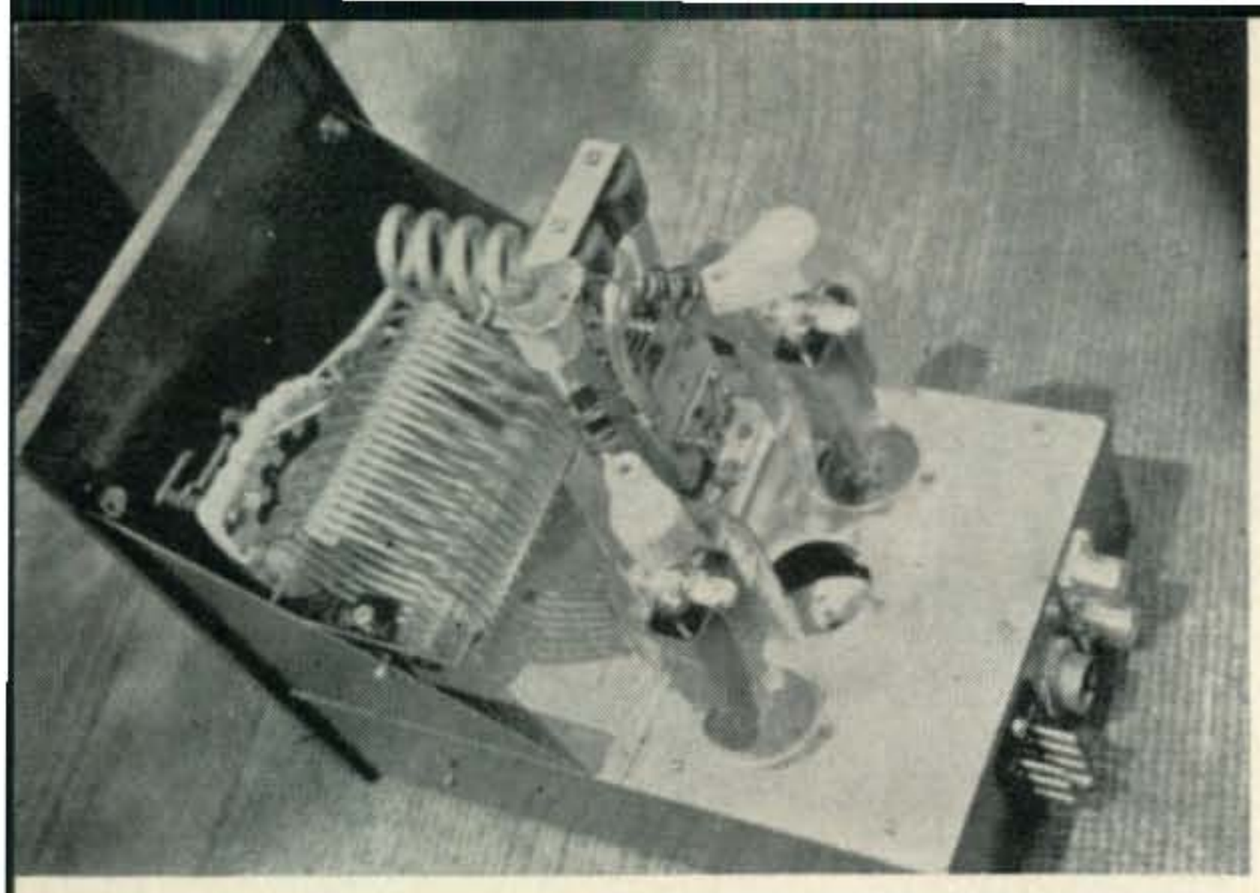
Circuitry

Figures 1 and 2 show the circuits of the 837 and 572B 'phases' of the linear. In fig. 2, only those components are shown which are different than in the 837 version. The filaments of the 837 tubes are wired in parallel and those of the two 572B tubes in series. This was done so that the filament choke, RFC_3, in the 572B version could be kept as small as possible and also so the wiring for K_1 and K_2 would not have to be changed. The cooling fan in the 572B version operates directly on 12 volts. A standard 117 volt fan would probably be easier to obtain but then, of course, 2 extra contacts would be needed on the power supply plug to accommodate the 117 volt line. Filament supply requirements for the 837 version are 12 volts at 2 amps and for the 572B version 12 volts at 4 amps. No extra allowance is made for the relays since they only draw current when transmitting and are easily handled by any transformer rated for continuous duty at the tube filament current levels.

For the metering system to function as shown, it is necessary that the B— lead from the



Bottom view of the linear. Fliament choke runs diagonally across the chassis. Relay K_1 is in the lower left corner and K_2 in the upper right. Tube sockets are the only components mounted on the sub-chassis.



Top view of the linear. The neutralizing capacitor is in front of the right 572B. Connections to the power supply, relay control and coax lines are on the rear apron. The socket in the center of the sub-chassis is for a third 572B.

power supply be above ground. Then, the meter measures plate current (0-1500 ma range) and grid current (0-150 ma range). Also, during standby periods, the 50K resistor in the cathode lead of the amplifier acts to provide almost complete plate current cut-off. One contact of K_2 shorts out this resistor in the transmit mode. The other contact of K_2, which is connected to the output of the pi-network circuit by as short a lead as possible, serves to ground the amplifier output during standby periods in case any diode noise should be present which might get into the station receiver.

In case a power supply is used where B— is grounded, the metering circuit will only function partially. In the 1500 ma range, the meter will measure *cathode* current. It will not be possible to measure grid current and the plate current will not be cut-off during standby. The latter is no great problem with the 837 amplifier since the standby plate current is only 40-60 ma. but with the 572B's, a standby plate current of 80-100 ma with a 2500 volt supply requires the dissipation of some 250 watts of heat in a very small enclosure. Therefore, particularly with 572B's or similar tubes, the use of the plate current cut-off circuit as shown is highly recommended.

The plate choke and filament choke, as shown in the photographs, are both home brewed but the use of manufactured components is recommended. A commercial filament choke, such as the B&W FC-15, does not provide a neutralization winding. However, I incorporated the extra winding on the home-made choke for convenience but careful checking of the amplifier showed it to be unnecessary.

If the copper tubing specified for L_1 is not available, a similar coil can be fashioned from heavy copper wire, #8 or #10. The little extra efficiency gained by silver-plated material at 10 or 15 meters is not worth the effort if the material is not readily available.

Adjustment

The adjustment procedure is basically the same regardless of the tubes used. The taps on the pi-network coil are set first. Just enough c.w. drive on the appropriate band is applied to the amplifier (filament and plate voltages applied and output connected to a 50 or 70 ohm dummy load) to give an indication on the meter in the relative output position. An absorption wavementer, tuned to the appropriate band, can also be held next to the pi-network coil and initially will usually give a more sensitive indication. The tap on the coil is then adjusted for maximum output indication while also adjusting the plate and loading capacitors for maximum output. In the 80 meter position, since the bandswitch contact is used to switch in an extra 500 mmf loading capacitor, coil turns are shorted out from the output end of the coil for proper resonance.

With the components specified we found the following tap positions worked well with both the 837 and 572B amplifiers: 10 meters—3 turns from plate end of L_1, 15 meters—entire L_1, 20 meters—2 turns from plate end of L_2, 40 meters —8 turns from plate end of L_2, 80 meters—3 turns shorted out on output end of L_2.

It is important that the drive used be kept as low as possible during these adjustments. This is to avoid any danger of adjusting the pi-network to a harmonic frequency and to avoid exceeding the plate dissipation of 837 or similar small tubes.

With sufficient drive (about 20-30 watts for 837's and 70-80 watts for 572B's), the plate current in the c.w. mode will run about 400 ma at 1200 volts for four 837's and 400 ma at 2500 volts for two 572B's.

[*Continued on page 109*]

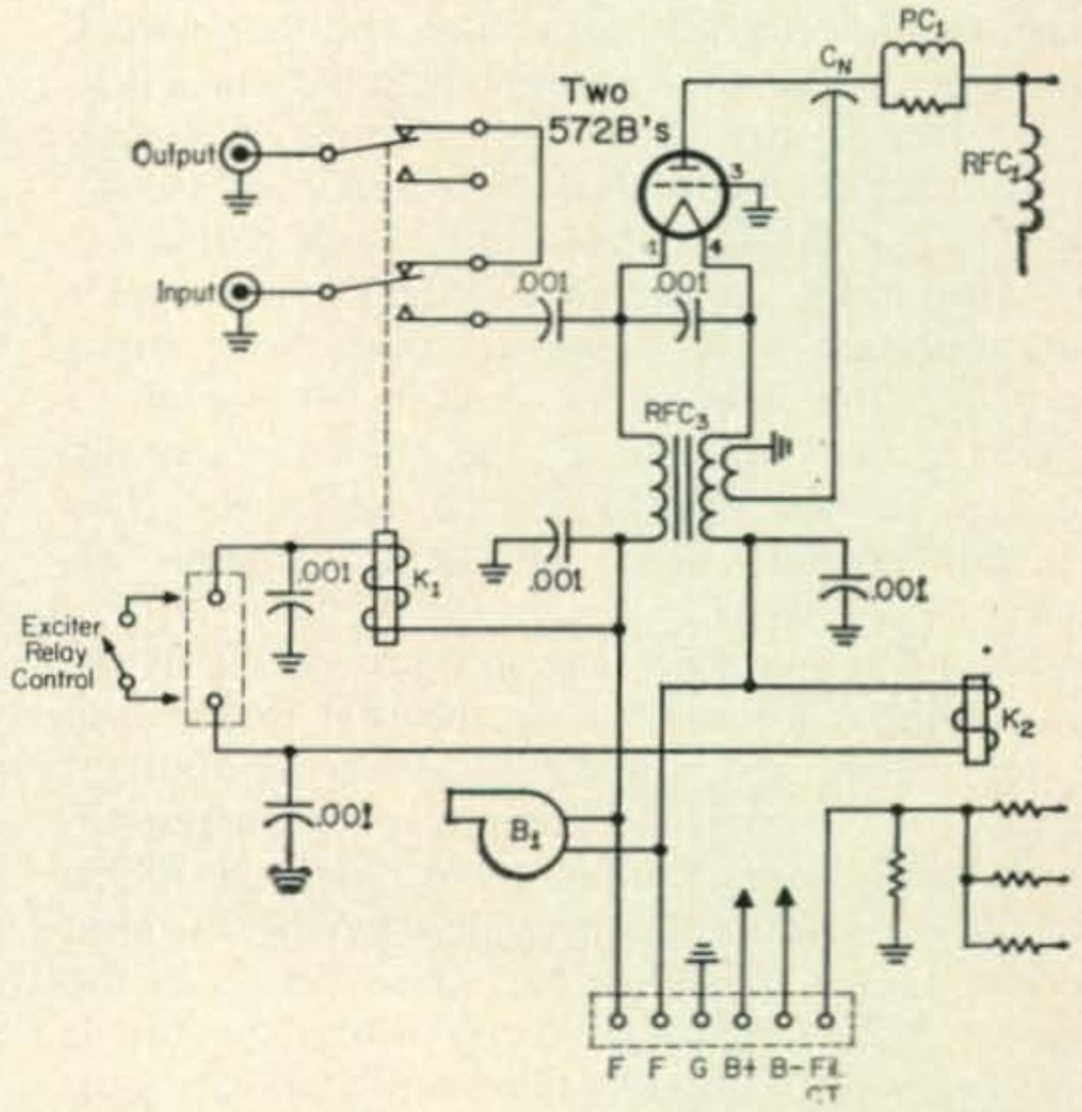


Fig. 2—Circuit showing modifications to the linear of fig. 1 for the use of two 527B's. All components unless otherwise specified are the same as in fig. 1. The portions of the circuit not shown also remain the same.

B_1—Blower fan—See text.
C_N—Neutralizing capacitor: ½" × 4 aluminum mounted on feedthrough insulator. (See photo.)
RFC_3—Homemade filament choke. Two windings of #14 wire, 36 t. ea. on a ⅜" dia., 7" long ferrite rod. Neutralization winding is 18 t of #22 hookup wire between the filament choke windings.

A tourist guide shows Claudette one of Portugal's famous museums, The Coach Museum in Lisbon.

Claudette stands in front of the bull-ring in Lisbon and talks to CT1LM, Jose Mendes Fernandes.

CLAUDETTE IN PORTUGAL

One night last March, Claudette Rouse, a young French girl from Cannes was listening to her fathers receiver and heard a distress call from CT1MA. Her father F9ZK, quickly answered the call and learned of an urgent request for a special medicine needed to treat a woman in Portugal. Claudette spent most of the night tracking down the medicine and making arrangements with the French police and airlines to ship it to Coimbra, Portugal, where it was eagerly awaited. Normally this would end a typical story of amateur participation in an emergency.

The story really begins with the French newspapers picking up the story and giving it plenty of publicity. Then the Portuguese newspaper *Diario de Noticias* picked the story up and started a campaign called "Lets invite Claudette to visit Portugal and meet the lady she helped." Radio Monte-Carlo, a large Portuguese broadcasting company, started collecting funds to give a public reward that would guarantee her future. The spirit caught on and the dream became a reality for Claudette. The Portuguese airline TAP and the National Tourism Dept. invited Claudette for an 8 day holiday in Portugal. The 8 days included a hectic schedule of sight-seeing, visiting local hams and dignitaries, and the eventful meeting with Mrs. Maria das Dores Figueiredo, the grateful recipient of the medicine.

Claudette will have many clippings from both French and Portuguese newspapers to fill her scrapbook as well as a lasting memory of a fairy tale visit that came true.

We wish to thank Vasco Felix of Portugal for making both the story and pictures available. ■

Visiting the beach of Nazaré, Claudette gives a taped interview to a member of the Portuguese Radio Club.

Manuel Bravo, CT1LR, stands by while Claudette operates his station.

AN I. F. TEST OSCILLATOR FOR F. M. RECEIVERS

BY BYRON H. KRETZMAN,*
W2JTP

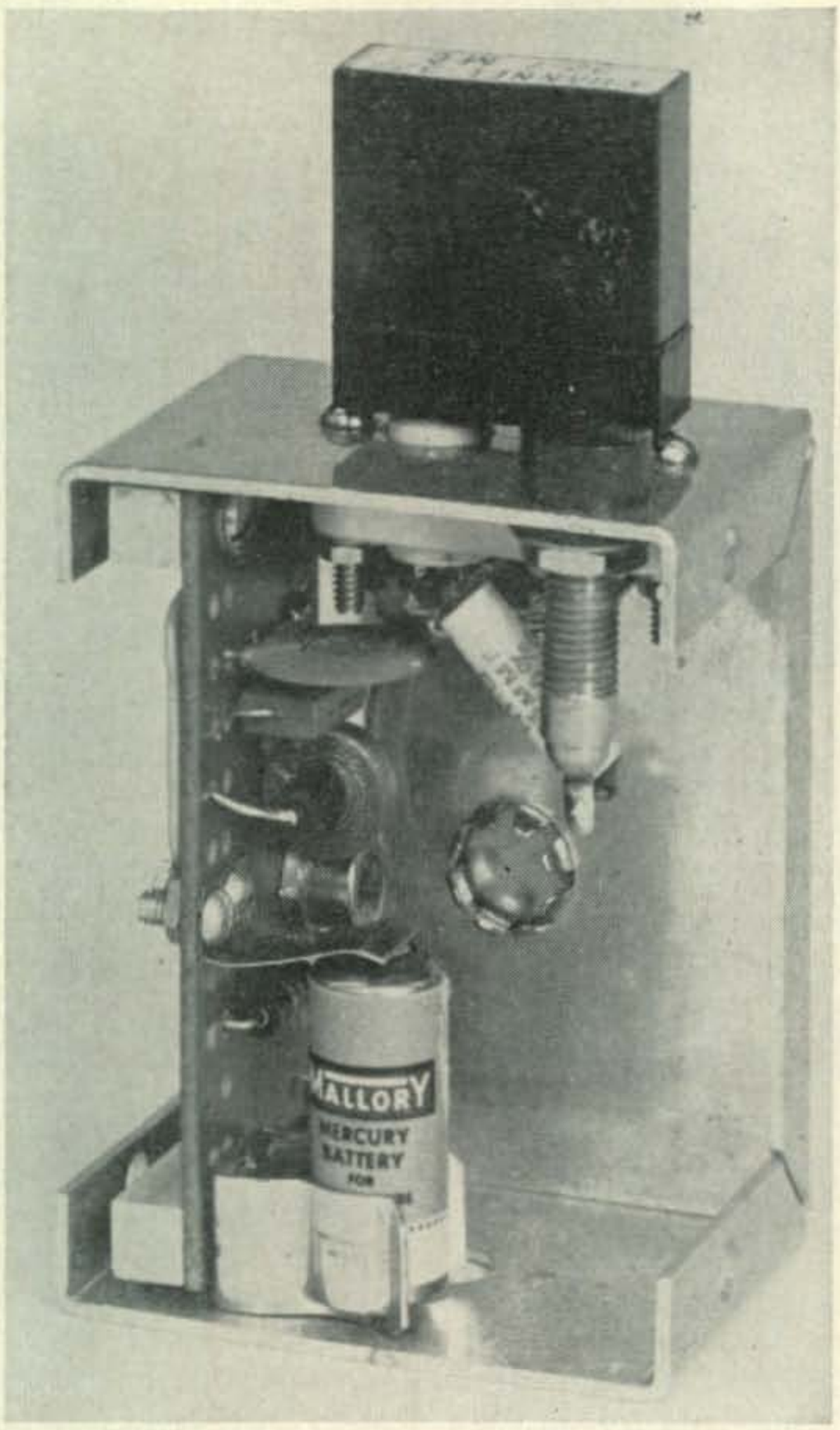


Fig. 1—Transistorized test oscillator schematic diagram. The cover of the box has been removed.

Now that the commercial surplus f.m. sets[1] are coming into wide use, for both phone and RTTY, on the 6 and 2 meter bands, a slightly sticky problem has arisen: How do we set the discriminator accurately on 455 kc? (Naturally this applies only to those receivers[2] which have a 455 kc second i.f.)

Setting the discriminator, and of course aligning the second i.f., is especially important when fixed-tuned filters are used in the receiver. The surplus BC-221 frequency meter makes a good signal generator for this purpose, but not all of us are blessed with this fine piece of gear. The thought struck us that a simple, inexpensive, transistorized crystal oscillator would do the trick. These are available in the form of printed circuit boards from several of the crystal suppliers and are relatively inexpensive. It was the cost of the 455 kc crystal that shook us up.

There ought to be another way, we decided. Giving this a bit of thought it was remembered that the surplus SCR-608 tank sets (BC-684 transmitter) used low frequency crystals multiplied 72 times to operate from 27.0 to 38.9 mc. One hundred and twenty of these FT-241 crystals were supplied with each set and, they are still available in surplus. So, out came the pencil and paper to see which of these crystals might come close to 455 kc.

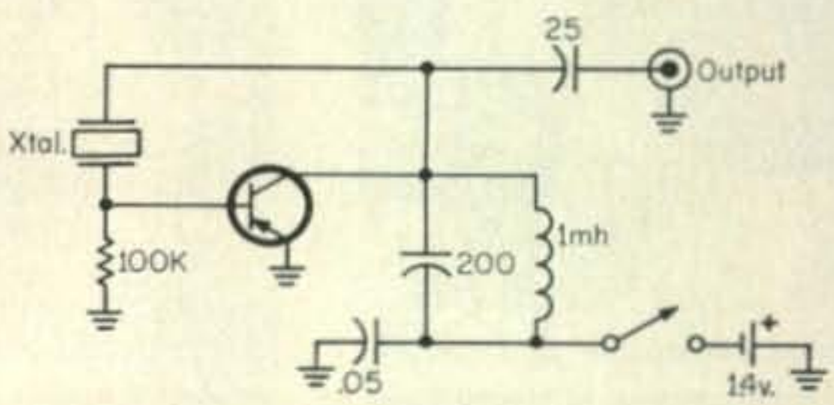
Now, bear in mind that these receivers were designed to accept an f.m. deviation of ±15 kc. The discriminators in the Motorola receivers, for example, therefore have their peaks about 40 kc apart. A little quick arithmetic disclosed that channels 316 to 339 inclusive should fall on the linear part of the discriminator S-curve, and that channels 327 and 328 nicely bracketed 455 kc, besides being reasonably close. Aha; *this* is the way, obviously! Two more check points arbitrarily about 5 kc away from 455 kc were picked. These are channels 324 and 331. Table I shows how these crystals stack up around 455 kc.

The Oscillator

Figure 1 is the schematic diagram of our I.F. Test Oscillator. As you can see, it is the epitome of simplicity. It works with almost any h.f. pnp transistor, even the 2N404. Many odd-ball strangely marked computor surplus transistors from the IBM boards now flooding the market, also worked very well, as did some of the old surface-barrier types. The battery is a tiny Mallory RM-401H mercury cell, putting out 1.4-volts. The current drawn is only about 150 *micro*amperes; the switch hardly seems necessary. (A 1.5-volt penlight cell could also be used, or any flashlight cell, for that matter.)

Construction

Our I.F. Test Oscillator is built into a 2¾ × 2⅛ × 1⅝ inch miniature aluminum box, avail-



A transistorized I.F. Test Oscillator for f.m. receivers. See text for comments on the transistor.

*431 Woodbury Road, Huntington, N. Y. 11743.

[1]Kretzman, B. H., "A New VHF Operation: FM," *CQ*, August 1963, p. 74.

[2]Kretzman, B. H., "Putting the Motorola FMTRU-80D On 2 Meter F.M.," *CQ*, February 1966, p. 65.

Channel	Freq. (mc)	Crystal Freq. (kc)	Kc from 455 Center	Typical Meter μa
316	31.6	438.89	−16.11	−35.5
324	32.4	450.00	− 5.00	−11.0
327	32.7	454.17	− 0.83	− 1.5
328	32.8	455.56	+ 0.56	+ 1.6
331	33.1	459.72	+ 4.72	+10.0
339	33.9	470.83	+15.83	+34.5

Table I—FT-241 crystal data for f.m. discriminator alignment.

able from Bud or Premier. The "tank" coil is a National R-50 r.f. choke, 1-mh, and it is fixed-tuned by a 200 mmf silver mica capacitor. The few parts used are assembled on a little bakelite board. The mercury cell is also mounted, in a fuse clip, on this board. Output is fed to an insulated banana-pin type jack through a 25 mmf ceramic capacitor. This could also be mica, and its value is not critical; any convenient value of 10 to 25 mmf could be used. A short piece of flexible wire with a banana plug on one end and a tiny alligator clip on the other end makes a test lead. It is a good idea to also ground the case to the receiver chassis with another short clip lead.

Performance

Figure 2 shows how our test crystals fall on the discriminator curve of a PA-9033B Motorola receiver that had a TU-145 filter and a 455-kc second i.f. It should be noted that some crystals might be off from the values listed in Table I as much as 150 cycles. (Aging? They *are* about 25 years old) The microampere scale indicates the readings obtained using a 50 microampere

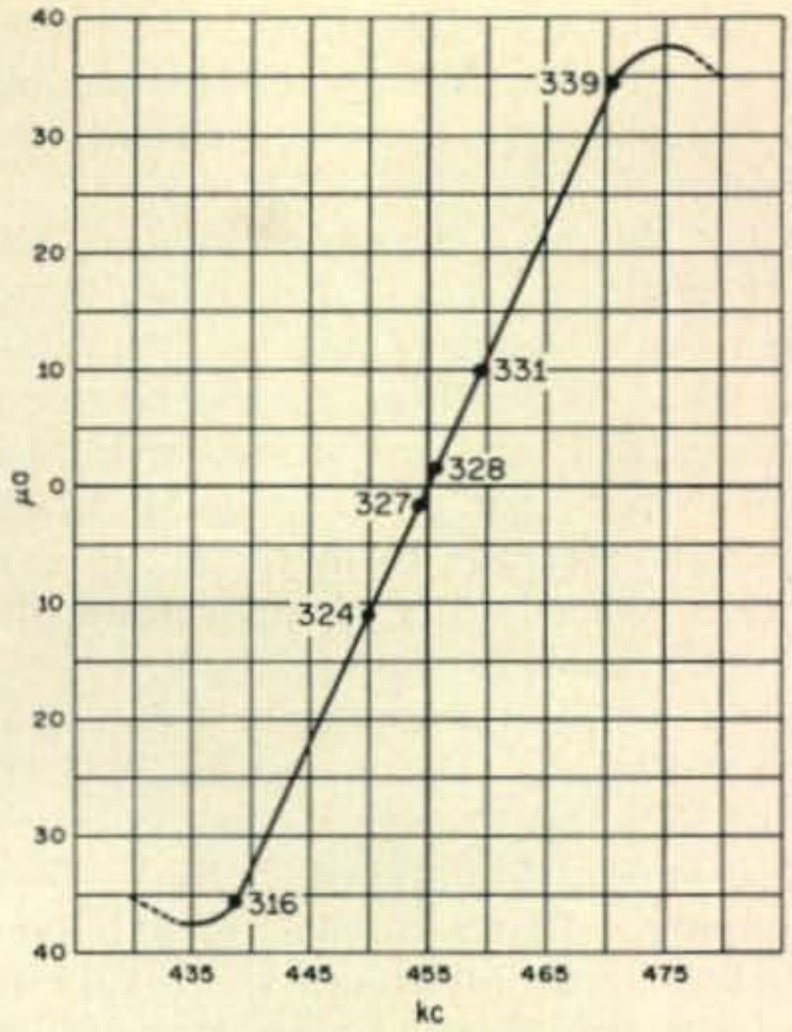


Fig. 2—Typical discriminator curve, with FT-241 crystal frequencies from Table I.

meter connected between pin 4 on the receiver metering socket and the chassis through an 18K-ohm resistor.

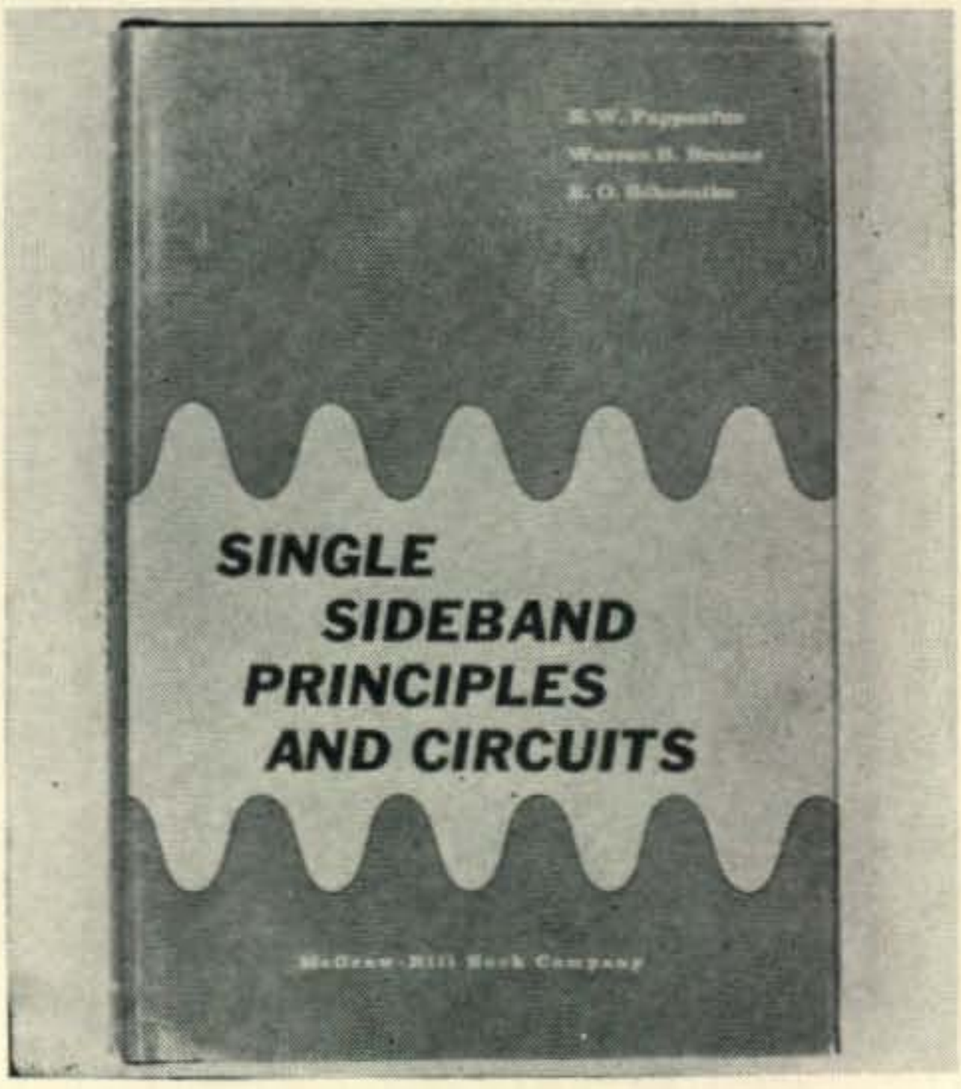
Notice how linear the discriminator curve is over the approximate ±16 kc range. The peaks, incidentally, should be equally spaced in respect to both frequency and meter reading. If your receiver discriminator does not have such a linear characteristic, or if the peaks are not equally spaced, something is not quite right. It is suggested that you check the primary tuning and the discriminator tube. The slope of the curve, for the particular receiver used, is about 2.2 microamperes per kilocycle. ■

Recommended Reading

"Single Sideband Principles and Circuits"

By E. W. Pappenfus, Warren B. Bruene, and Edgar O. Schoenike

MUCH technical information has been published concerning single sideband but it has been of a rather spotty nature in that the articles have been somewhat limited in their scope and have been spread out among a variety of publications, both professional and amateur. Although one might collect this data into a useful reference file, it would be a cumbersome and uncoordinated collection and one which might not even completely cover the subject. Thus, there has been a need for an authoritative publication in which all the technical aspects of s.s.b. techniques and circuitry are included under one cover. This has been fulfilled with a recent McGraw Hill publication "Single Sideband Principles and Circuits" by E. W. Pappenfus, Warren B. Bruene and Edgar O. Schoenike. The authors of this book have brought together all the material needed for a designer's reference in a comprehensive treat-



ment of the whole subject of s.s.b. Not only are the theoretical aspects fully discussed and explained, but practical operating circuits are included also.

Although the book has been written for the practicing engineer, it will be attractive to the technician and advanced amateur alike. The subject is covered in depth in an orderly sequence and in a practical and easy-to-understand manner. Explanations are given in detail where required, while reference to mathematics is made only in cases where other means cannot provide the necessary analysis.

The scope of the book may best be visualized from the following chapter headings: 1—Introduction to SSB; 2—Propagation of Radio Waves and Effect upon Modulated Signals; 3—Basic SSB Equipment Requirements; 4—SSB Generation; 5—Balanced Modulators; 6—Filters for Sideband Separation; 7—Exciters for SSB; 8—Frequency Generation; 9—Linear R.F. Amplifier Tube Operating Conditions; 10—Tank Circuits and Impedance-Matching Networks; 11—Neutralization and Stabilization; 12—SSB Amplifier IM Distortion; 13—Distortion Reduction; 14—Linear R.F. Amplifier Circuits; 15—Power Supplies for SSB Amplifiers; 16—Survey of Receiver Design; 17—Receiver R.F. Translators; 18—I.F. Amplification and Demodulation; 19 – SSB Transceivers; 20—Signal Processing for SSB Transmissions; 21—Receiver Tests and Measurements; 22—Transmitter Tests and Measurements.

Of especially new interest to the amateur, among the 374 pages of text, are such topics as the History of SSB (yes, it started way back in 1915!), frequency synthesizers, phase-locked oscillators, clipping and compression, linear amplifiers, distortion, test measurement procedures.

A few words about the authors will illustrate the authoritative quality of the book. These men have long been associated with the development and production of s.s.b. equipment and techniques, particularly in respect to the up-to-date methods that have evolved. Their names should be familiar to many readers, due to their technical articles which have appeared in amateur and professional publications.

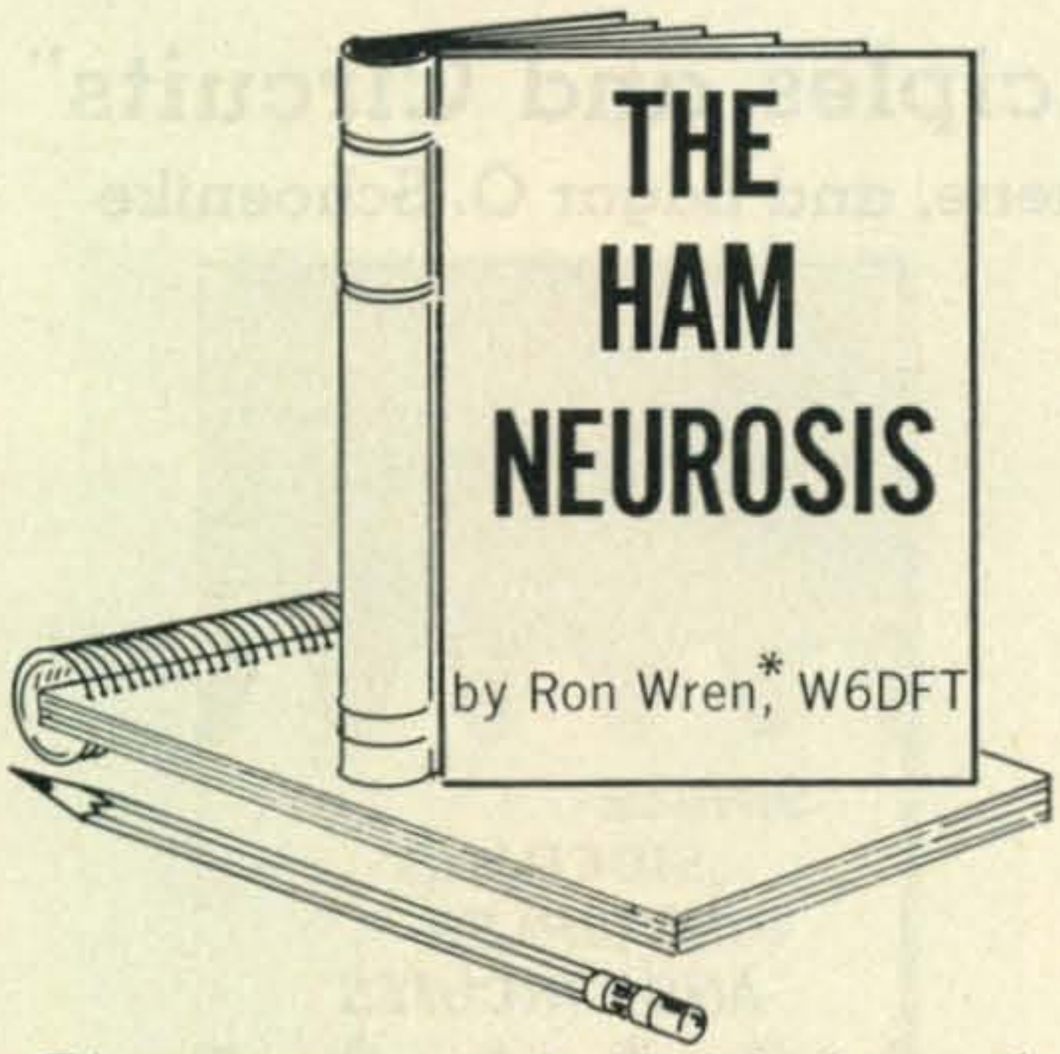
E. W. Pappenfus, formerly of Collins Radio Co., is Vice President of Engineering, Granger Associates. Warren B. Bruene is Senior Technical Consultant for Collins Radio Co. He developed the Bruene Method of capacitance bridge neutralization for single-ended tetrodes, which is the most widely used system in present day equipment and which was originally described in *CQ*.[1] Edgar O. Schoenike is Head of Advanced Development Group at Collins Radio.

We found that "Single Sideband Principles and Circuits" is written in such a smoothly flowing manner that reading is very pleasant, yet fully informative; in fact, chapter after chapter could be read and easily understood at one sitting without becoming fatigued. Many intriguing facets of s.s.b. were gleaned from the text and enough new ideas were formulated to keep us busy with new projects for some time to come.

If you are a design engineer, a technician or a serious minded s.s.b. amateur, you'll find this book a must to have in your technical library. Even if you're just plain Joe Ham, you'll find many understandable topics from which you will gather enough data to be able to talk intelligently about s.s.b. over the air.

"Single Sideband Principles and Circuits" is published by McGraw-Hill Book Company, New York, N.Y. Price is $7.00. —*W2AEF*

[1]Bruene, Warren B., "Single-ended Tetrode Final," *CQ*, August '50, page 11.



STRETCHED out on the black leather couch, I nervously fumbled with my earphones—a last link with my special kind of reality—and tried to relax.

*1264 Idylberry Rd., San Rafael, Calif.

I was in the office of Dr. Warren Miller[1], one of San Francisco's leading psychoanalysts—and the doctor was about to CQ my psyche. We hams have come along way in our knowledge of the important things we deal with: linear amplifiers, transistors, solder. We are even beginning to understand TVI. But what we haven't understood is why we do the things we do! What makes us as strange as we are? I was prone to find out. I would hold nothing back, bare my deepest mental components in the hope that I could shed some scientific light on this most puzzling of all ham dilemmas.

The Doctor began calmly. "What exactly is troubling you?"

"Well," I replied, "I suffer from anxiety, nervousness and I seem to hear things. . . ."

"Hear things?"

"Kind of voices from far, far away. They're calling me—W6DFT. I try to answer them but I never seem able to hook them."

"Let's start from the beginning," said the Doc-

[1]It is recognized that an accurate analysis cannot be given on the basis of one interview, and as such the name of Doctor Miller is a pseudonym for ethical reasons.

The author on the psychoanalyst's couch exposing his psyche.

tor. "What was your first connection with electronics?"

"As a child I used to enjoy sticking my finger in the a.c. plugs and getting shocks," I joked.

"Did you ever get a shock in the head?"

"No, Doctor. Just kidding. Seriously, I think my trouble began when I got my ham license in high school. While other kids were going to dances and football games I was trying to work DX."

"I see," said the psychoanalyst. "I might suggest that this could indicate that your relationship with adults was a *frustrating* one. . . ."

"They treated me like a child," I interjected.

". . . and therefore you tended to avoid contact with people. You found a measure of gratification in manipulating objects which you could control—instead of people which you could not control. Perhaps this devotion to your hobby provided isolation from your frustrations. It also would give you a feeling of mastery over what you were doing. You were escaping from reality in the sense that ultimate reality is other human beings."

"Well, Dr. Miller," I said, "I *tried* to interest others in ham radio. I *did* invite them to my shack to watch me operate. . . ."

The Doctor nodded. "I understand. It seems to me that you brought them to your radio room in order to strike back at them! You were saying, in effect, 'See, I'm smarter than you.' You probably amazed them with your electronic expertise and technical jargon," he said.

"Right, Doctor. I did throw around a lot of fancy terms. Like you're doing."

He frowned.

"Doctor," I asked, "what would make me more interested in hearing voices from a speaker than talking to people in person?"

Doctor Miller smiled knowingly. "Perfectly clear. You preferred electronic voices because you didn't want to face real people. This was too much for you. By placing a great deal of equipment between you and another ham you were not only isolating yourself but you were exercising great power. You could turn your ham friend off, turn him on, make him louder, softer or switch to someone else. This is an electronic way of manipulating your environment. In a sense you are playing God."

"Well, I *am* pretty big around the surplus stores," I replied modestly. "But tell me this—why do I feel compelled to talk on the air?"

"Do you operate your transmitter often?" he enquired.

"Not *too* much," I told him. "Maybe four nights during the week. And, of course, all day Saturday and Sunday."

He asked what I talked about. That was a tough question.

"Doctor, I guess it's like this: I tell him my name and location. He tells me his. I tell him about my rig, exchange a signal report . . . and then . . . sign off. That's about it."

"Ah hah!" ah hahed the doctor. "Then you really aren't *communicating*. Very significant.

I'm beginning to see signs of . . . what shall I call it? . . . a *ham neurosis*."

I felt as if I had been found out. "But they don't say anything to me, either," I alibied.

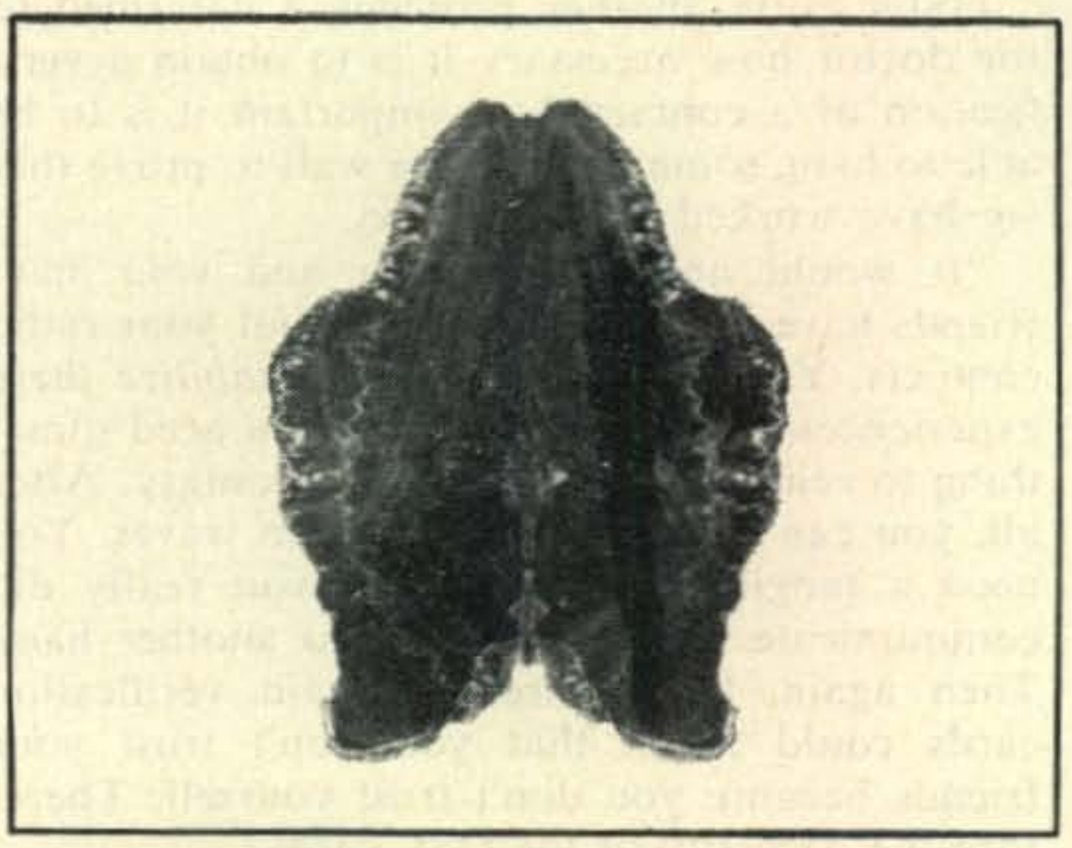
"Quite understandable. You see, you aren't really saying anything. And since you don't expect this other party to say anything, you probably don't even listen."

He was right. How often had I asked for a repeat on a name? Pretended that QRM had obliterated a signal report? In fact, I knew that the information had been given but I simply hadn't heard it.

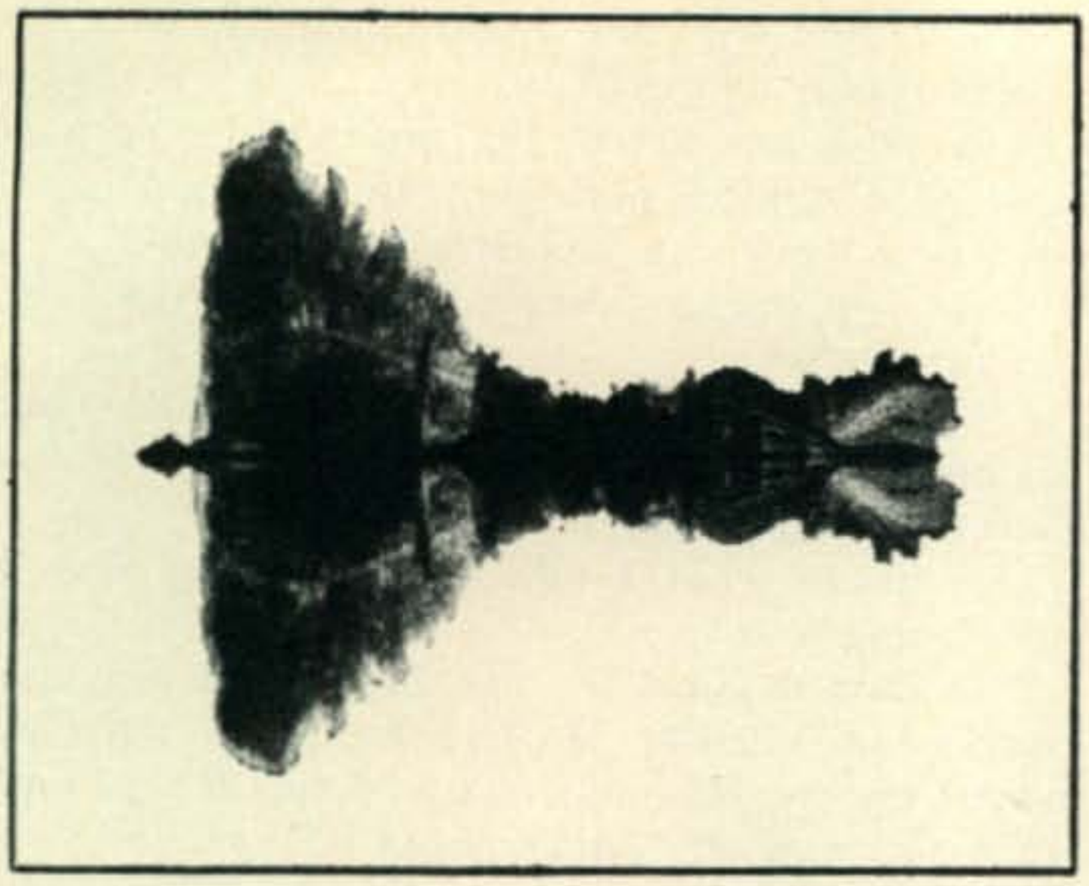
"Now about your desire to talk all the time . . ."

"You see, Doc, we have these contests almost every weekend which encourage us to make a lot of contacts and . . ."

The psychoanalyst smiled again. "I know. It's a very immature concept of social relationships reminiscent of young girls who measure their popularity by the *number* of dates they have —not by the individual merits of each date. A quantity over quality concept. Ham radio seems such a nebulous thing that you feel compelled to put a quantitative value on it—so you can, in some way, measure its worth."



The author decided this Rorschach ink blot test card was a scope pattern for BLAHhhrr.



A poorly aligned i.f., or is it a butterfly, what do you think?

Feeling uncomfortable again I took another tack. "Doctor Miller, is there a ham type, a special kind of person who is drawn to this hobby?"

"We don't know," he said. "Not many hams have been psychoanalyzed. Although from what I've heard today I would say that a good number of them should be. Perhaps ham radio is a kind of mutual psychoanalysis. You ramble to him and unburden yourself. He rambles to you. And, of course, neither of you listens to what the other is saying. Remember, we established that in this communication hobby you don't really *listen*, do you?"

". . . ah . . . what were you saying, Doctor?"

"Never mind," he replied. "Now, when you meet another ham in person, what happens?"

"We usually chew the rag . . ." he looked startled! . . . "I mean chat. Then after a couple of minutes, you know, when the conversation runs down, we go into the shack and talk to someone else on the air."

"I thought so," said the Doctor with obvious satisfaction. "You *know* that you are rather dull and so you tend to minimize these personal contacts. As soon as possible you prefer to return to the relative security of your objects—your electronic devices."

QSLs cause another problem. I described to the doctor how necessary it is to obtain a verification of a contact, how important it is to be able to hang something on the wall to prove that we have worked a rare station.

"It would appear that you and your ham friends have a basic insecurity about your radio contacts. You need something to *stabilize* these experiences with the real world. You need something to remind you that it isn't a fantasy. After all, you can't *see* electrons or radio waves. You need a tangible assurance that you really did communicate . . . I mean talk to another ham. Then again, this desire to obtain verification cards could mean that you don't trust your friends because you don't trust yourself. Therefore the necessity of the QSL cards."

"Right, Doctor, right. And we have to compete with each other for the greatest number of QSL cards from the most exotic spots."

"Then radio," said Doctor Miller," is actually a passive form of competitive sport. I imagine you have your rules that you follow, your penalties and all. Very interesting. Go on."

I told him next of my obsession with change. I *had* to have new antennas, new transmitters, new receivers. I *had* to keep changing and trying something different. And the more I changed the more anxious I became.

"It's a manifestation of a ceaseless search," said the Doctor with great authority. "You are playing a game in which there are rules but no goals, therefore there is no conclusion. The game is never ended. The aims of amateur radio are not defined clearly. That is why there is no fulfillment, no satisfaction. Some would say that this reaching for so-called improvements is a productive goal. I would say it is neurotic."

"Do you mean we're all crazy—like my wife says?" I asked.

"We shall see. Now, with all of this time spent buying, fixing and operating your equipment, do you have time for other interests? Do you spend time with your family? Are you active in civic affairs?"

I shook my head. Some things are just more important than other things.

"Well, then, this equipment is actually a defense mechanism which you use to avoid life's responsibilities, life's problems. Normal . . . ah . . . *other* people face these things. Hams apparently take refuge in their shacks and find temporary relief from their cares."

The Doctor's analysis had me worried. Here I was—frustrated, afraid to meet people, electronically attempting to control my environment, escaping from reality. "You mean, Doctor, that we are really *unhappy?* Is that what you're saying?"

The psychoanalyst looked thoughtfully away. "I would say that you are no worse off than many people. You see, if we were to take a ham out of his radio role and ask him to go out and interact as normal . . . ah . . . *other* people do, we could threaten him with a difficult situation. No, for those who are confirmed hams such as yourself, I would say let them alone. You and they have found a refuge, a role an escape. But for the young fellows beginning this hobby, let them be *warned* . . . warned of the dangers of becoming rigidified in this odd pattern. Let them be warned that like narcotic addicts they can become hooked on this strange and definitely abnormal way of life. They can lose grips entirely with the outside world."

The interview was over. I got up, thanked the doctor and headed out of the office. I thought of the new meaning my life could take, now that I understood myself. I thought of the new challenges that life apart from amateur radio offered. Then, I thought of something more important. If I can get home fast enough I just might snag me an HL9 before bedtime. ■

Rack Mtg. Table Top Equipment

BY HARRY LOWENSTEIN,*
W2HWH

MANUFACTURERS of amateur gear seem to be packaging all their goodies in table top boxes and so the ads in the magazines show very neat installations. What they don't show are the interconnecting cables, antenna leads s.w.r. bridges, antenna tuners and sundry clutter common to the amateur station. After a while the station becomes a pile of boxes and cabinets and that "clean" look is gone.

Here, at W2HWH, rack mounting is used to combat the clutter[1]. When a nice shiny NCX-5 was acquired the problem of rack mounting it arose. Since there are controls under the lid that require occasional adjustment, a slide out arrangement, in addition to the rack mount, was required. How it was done is shown in the photos. ■

*806 Morris Turnpike, Short Hills, N. J.

[1]Lowenstein, H., "A Station Package," *CQ*, Sept. 1964, p. 56.

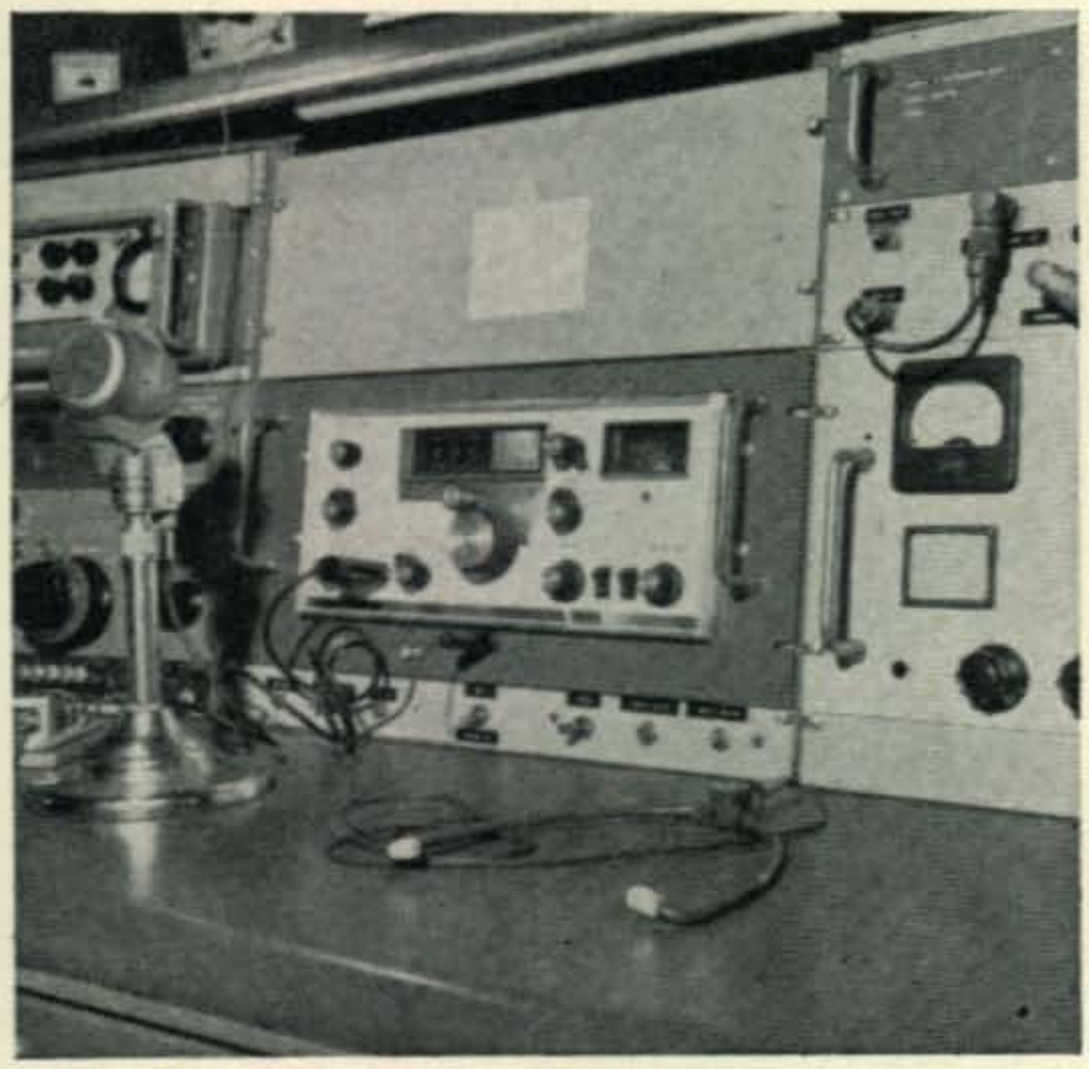


Fig. 1—The NCX-5 mounted in the rack. The connectors directly under the unit are extended from the rear of the transceiver for the key and headphones.

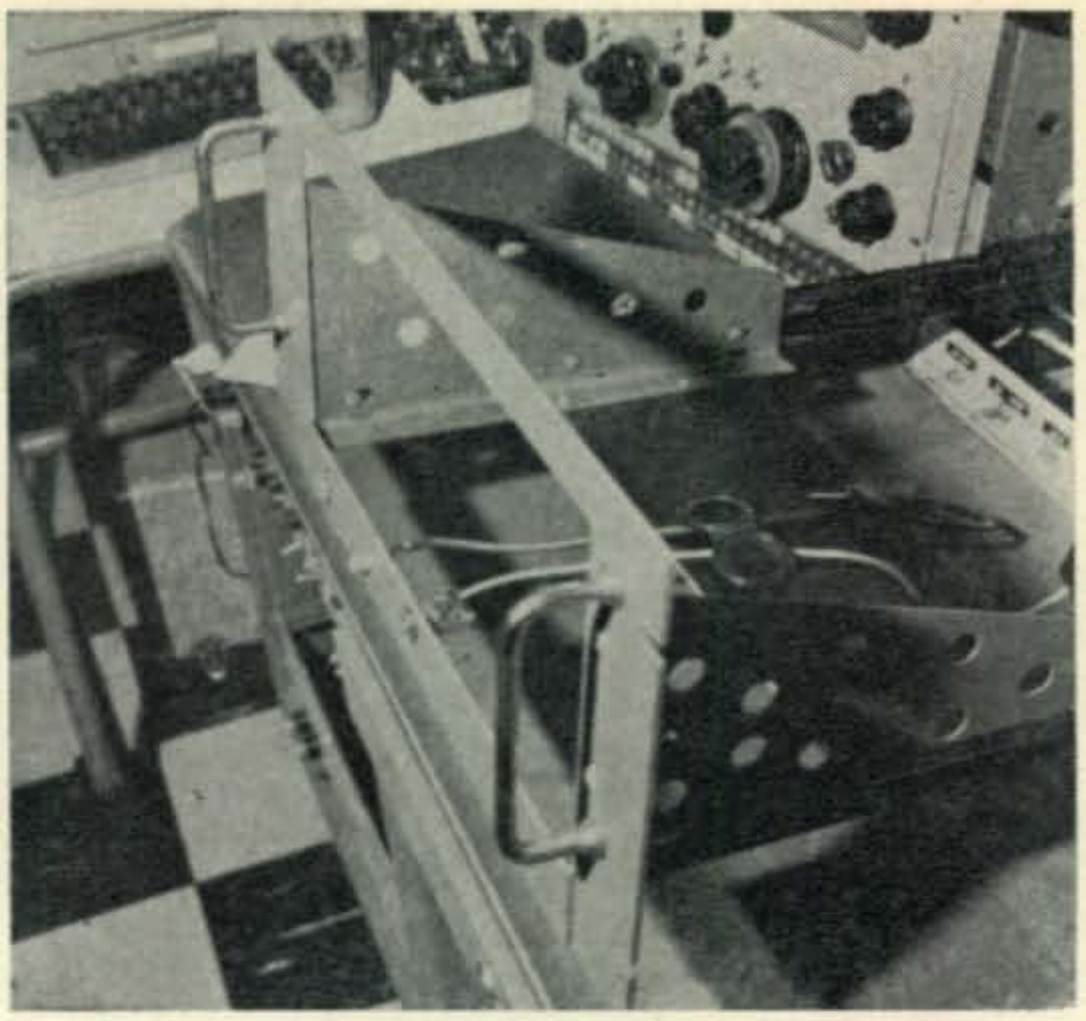


Fig. 2—The rack itself. Note the jumpers from the back of the transceiver jacks to the front panel of the slide-out mounting.

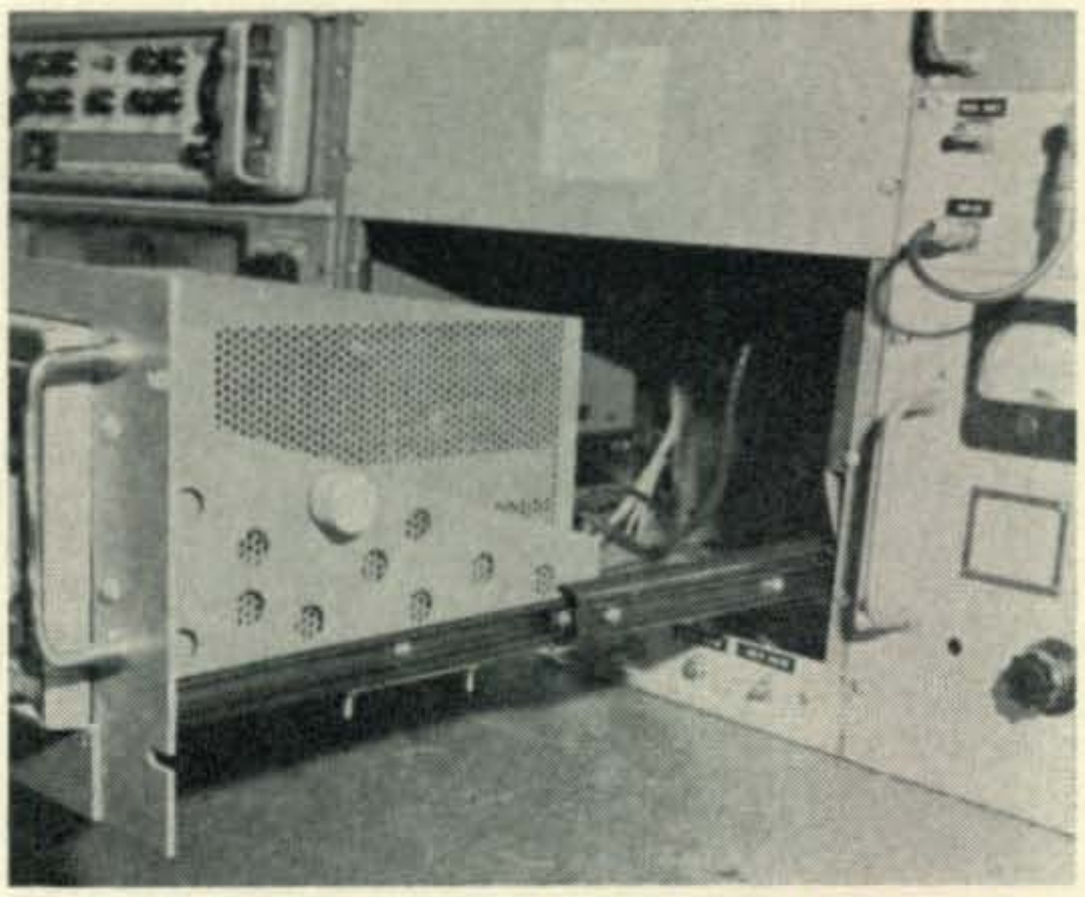
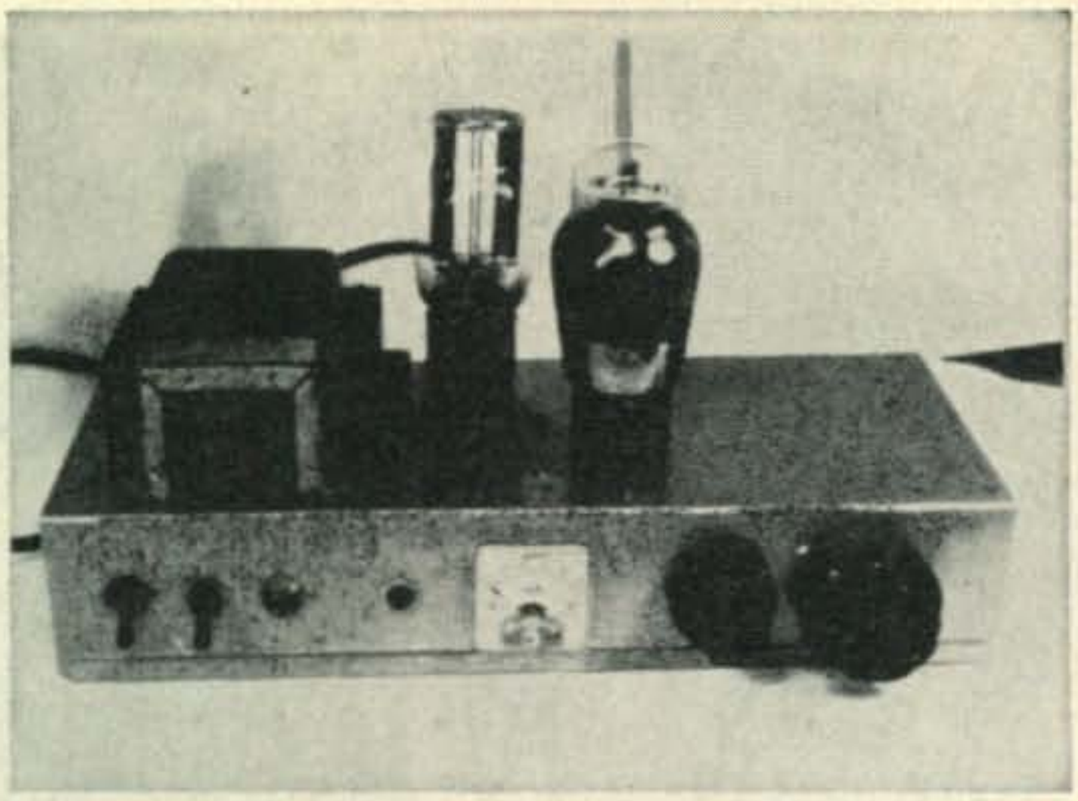


Fig. 3—Transceiver mounted in the rack. The rubber bumpers sit on the flanges of the side brackets and the unit is held in place by the mobile mounts. The drawer slides extend 9 inches. Since 13" is required to permit the top to open, two pairs were used in tandem providing an 18" extension.

Fig. 4—View of the transceiver with the rack extended and the lid raised for adjustments.



Front view of the 40 meter Novice transmitter. The front panel components are, from left to right, ON-OF switch, SEND RECEIVE switch, indicator light, key jack, plate meter, PLATE TUNING, LOADING.

A 40 METER NOVICE RIG

BY ED MARRINER,* W6BLZ

SOMEHOW, the Novice struggles along and gets his license and is ready to get on the air. Now he needs a transmitter. How does he get this transmitter? Why not build it? The cheapest way for the Novice to get on the air is to use receiving type parts for the transmitter. These parts can be ordered from catalogs which can be obtained from many of the stores listed in the back of radio magazines.

Today, the building of a transmitter is more of a problem than it was many years ago for most of us. We only had to recognize a tank coil, tuning capacitor and a tube. There wasn't even a crystal oscillator circuit available for hams. Life was simple! Wireless was learned in functional steps. The outlook must certainly be awesome to present day beginners who view an s.s.b. transceiver design. For them the place to start is still with a simple, reliable, inexpensive, trouble free transmitter using a minimum of parts. This circuit might be it.

*528 Colima Street, La Jolla, California.

Novice Operation

The Novice is allowed to operate in the forty meter amateur band between 7150 kc and 7200 kc but is limited to crystal control of the frequency. Whatever frequency the crystal is oscillating on is where he is stuck unless he can buy a pocket full of crystals. Surplus crystals can be obtained in larger cities for ten cents each. The store will not sort them out or mail them, you have to pick them yourself.

Much has been written on crystals. A portable crystal tester which helps you select good crystals was covered in an earlier issue[1]. Also, there have been articles explaining how the frequency of crystals can be shifted[2].

Circuit Theory

The circuit, shown in fig. 1, consists of three tubes. The first, V_1, is an oscillator-amplifier, the

[1]Marriner, E., "The Crystal Checker," *CQ*, July 1964, p. 30.
[2]Greenbaum, J., "Vary Your Crystal Frequency," *CQ*, March '62, p. 42.

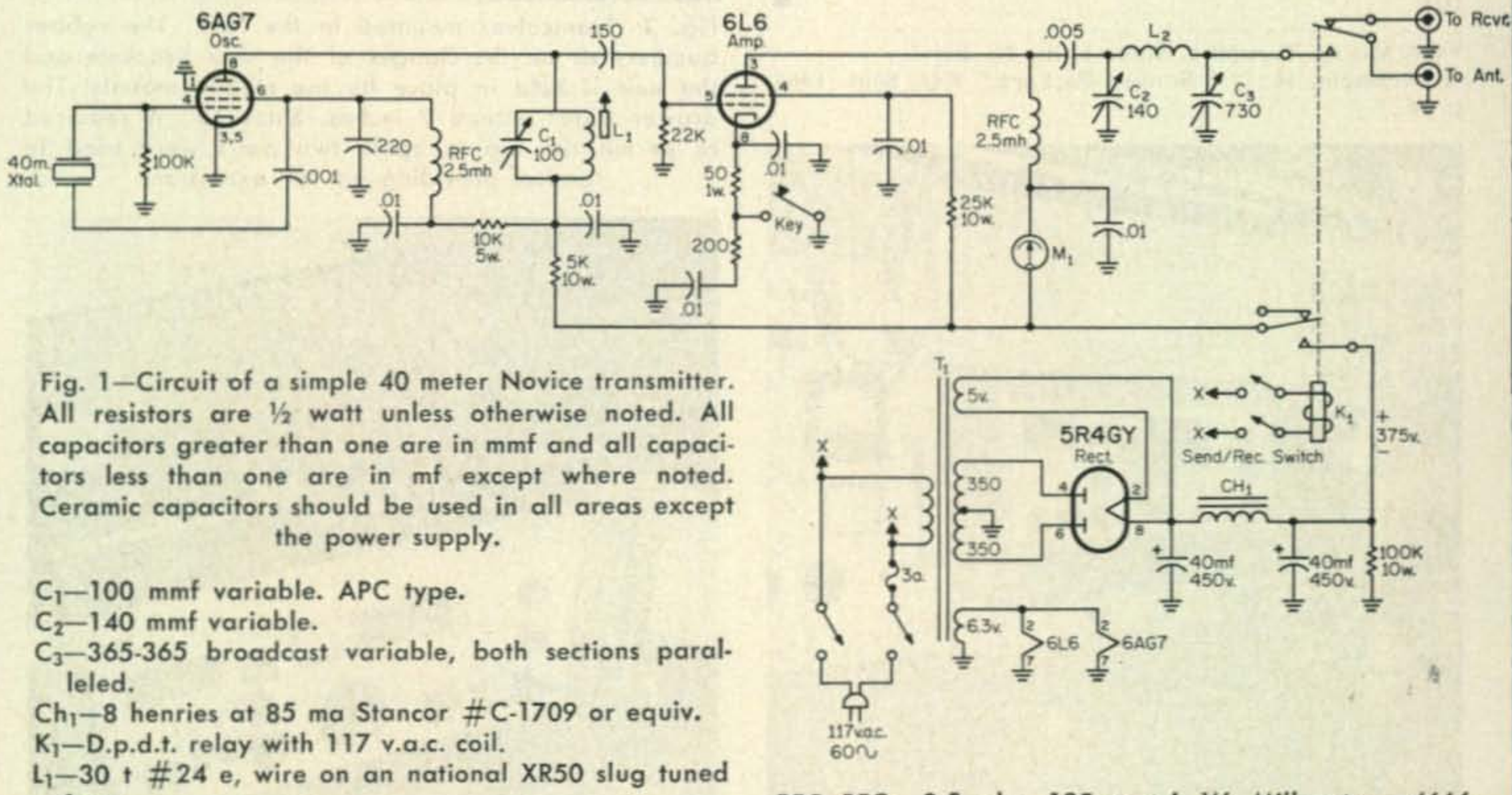


Fig. 1—Circuit of a simple 40 meter Novice transmitter. All resistors are ½ watt unless otherwise noted. All capacitors greater than one are in mmf and all capacitors less than one are in mf except where noted. Ceramic capacitors should be used in all areas except the power supply.

C_1—100 mmf variable. APC type.
C_2—140 mmf variable.
C_3—365-365 broadcast variable, both sections paralleled.
Ch_1—8 henries at 85 ma Stancor #C-1709 or equiv.
K_1—D.p.d.t. relay with 117 v.a.c. coil.
L_1—30 t #24 e, wire on an national XR50 slug tuned form.
L_2—30 t, 1" dia., 3" long. Polycoil #1747 or Air-Dux #810.
M_1—0-100 ma milliameter. Lafayette #99-5055 or equiv.
RFC_1-RFC_2—2.5 mhy, 125 ma. J. W. Millen type 4666 or equiv.
T_1—Power transformer 350-0-350 v.a.c. at 150 ma. 6.3 v.a.c. at 5 amps and 5 V at 2 amps. Therdarson T13 R13 or equiv.

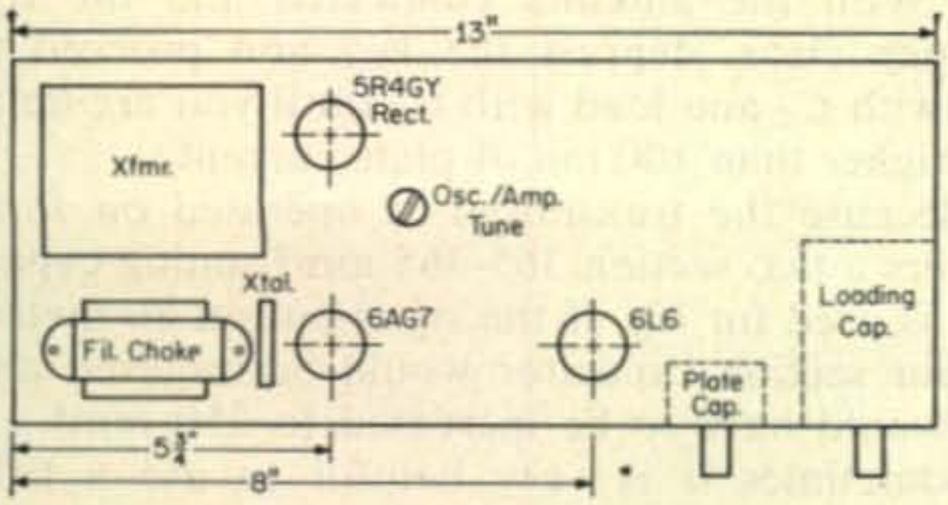


Fig. 2—General layout of the 40 meter Novice transmitter.

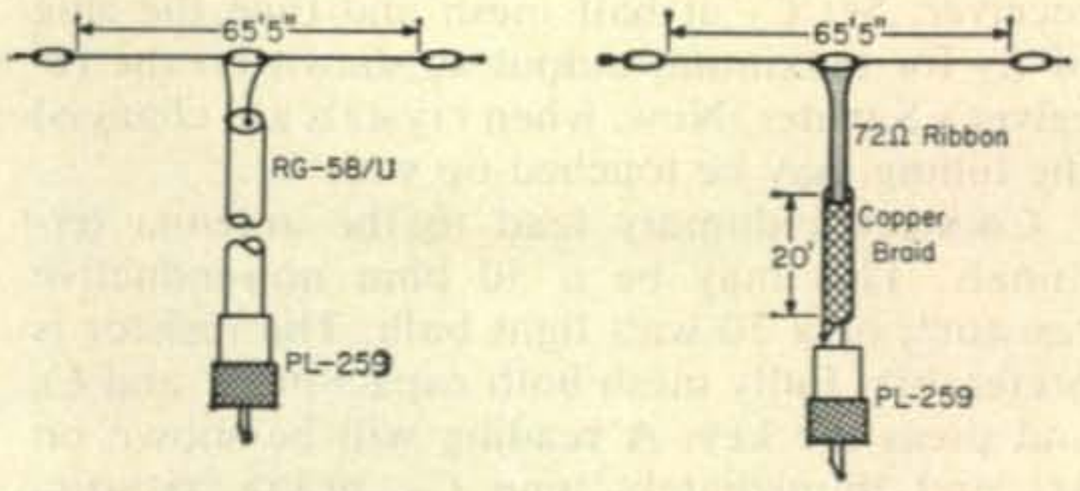


Fig. 3—Simple dipole antenna for use with the Novice 40 meter transmitter. The length is computed from the formula 468/*f* in mc.

second, V_2, is a power amplifier and V_3 is the rectifier for the power supply.

The first stage, V_1, is a Pierce crystal oscillator circuit with the screen grid acting as the plate of the oscillator stage. The plate of the pentode acts as the amplifier and the circuit is comparable to the electron coupled oscillator except that it is crystal controlled. The tuning capacitor, C_1, does not affect the crystal oscillator action and should be set for maximum output from the 6AG7.

The r.f. signal is impedance coupled to the power amplifier control grid circuit, V_2. This is a 6L6 operated in Class C. The 50 ohm cathode resistor provides a safety bias should the input signal fail and so not provide the necessary grid bias.

When transmitting, the oscillator is on all the time and the power amp, V_2, is keyed in the cathode circuit. The components across the key act as a key click filter.

The plate of the power amplifier is coupled to a pi-network which is connected to the send-receive relay contacts. The antenna is connected to the armature of the relay and switched to the receiver when in the RECEIVE position.

The power supply is a conventional full wave rectifier circuit with a pi filter. It develops 375 volts d.c. output fully loaded with the transformer specified.

Construction

A few tools are needed to build any piece of radio gear[3]. Holes are the most difficult to make without a punch. It would be nice to have a 1½" punch for the meter hole and a 1⅛" for the tube socket holes. However, they can be cut with a metal coping saw blade and filed out. A hole cutter is often dangerous and difficult to use without damaging the chassis.

The transmitter is built on an LMB box chassis #18, 5¼" × 13" × 2⅝". The first thing to do is put masking tape on the chassis so that the parts arrangement can be marked with a pencil. The layout is shown in fig. 2. After mounting the power transformer, layout and cut the rest of the holes and mount the parts.

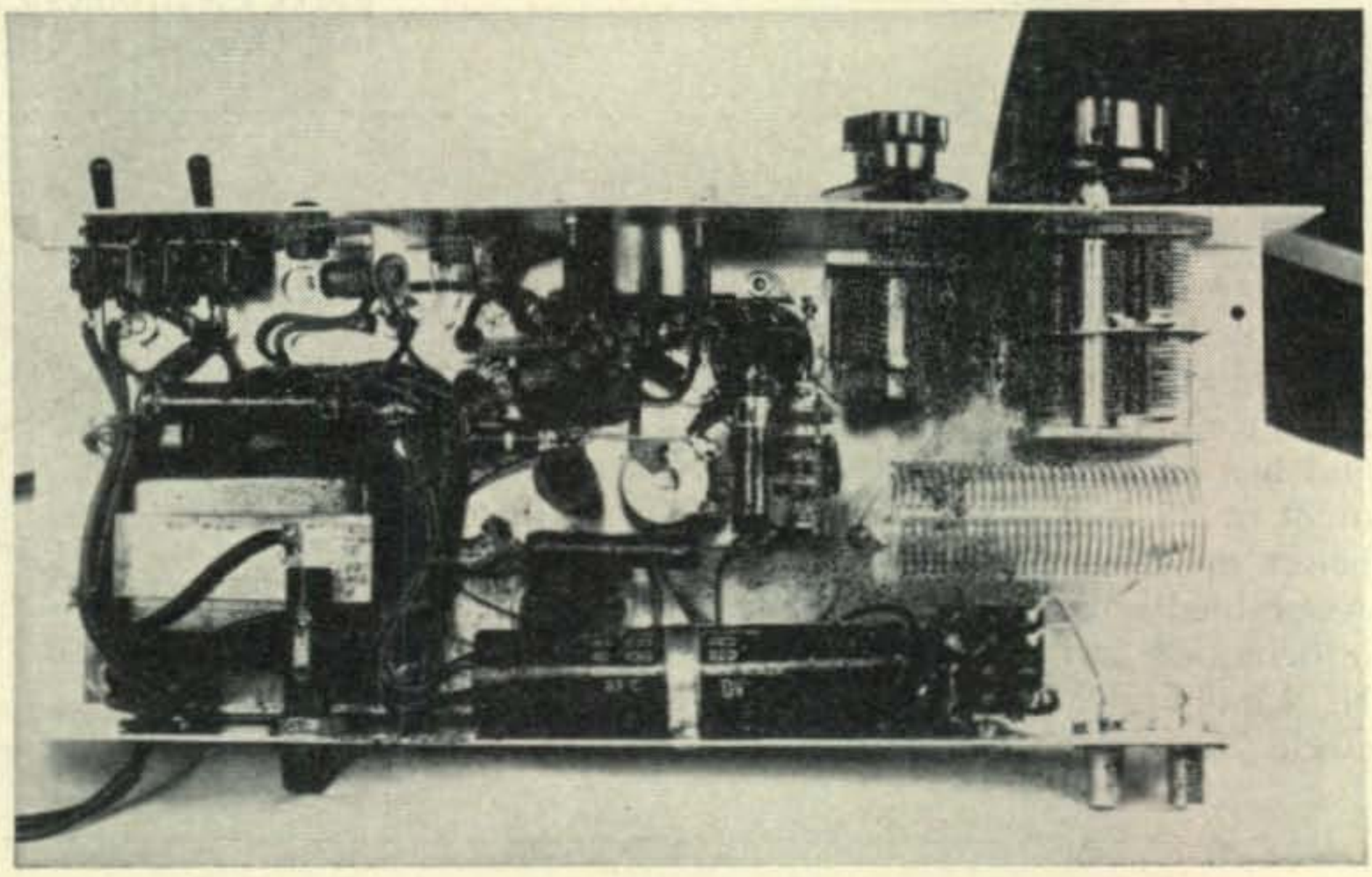
After the parts are mounted you can proceed with the wiring. Follow standard wiring techniques as explained in the *CQ* article by Bill Scherer[3]. Recheck your wiring when complete and test the transmitter as described below.

Testing

Plug the line cord in to the a.c. outlet and turn the power on. Observe to see that the filaments light and pay careful note to the 5R4 rectifier. If there is any blue flashing in this tube, shut down immediately as there is probably B plus short somewhere. If no trouble is indicated and all tubes light, proceed as follows:

Turn the SEND-RECEIVE switch (it controls relay K_1) to the SEND position. Do not depress the key yet. Now V_1, the oscillator, is powered and if it is operating its signal can be picked up on a

[3]Scherer, W .M., "Tool and Workshop Practices for the Radio Amateur," *CQ*, Nov. 1963, p. 30.



Bottom view of the 40 meter Novice transmitter. The power supply occupies the lower left of the chassis. The pi-network is in the upper right corner. The relay can be seen just below the pi-net coil, L_2.

receiver. Set C_1 at half mesh and tune the slug of L_1 for maximum output as shown on the receiver's S meter. Now, when crystals are changed the tuning may be touched up with C_1.

Connect a dummy load to the antenna terminals. This may be a 50 ohm non-inductive resistor[4], or a 30 watt light bulb. The resistor is preferable. Fully mesh both capacitors C and C_3 and press the key. A reading will be shown on M_1 and immediately tune C_2, PLATE TUNING, for the lowest possible current. This is generally referred to as a "dip."

Now, gradually start to unmesh C_3, the LOADING CAPACITOR, and the plate current, as indicated on meter M_1, should rise. Bring it up to about 100 ma. Re-dip C_2 and again bring the plate current up to 100 ma with C_3, redipping C_2 again. The last adjustment is always the dipping of C_2.

If the output of the 6AG7 oscillator is low due to a sluggish crystal it may only be possible to load up the plate current to as little as 60 ma. Actually it may fall somewhere between 60 and 100 ma.

If things appear satisfactory at this point substitute the antenna for the dummy load. A good antenna for this transmitter is shown in fig. 3. Be sure to check the frequency to make certain you will not interfere with any QSO while tuning up. With the antenna connected and the frequency clear, depress the key and proceed to dip with C_2 and load with C_3 until you are up to no higher than 100 ma of plate current.

Because the transmitter is operated on forty meters a two section 365-365 mmf tuning capacitor is used for C_3. If the rig is put on 80 meters a four section capacitor would be required and C_2 would have to be increased to 250 mmf.

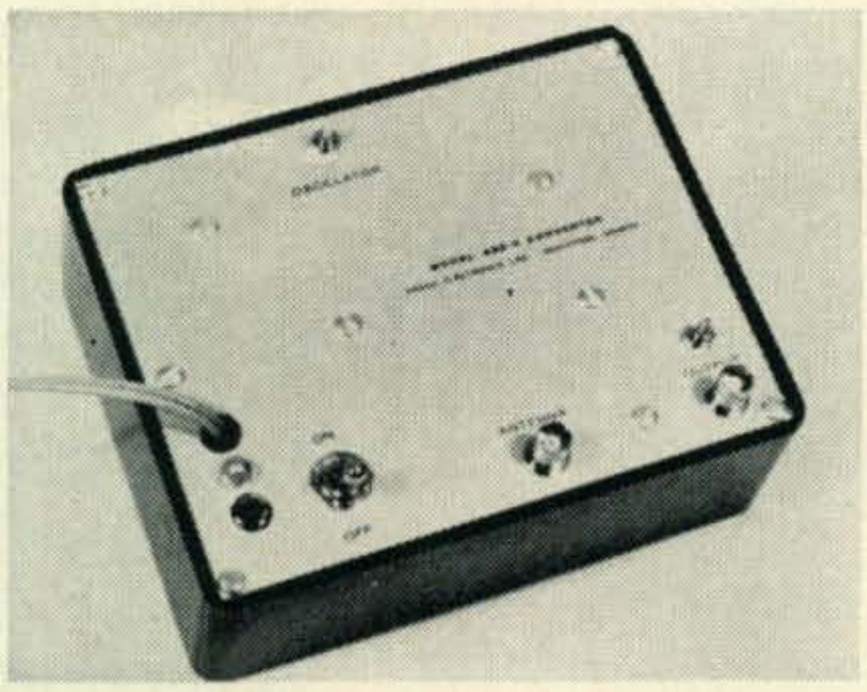
Sometimes it is very helpful to use a field strength meter to show maximum output. Again, several articles on the construction and operation of f.s. meters have been published and some are listed below. [4,5]

The transmitter is reasonably safe as nothing is exposed except the tubes. These may burn you as they do get quite hot. If it is necessary to work under the chassis do so with the plug pulled from the outlet. The a.c. line is more deadly, in many instances, than the 375 volt B plus.

Be sure the chassis is connected to an earth ground for safety reasons and also because it frequently helps the performance of the antenna system. ■

[4]Chapin, W., "The Transmitter Tune Up Box, *CQ*, Nov. 1964, p. 47.
[5]Turner, R., "Taming the Diode F.S. Meter," *CQ*, Feb. 1963, p. 44.

New Amateur Products

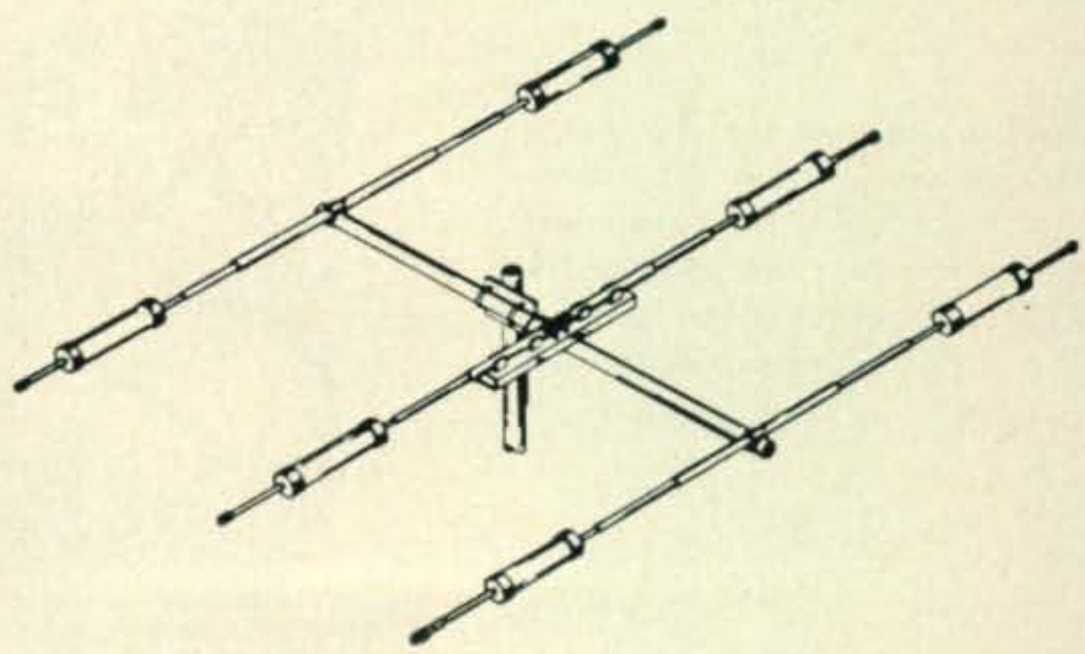


Parks 432-3 Converter

THE Parks 432-3 converter is a solid state converter for 432 mc which features: all solid state design, zener regulated a.c. power supply, low noise front end —4 db or less, high image and i.f. leak through rejection, and excellent stability. The unit uses T.I. XMO5's in the front end, silver plated tuned lines and silver plated air-dialectric tuning capacitors. It is available in a variety of i.f. ranges and sells for $49.95. For further details write to Loren Parks, Parks Electronics Lab., Route 2, Box 35, Beaverton, Oregon, or circle 69 on page 110.

Mosley Electronics

A new addition to the Mosley line of antennas is the Classic 33. The new beam has wider spacing and power ratings of 1 kw a.m./c.w. and 2 kw p.e.p. on s.s.b. It is fed with 52 ohm coax, and has an 18 foot boom with a maximum element of 29 foot. The front to back is 20 db or better on 15 and 20: and 15 db on 10 meters. Assembled weight is 60 pounds. For complete information write to: Mosley Electronics, 4610 N. Lindbergh Blvd., Bridgeton, Missouri, or circle 70 on page 110.



BY SYLVIA MARGOLIS*

"I'VE bought a Mille Miglia Maserati," wrote Cal, K6IWG, from Italy, "and she's a beaut!"

His year in Australia had made a regrettable mark on his all-American vocabulary. He drooled on about the Maserati, how handsome and accomplished she was, what a thoroughbred. Stirling Moss himself had driven her, she could reach two hundred miles an hour, she was this and she was that. And he had met a Dutch girl and they might be getting married.

Our interest in the Maserati was purely academic. After years of experiment with the suppression of standard production cars, the Maserati presented a challenge which would surely test every resource of the experienced "Mobile News" Investigation Team. Suppression was a consideration which concerned every mobile operator. If we could tame the Maserati —and it was essentially a theoretical problem, for nobody in his right mind would want to install mobile gear in the monster, presupposing he was in his right mind in the first place to buy the thing—but if we could whip the big brute into even a degree of submission, then there was no ordinary car that could beat us.

Then Cal wrote he was coming to London to get a top made for the Maserati. And the Dutch girl was coming too, so in between fixing the Maserati, they might get married in London.

We chatted up a few friends who knew all about such things. What mobile gear would you suggest installing in a Maserati? And what antenna? What about power supplies? Is the Maserati negative-grounded or positive-grounded? And how long do you need to live in Britain to have established residence so that you can get married?

At seven o'clock on a cold, wet, dark, mean-spirited Sunday morning, the telephone by our bed exploded into obscene peals of morning glory. Maurice picked up the receiver and grunted. Such a call could mean only sudden death, atomic attack, mayhem, bankruptcy or, at the very worst, Cal's arrival.

"Immigration Officer, Harwich, here, Sir," said an indecently cheerful voice. The man could afford to be cheerful. He had hurled us out of our warm, Sunday-morning cocoon of sleep and that had just about made his day.

"Sorry to trouble you, but we have a Mr. Niles Frederick Moss here, a United States citizen. He has brought a—well—a car—with him and needs some British currency for Customs clearance. He says you are holding a sum of money for him. Can you confirm that?"

Maurice's first impulse was to allege that the Captain of the "Mayflower" had made a grave error of navigation in 1620, that we had never heard of Mr. N. F. Moss, that the only cash he was holding for anybody was the inordinately large amount which was due to go to the Taxation Department, destined no doubt to pay the salaries of inconsiderate and unnaturally inclined Immigration Officers. Further, he would suggest that the aforesaid Immigration Officer fling the aforesaid Mr. N. F. Moss back into the sea, from whence he had come.

But I kicked him under the blankets, so he agreed to guarantee the entry of this United States citizen into our Sceptr'd Isle.

During the 80-mile drive, through drenched, frozen countryside, we argued spitefully about whose friend Cal was—Maurice's or mine. At Harwich the Immigration Officer gladly passed us over to the Customs Officer, who gladly showed us where Mr. Moss was lurking in the empty Customs shed, with a police guard. We

EL7B, Niles ("Cal") Moss, home call K6IWG, signs the marriage register.

*95 Collinwood Gardens, Clayhall, Ilford, Essex, England.

looked at what he had brought with him and a slow grin spread across Maurice's face, forgotten the rude awakening, the bitter cold.

Maserati be blowed—the Dutch girl was really gorgeous—handsome, thoroughbred, low mileage, superb condition, perfect bodywork, lovely upholstery.

We led the way back to London. The heads of the few people in the streets turned predictably and sharply, as if on puppet-strings, as the red Maserati, with the blond girl, zoomed past. On good stretches of road, we held back and let the Maserati show her paces. A couple of Jaguars and an Aston-Martin tried it on for size. We let Cal have them. He chewed up the bits and spat them out disdainfully. Then there was a brief, frustrating interlude when a magnificent Rolls Royce joined us for a few miles, but the chauffeur, effete minion of a decadent capitalist system, chickened out and turned off into a by-road.

Maurice switched on the mobile and worked an insomniac in Rhode Island. He explained that K6IWG was following behind in a red Maserati, with a blonde Dutch girl. The K1 wanted to know what was her brake horse power.

My younger son had intended to charge his school friends a penny a view of the Maserati, with a percentage, a very small percentage after the deduction of expenses, to go to charity. He'll go far, that child. But after one look at the Maserati, he decided that the real money lay in letting his friends pay a penny for a peep at Cal's blonde Dutch girl.

We put the Maserati in the garage and, truly, we did think about it often. But meanwhile there was a wedding to be arranged, and fast.

But first things first. The Reciprocal Licensing agreement between the U.K. and U.S.A. had been signed, so we applied for a G-license for Cal. However, the necessary application forms were not yet ready. It was, after all, only ten months since the Postmaster-General's first announcement in Parliament that reciprocal licensing would be granted! So Maurice spent a most *interesting* hour on the phone with the G.P.O., to obtain permission for Cal to operate our own station temporarily, until the forms materialized. Bureaucracy relinquishes its authority grudgingly, but at last Maurice made them see it our way and permission was granted for Cal to operate the station G3NMR for seven days only. Thus he became the first U.S. radio amateur to be given permission to operate a private British amateur radio station. Americans had been able to operate exhibition stations since 4 July, 1963, and the concession to use a private station had been given to one Belgian in November, 1965. But Cal, as the first American, made history.

Now it was a question of how to lasso, rope and tie our wandering boy so that not only would the world know it, but the Bridegroom, too.

The next sixteen days may have been a sufficient period for Her Majesty's Government to accept as "established residence," but they were hardly time enough to fix a wedding. In Britain we are still old-fashioned enough to attribute a certain importance to marriage. It's notoriously difficult to get unmarried, but it's not all that easy to get married either. And as Cal's attitude to the wedded state was unduly flippant, we wanted to make it a *proper* wedding, with all the frills, so that he would take it seriously.

Wedding cake, backed with U.S., British and Dutch flags. All Cal's exotic callsigns are written on the frill.

January is a miserable month, when Christmas is over, the weather filthy, the flu virus rampant, the Winter Sales finished, January bills already dangerously gathering dust and months and months to wait before the sun comes out and the first Hamfest is due. A wedding would cheer us all up, for everybody loves a wedding, even radio amateurs, about whose claim to humanity there are distinct doubts.

First—the date—it mustn't clash with the production of "Mobile News," that week in each month when our home needs a wedding like it needs a hole in its head. Then the guest list, strictly limited by the size of the house. You can't get the whole of the British callbook, plus those itinerant W's and K's who happen to be in town, into a suburban home.

We listed the food and drink to be ordered. Nothing but the best—a whole side of Scotch smoked salmon and Bollinger '59, extra dry. We went into a huddle with the florist, who was delighted to talk orchids, and with the printer, up to our elbows in silver ink and bells, to show him how to set up the callsign, K6IWG, correctly on his block.

Only one shadow loomed over our happy home causing us all great sadness. A relay had blown and the home-station, G3NMR/G3UML, was out of action. We had taken the mobile rig out of the car and lashed it up for the time being, but it wasn't the same. Despite telegrams and progressively vituperative phone calls, nothing could be done to speed the passage of the new relay across the Atlantic.

"But it's for a wedding!" roared Maurice.

It's an olde Englyshe custom! left to right: G3BXI, G3UML, G3SUS, CE3VU, Anne and Cal Moss (K6IWG), G3OGB, AP2AD, G3KVF, G3BDH, G2BVN (President, Radio Society of Gt. Britain) and G3NMR. There are two father/son combinations in this picture—G3SUS is G3OGB's son; G3UML is G3NMR's son.

"Then I hope you'll be very happy!" they roared back.

Each participant on the wedding-day received a schedule, timed down to quarter-hourly intervals. A master-plan on the kitchen wall showed all the schedules, with routes marked on a map and a large crayon handy, so that we could plot everybody's movements.

Cal's mother had flown from Los Angeles and was staying at a downtown hotel. I had asked her to get some last-minute shopping, things I had not been able to buy locally. We needed fancy candles and small flags, British, Dutch and U.S., for table decoration. Ten minutes before her schedule signalled her as having reported for duty, she telephoned frantically, still ten miles away in the center of London.

"I've got the Dutch and American flags, honey, but where the hell in this town am I supposed to find a British flag?"

The night before my whole family had taken baths, an extraordinary circumstance on which Cal inevitably remarked, for it is a most un-British thing to do. Everybody knows that a brisk rub-down with a blubbery rag is all we British aspire to in Winter. But we tilted our bowler hats, twirled our umbrellas and dropped a few carefully barbed comments about California kilowatts, the American fone band and incentive licensing, which put him back to square one.

The milkman arrived and we called him in to wet the Bridegroom's head.* Then the florist arrived with the flowers and he came in to wet the Bridegroom's head, too. So did the man who brought the beer, the telegram delivery boy, three neighbors whom we hadn't yet antagonized because they have no television, a political candidate who was canvassing the area for votes and who understood that we were all going to vote for him at the next election and another man who, everybody thought, was a friend of somebody else and who had a simply marvellous time.

*To drink to the Grooms' health.

By now the house was in chaos with all the visitors helping to shift furniture, polish glasses, arrange flowers, answer the phone, open telegrams and, of course, wetting the Bridegroom's head. Outside in the street stood a row of cars, so enthusiastically decorated with white bridal ribbons that you could hardly see the mobile antennas.

My sons put on their white shirts, best suits and brushed their hair, but they bucked at the cabbage-sized white carnation buttonholes, all tarted up with silver foil and fern. For once in their lives in fraternal harmony, they declined to deck themselves out thus, saying, with folksy Cockney humor, that they would look like a couple of right Charlies.

By then I was in no mood for any kind of humor, but I put the situation to them as prettily as I could, like threatening that if they didn't wear the nice flowers, there would be no, repeat no, amateur radio for a whole month. They said they would leave home.

"Good," said Maurice, "then I will be able to get a word in on my own transmitter, instead of having to make an appointment for a vacant minute."

Cal's mother arrived. She had cornered the market in candles—big ones, small, thin, thick, curly, straight and some shaped like wedding bells. There were enough candles to see New York through its next power failure. She had found a British flag too, so that the set was complete. Secretly we measured the flags with a micrometer and they were all the same size, which was just as well.

Then disaster struck. Maurice and Cal were still unshaven, dressed in old pants and indescribable sweaters when the postman arrived. After he had wetted the Bridegroom's head and handed me the usual batch of goodies, like bills, editors' rejection slips and rare QSL's wrongly addressed to us, he delved to the bottom of his bag and brought out a small packet. It was the missing relay.

Everything had to stop, space was cleared for action, out came the meters, circuit diagrams and soldering iron. I ventured to say that it wouldn't look nice going to a wedding dressed like that and they replied, *coldly*, that it would look even less nice to have a wedding without an all-systems-go rig.

I put on my new suit and the mink hat and tie that Maurice had bought me to wear at the wedding. Then I put on the lovely spray of flowers that Cal had bought for me, trying hard to forget his uncalled-for remark that I must be just about the oldest Bridesmaid in the business.

Maurice and Cal were still making with the soldering iron, with the solder slurp-slurp-slurping onto the carpet. I pointed out that it was unlucky for a Bride to arrive for the ceremony before the Bridegroom and they told me to go rev up my broomstick.

At last it was done. They put out a CQ and

back came two VK's and a ZL, all 5/8. Maurice explained, regretfully, that he would have to go QRT for a while, as Cal had to get married, but they would soon be back on the air, so would the other stations on the frequency please QRX.

The wedding was lovely and I cried. I always cry at weddings. The Bride looked so serene and ethereal and far too beautiful to be wasted on a radio amateur. Poor girl! Would she be able to stand it? The noise, the mess, the delayed meals, having to spend the rest of her life with the wives of other radio amateurs? Was it too much to ask of a girl?

The President of the Radio Society of Great Britain, G2BVN, Roy Stevens, came to the party that night. So did a lot of other people, including CE3VU and AP2AD, who happened to be in London. The wedding cake was decorated with a toy covered wagon, bearing a mobile antenna, and on its frill were all Cal's exotic callsigns—YA1IW, EL7B, HC2IW, HC6IW.

The local paper sent a reporter. He listened to our discussing the latest anti-ham insult published by one of our large dailies, which is so notorious for its unkind attitude towards amateur radio that we think its founder, may his dear soul rest in peace, must have been frightened by a transmitter as a child. The reporter was so impressed by our talk of lawsuits, misrepresentation and defamation of character, that he subsequently checked the details of his story with me over the phone, an unheard-of step, and it was one of the best and most accurate write-ups on amateur radio we have ever seen.

One thing distinguishes a radio amateurs' party from a normal party. There is no music. Music would constitute QRM and what would be its purpose? The men are far too busy to dance, engrossed as they are in comparing the lengths of their antennas.

The only music we had was when they turned on the hi-fi, to demonstrate the complete absence of break-through from the transmitter.

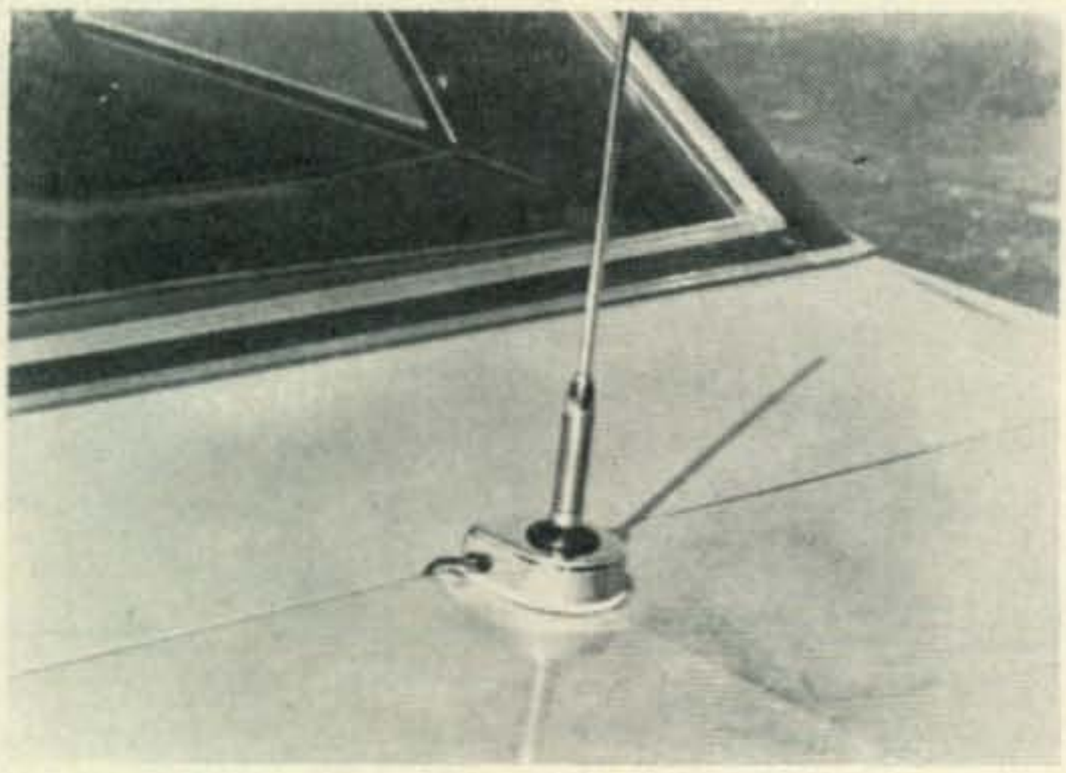
The Bride cut the cake and we all drank champagne and the President of R.S.G.B. made a graceful speech and I cried. They worked a W2 who said his wife was crying too, because it sounded like a beautiful wedding. Then there was a bit of real excitement, because an FL8 came up on fifteen. Those who lived nearby rushed off home to work him. When they returned, we drank more champagne to celebrate having worked him. Those who lived too far away to go home, drank champagne to compensate for not having worked him. It was a lovely party.

At 2:30 in the morning we took a final count of the people left in the house. There seemed to be only ourselves. We looked carefully under all the tables to make sure they had all gone home, then we went to bed.

The morning was cold, wet, dark and mean-spirited. At 7 o'clock the telephone by our bed rang. It was the Immigration Officer at Southhampton.

He never did get the chance to say what he wanted to say. ■

New Amateur Products



E-Z Mobile Antenna Mount

THE E-Z Antenna Mount Company features a novel approach to securing that mobile antenna without drilling holes in your car. The mount easily clamps on the rear portion of the trunk lid. It is priced at $8.95. For further details write to them at: P.O. Box 277, Algonac, Michigan, or circle 68 on page 110.

Semitronics Corp.

SEMITRONICS CORP. has just released its new semiconductor Interchangeability and Replacement Guide. The chart is priced at 25¢ from the Semitronics Corp., 265 Canal Street, New York, N.Y. For more information circle 67 on page 110.

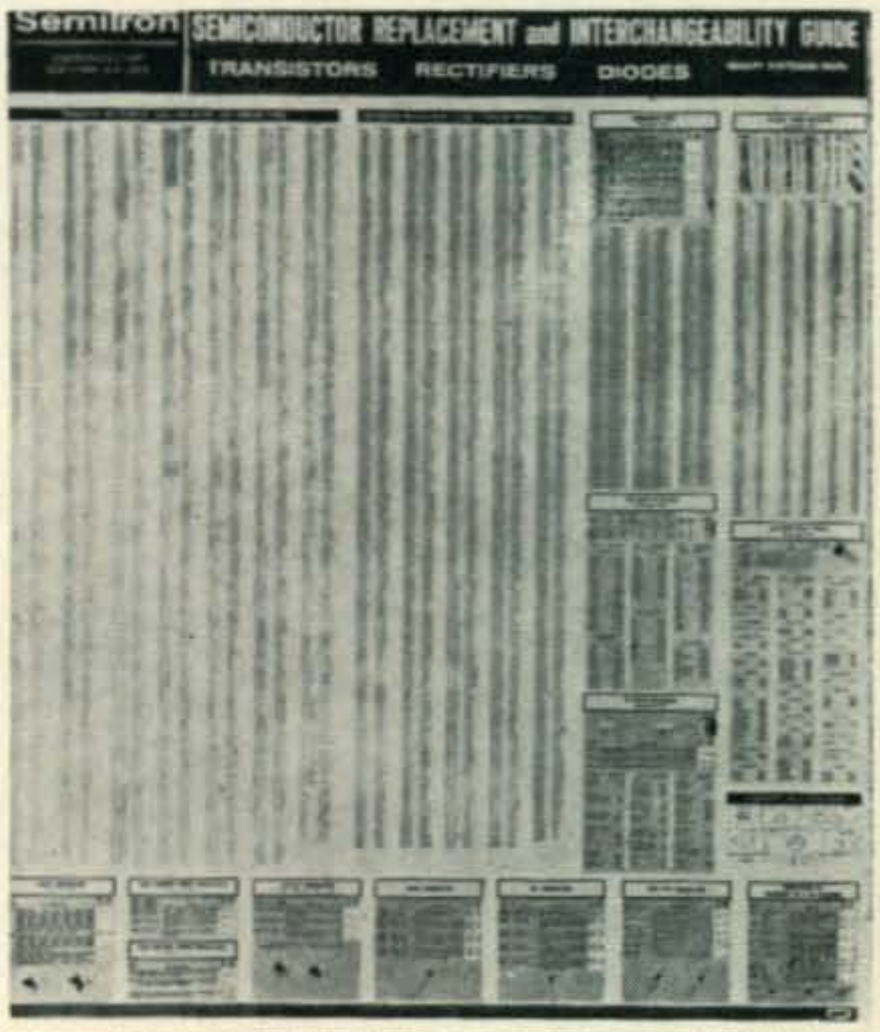


Fig. 1—Inexpensive phono-type connectors like the one on the back of this kit transmitter are adequate for hi-fi applications, but are highly undesirable for r.f. applications. Accidental damage to the connector and dielectric occurs easily, and could possibly result in a blown final due to a shorted output.

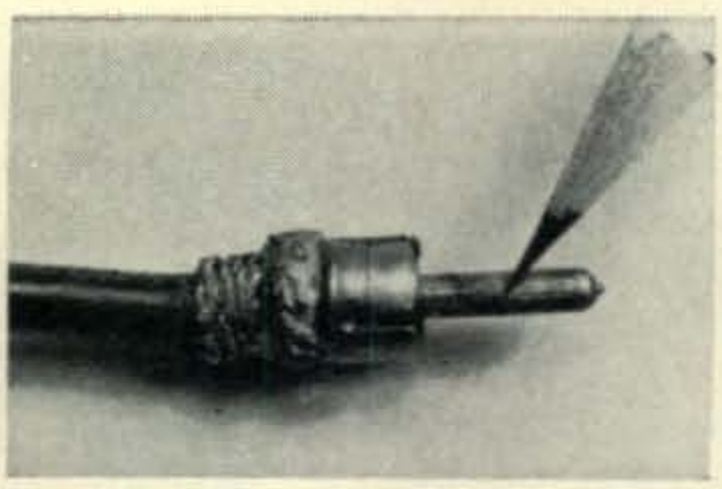


Fig. 2—Flimsy phono plugs like this one are trouble sources because they are not designed for r.f. applications. Shorting between the braid and center conductor may occur because of poor separation between shield and pin. Also, environmental abuse can loosen the fit of the shield over a chassis connector.

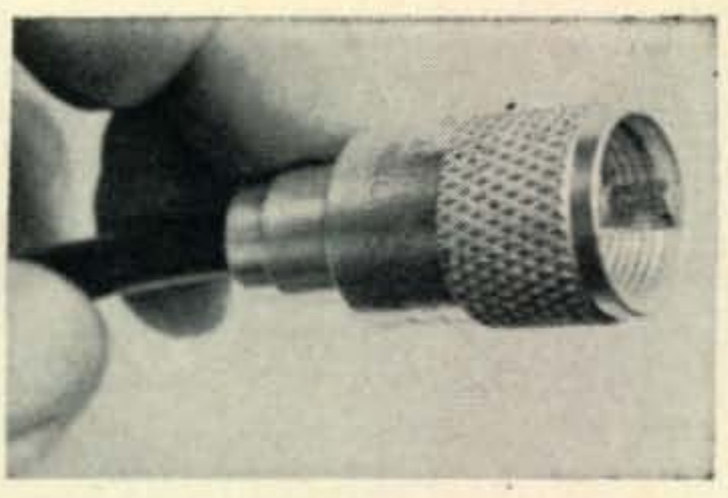


Fig. 3—This is the UHF-type connector most popular with amateurs conscious of the need for adequate r.f. connectors. Although well machined and offering good protection from accidental disconnection on low- and medium-power rigs, UHF-type connectors are low in cost and easy to install.

A Close Look At
Connectors

BY FRANK MacKINNIS,* WB2INM/1

The selection of proper r.f. connectors when building equipment is generally left to chance or the junk box. The author, an authority on r.f. coaxial connectors, has pin pointed the dangers in the use of inadequate connectors as well as introduced several models and applications probably not familiar to some amateurs.

"CONNECTORS?—Oh, I'll grab a couple when I pick up the chassis and some bolts."

Unfortunately, that's the impunity with which most radio amateurs select the coaxial and power connectors they use. And amateurs aren't the only ones responsible for the inadequate, often under-rated connnectors which appear on amateur gear and cables. Some kit and equipment manufacturers set a poor example by flagrantly disregarding these not-so-lowly items of "hardware."

No one would think of putting a tin-sheet buckle on seat belts, no matter what the dollar savings might be—because when seat belts are needed most, they're only as strong as the buckle connecting them. And yet, both hams and equipment manufacturers often disregard this philosophy when it comes to connectors.

*Amphenol Borg Electronics Corp., 33 E. Frankiin Street, Danbury, Conn.

Fig. 4—A handy connector unknown to most amateurs, this right-angle u.h.f. plug makes it easy to connect cables to chassis connectors on the back of low- and medium-power equipment. A right-angle plug is shown as it is connected to the back of an antenna tuner.

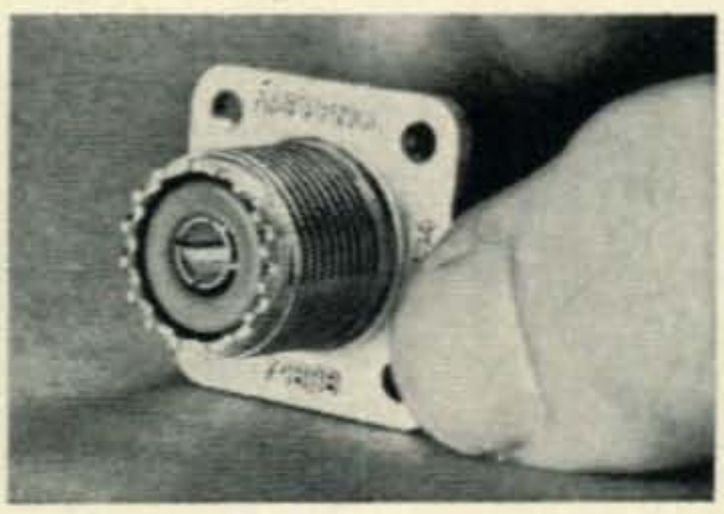


Fig. 5—The most common type of u.h.f. chassis connector, the SO-239 is a mica-filled, bakelite-insulated model with excellent environment-resisting characteristics. Like all UHF-type connectors, it is made of silver plated brass. These two metals provide a rugged combination.

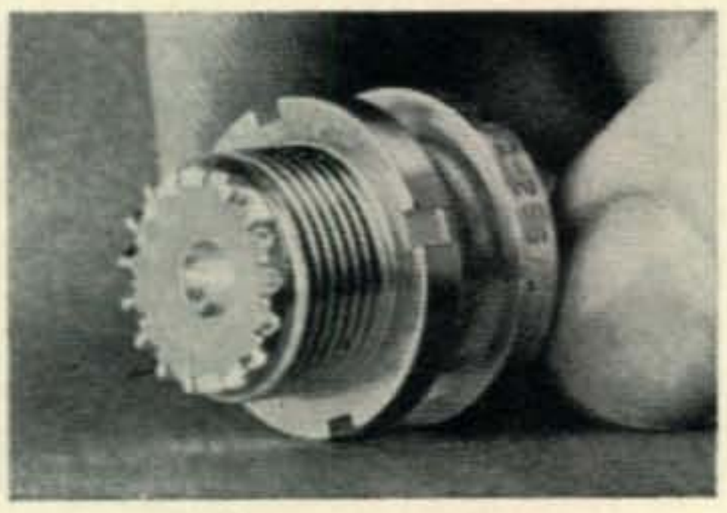


Fig. 6—An excellent choice for converting rigs with phono connectors to safer u.h.f. connectors, this bulkhead receptacle can be installed on commercially-built gear merely by enlarging the chassis hole left after removing a phono-type connector. It is very simple to install.

Phono Connectors: Cheap Trouble-Makers

The phono-type chassis receptacle (fig. 1) seen on some of the most sophisticated s.s.b. transceivers, and practically all kit transmitters, is the best example of expensive penny-pinching. These tiny shielded plugs are adequate for hi-fi, where voltages range in the microvolt levels for which the plugs were designed. But thousands of hams try to force 200 watts p.e.p. and more through these tiny sockets and plugs—power levels far beyond the capabilities of the dielectric and the conductor spacing.

Little better are phono connectors with ceramic dielectrics. Although providing somewhat better protection against breakdown, they still possess several characteristics which make them highly *un*desirable for r.f. applications.

Because the plug shields depends on a friction fit over the female chassis receptacle, a considerable strain is put on the dielectrics of both connectors whenever the slightest tension is put on the cable to which the plug is attached. The process of mating and unmating these plugs and sockets, combined with cable strains on the mated connectors, can crack dielectrics and short out the conductors.

Another danger exists with phono-type connectors: they are easily damaged by mating and unmating, and by such mundane environmental calamities as being stepped on. Since the connection depends upon the pressure of the plug shield against the chassis receptacle, a damaged shield may permit connectors to unmate without being detected. This does no damage if the connectors link a receiver to a coax relay—but if they link a final amplified to an antenna, real damage can occur.

A third danger exists—the possiblity of braid-to-conductor shorting. The simple nature of the plug makes it practically impossible to solder the braid to the shield without risking a short. The distance between the braid and the center conductor depends upon the neatness of the person preparing the cable for the plug. Tiny slivers of braid can easily short out the connector, causing that strange insensitivity in receivers and those blown final amplifier tubes.

Emerging from this example of poor connector selection are several basic criteria each ham should consider in picking a connector.

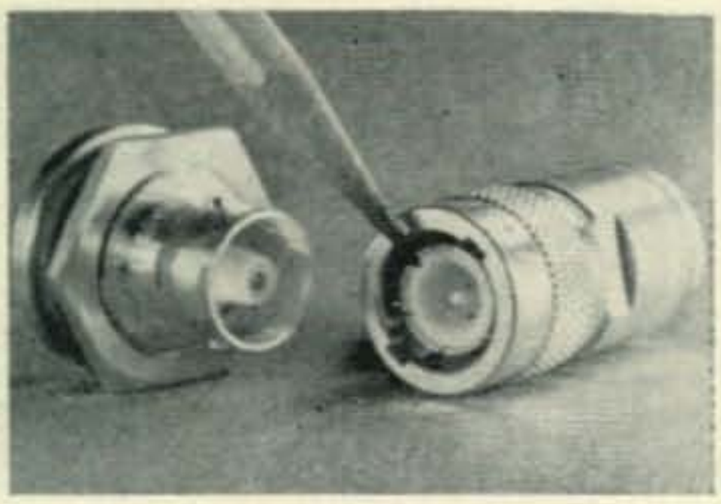


Fig. 7—For the amateur running high power, and even medium power above two meters, the protection of "C" type connectors is highly recommended. The secret to the low s.w.r. and high-power capacity of these connectors is in the dielectric design. The "C" connector is also good for power applications, and as a weatherproof connector. The assembly technique is shown in fig. 11.

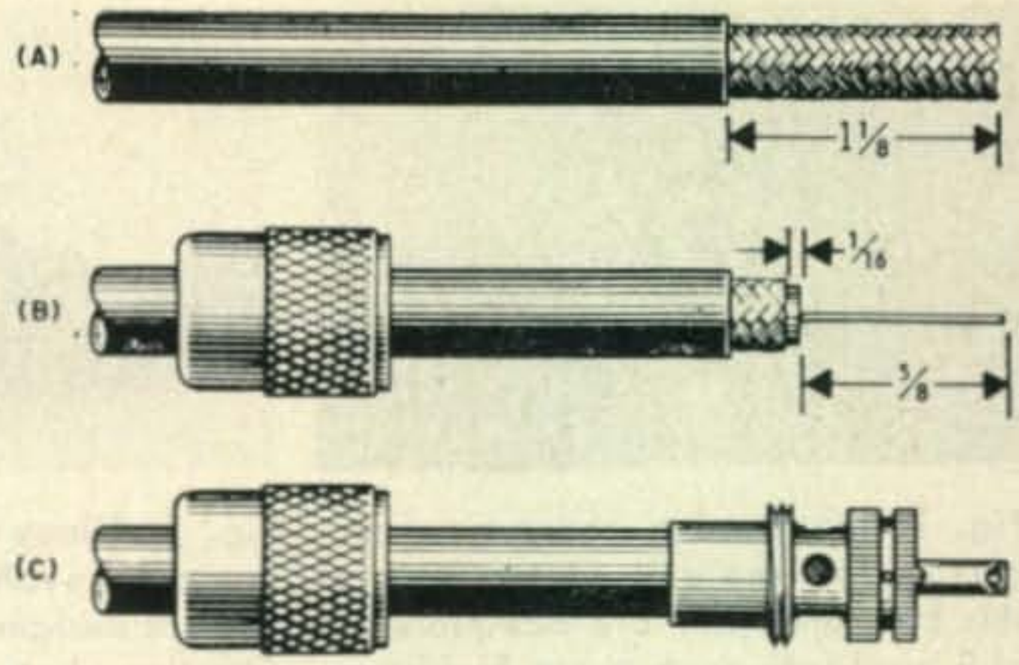


Fig. 8—Instructions for connecting UHF type connectors to RG-8/U (top) and RG-58/U coaxial cables. Amphenol plugs, type 83-1SP and 83-822, are described on top. In (A) the vinyl jacket is cut back 1⅛" (for 83-1SP remove 1¼"). Prepare the center conductor, insulation and braid as shown in (B). Slide the coupling ring on the cable and tin the center conductor. (C)—Screw the sub-assembly on the cable and solder to the braid through the solder holes. Also solder the center conductor to the contact pin. Do not use excessive heat Screw the coupling ring up on the sub-assembly.

1. *Electrical*: Dielectric and conductor spacings must be capable of the maximum voltage and current to be passed at operating frequencies.

2. Physical: The connector structure must be able to withstand the harshest physical demands which might be made on it, which include mating and unmating abuse and environmental abuse.

3. Environmental: Weatherproofing (where necessary).

4. Speed of Disconnection and Connection: For power applications, quick-disconnect. For r.f. application, most positive connection.

5. Size: Connectors may have space limitations on chassis, *etc.*

Probably the commonest connector for low frequency amateur use—other than the phono-type—is the UHF series (Amphenol 83-1SP), illustrated in fig. 3. Designed for non-constant impedances and medium-power r.f. applications, they are good general-purpose connectors when line unbalance and slightly increased standing wave ratio are not important. The center conductor is insulated with either mica-filled bakelite or Teflon.

Space and Patience Savers

U.h.f. plugs work well when there's plenty of room behind the equipment to which they are attached. But if you've ever tried to couple a connector to its receptacle in tight areas, you'll appreciate the little-known angle plug (Amphenol 83-1AP) shown in fig. 4. Not an easily-misplaced right angle adapter, the angle plug simplifies the connection of coaxial cable to receptacles on the backs of equipment.

The common receptacle used with u.h.f. plugs is the military-designated SO-239 (Amphenol 83-1R), illustrated in fig. 5. It requires four ⅛" mounting holes, and a ⅝" hole for the receptacle itself.

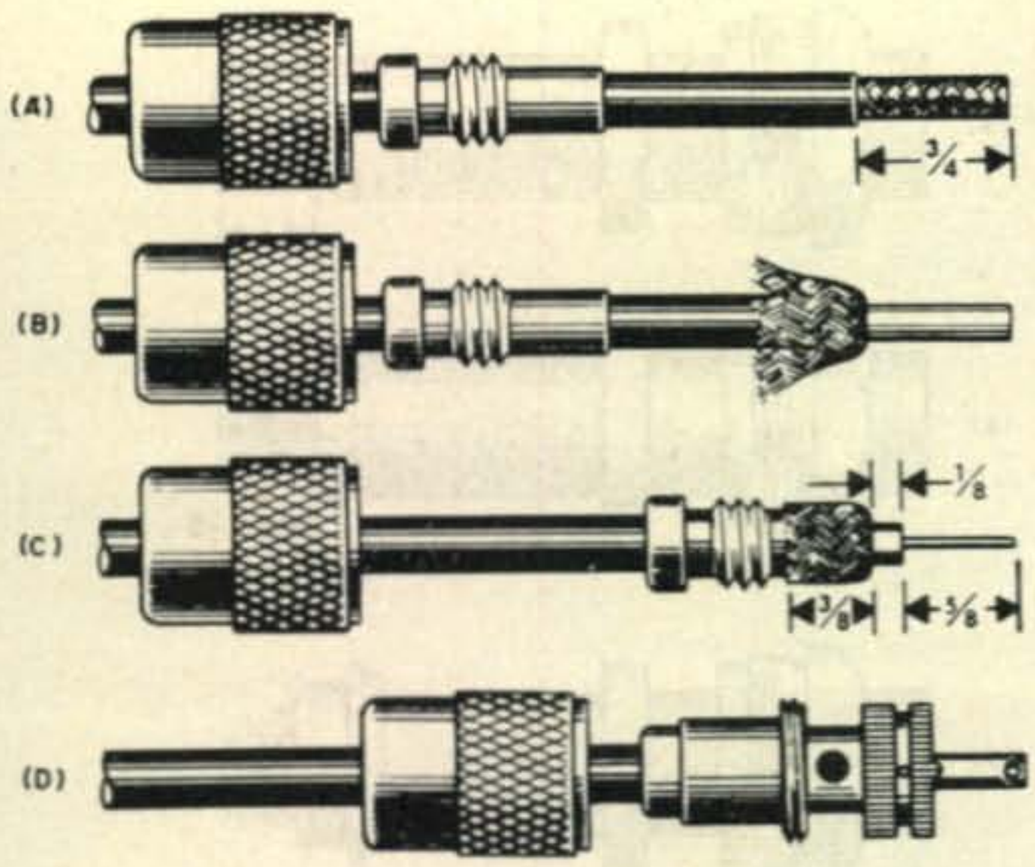


Fig. 9—Instructions for connecting Amphenol 83-1SP, 83-822 and 83-750 connectors to RG-58U, using the 83-168 or 83-185 adapter, is shown above. In (A) the coupling ring and the adapter are placed on the cable and the vinyl jacket is cut back. In step (B) the braid is fanned out and folded back. Position the adapter to the dimension shown in (C) and trim the braid as shown. Screw the plug sub-assembly on the adapter and solder the braid to the shell through the solder holes. Be sure to use enough heat to bond the braid to the shell. Solder the center conductor to the contact pin and screw the coupling ring on the plug sub-assembly.

Drilling and mounting the SO-239 can be a tricky job on a blank chassis, and even trickier if you've decided to put one on an already-built piece of equipment. Before drilling five holes in a piece of commercially-built gear, check to see if you need *all* the features of the SO-239. The four mounting holes make possible the installation of a shielding hood (the flange) on the back of the receptacle. If the receptacle is to be used in a piece of v.h.f. or u.h.f. gear, if it will be close to unshielded power cables, or close to interstage wiring, this hood is important. Without it, the r.f. circuit isn't really "bottled up."

But if interstage coupling is unlikely, and if the cable runs a safe distance from power cabling, the SO-239 and hood is unnecessary, and a bulkhead-type receptacle (Amphenol 4575), with a large threaded nut instead of a mounting plate, makes an excellent substitute. Because it mounts in a single hole, an old phono-type receptacle can be removed, its chassis hole enlarged to ⅝", and the new bulkhead-type screwed into place (see fig. 6). Just make sure to use substantial lock washers between the chassis and the nut, and between the chassis and the shoulder of the receptacle, so mating and unmating can't unscrew the receptacle.

There's More Than One Type

Although u.h.f.-type connectors are the most universally applied among the ham ranks, they're not as all-purpose as many believe. Let's take a look at typical u.h.f. connector characteristics:

Electrical

Impedance . . . non-constant (but good match on low amateur bands).

Frequency range . . . 0-200mc, (0-500mc with caution).

Voltage . . . 500 volts peak.

Environmental

Thermal limits, Mica-filled bakelite: —67°F to 300°F.

Weather protection . . . non-weatherproof.

Clearly, u.h.f. connectors are not the optimum type for use above 220 mc, nor are they the proper connector for carrying plate voltage into a kilowatt rig. And because of their non-weatherproof nature, they're unsuitable for any place where exposure to elements is involved.

The u.h.f. enthusiast running high power might consider switching to a connector without the frequency limitations of a u.h.f. coaxial connector. A "C" connector such as Amphenol's 82-530 (Fig. 7) offers low v.s.w.r. up to 10,000 mc, as well as constant 50 ohm impedance, providing a much better match to 52 ohm coaxial cable. The combination of these factors, along with a 1,500-volt peak and 3,000-volt r.m.s. rating, make the "C" connector excellent for high-power u.h.f. and near-microwave applications. The "C" connector is just one of many connectors with higher voltage ratings than the UHF type.

Weatherproof Connector

The weatherproof connector is practically unheard of among amateurs, yet there are many instances when it could simplify a normally difficult job.

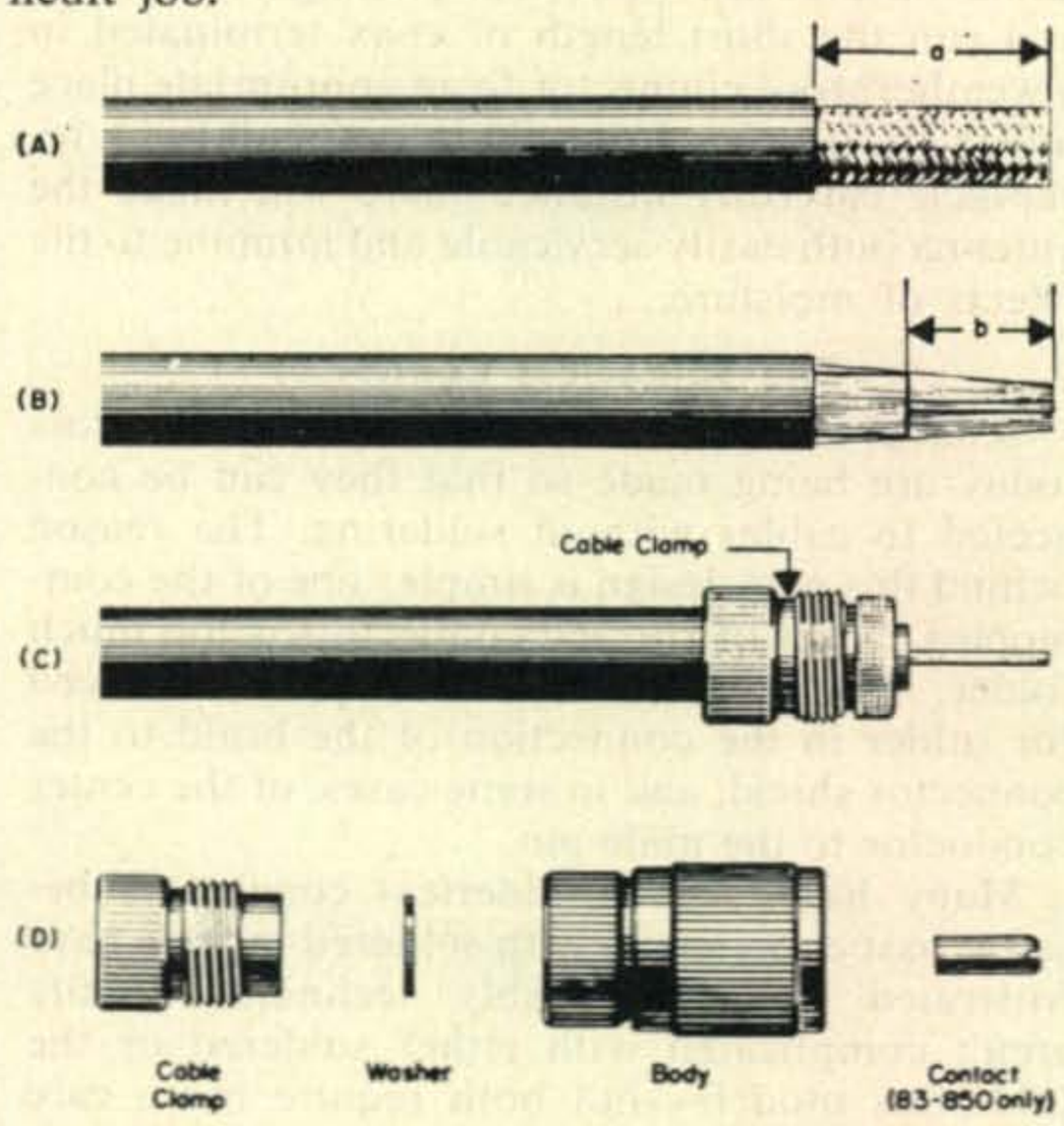


Fig. 10—The proper assembly instructions for solderless and semi-solderless connectors, Amphenol 83-850 and 83-851 are shown above. Trim off the vinyl jacket as shown in (A). For the 83-850 dimension *a* is 15/16" and for 83-851 it is 31/32". Comb out the braid as shown in (B) and cut the dielectric so the dimension *b* is 35/64" for type 83-850 and ⅝" for type 83-851. (For the 83-851 only, pre-tin the center conductor.) Taper the braid forward as shown. Screw the cable clamp onto the jacket of the cable so that the inner shoulder butts up against the end of the vinyl jacket. Fold the braid back over the cable clamp, trim and smooth out as shown in (C). Place washer into body cavity and screw the body tightly onto the cable clamp. For the 83-850 only, screw the contact on to the center conductor. For the 83-851, soft solder the center contact quickly and carefully to avoid damaging the insulator.

Take the old problem of getting a coax feedline into the shack—hams have labored long over elaborate tarred-pipe monstrosities, giant ceramic wall-penetrating feed-throughs, etc. But, a straight-through feed-line isn't the answer.

The answer is weatherproof bulkhead connectors. Merely drill a one-inch hole through all but a quarter-inch of the shack window frame, then drill a centered ¾" hole through the last quarter inch. A "C" bulkhead adapter will seat perfectly in the ¾" hole, offering a weatherproof fitting on both sides of the window. Rain, sleet, and snow won't affect the exposed connection, and you'll be able to connect a new feedline to the bulkhead adapter at a moments notice.

Another application for weatherproof connectors is between a bumper-mounted mobile antenna and the car body. Too many hams fail to weatherproof the base of their bumper-mounted antenna because to do so would make its removal for servicing a difficult task. So they leave the base connection exposed, and punch a hole in the bottom of the trunk for the antenna cable. The result is corrosion both at the base of the antenna and at the punched hole. The latter is merely annoying, but the former can result in unstable loading and high s.w.r. due to moisture and r.f. leakage, especially in coastal areas.

The solution is simple—waterproof the antenna base connection with potting compound, and run the short length of coax terminated in a weatherproof connector to an appropriate place under the trunk. A weatherproof bulkhead receptacle carefully installed there will make the antenna both easily servicable and immune to the effects of moisture.

The Solderless Connector

A large number of r.f. and power connectors today are being made so that they can be connected to cables without soldering. The reason behind this new design is simple: one of the commonest causes of shorted connectors is too much solder. The new connectors eliminate the need for solder in the connection of the braid to the connector shield, and in some cases, of the center conductor to the male pin.

Many hams select solderless connectors because past experiences with soldered models have frustrated them. Assembly techniques really aren't complicated with either soldered or the solderless models—but both require more care than that normally given them.

Common varieties of UHF connectors are designed for use with coaxial cables about a half inch in diameter, such as RG-8/U. Figure 8 shows how to connect a soldered plug to RG-8/U, and fig. 9 shows RG-59/U-size cable. The reducing adapter used for RG-58/U in fig. 8B is very important because it firmly grips the cable, distributing excessive strain on the brand and conductor to the jacket and plug assembly.

Figure 10 illustrates the proper assembly procedure for solderless and semi-solderless connectors. Both connectors use a washer to firmly clamp the combed braid against the connector shell. But the solderless plug uses a screw-on contact to hold the center conductor while the semi-solderless variety uses soft solder. Like completely soldered plugs, the solderless and semi-solderless models are designed for RG-8/U-sized cables. When RG-59/U-size types are used, they must be reduced with the proper adapter.

Whether you choose the soldered or solderless variety is quite unimportant from a safety point of view. Both have similar dielectrics and conductor spacing, and both are non-weatherproof. The important thing is that you take a good, hard look at your rig, and ask yourself the following

[*Continued on page 104*]

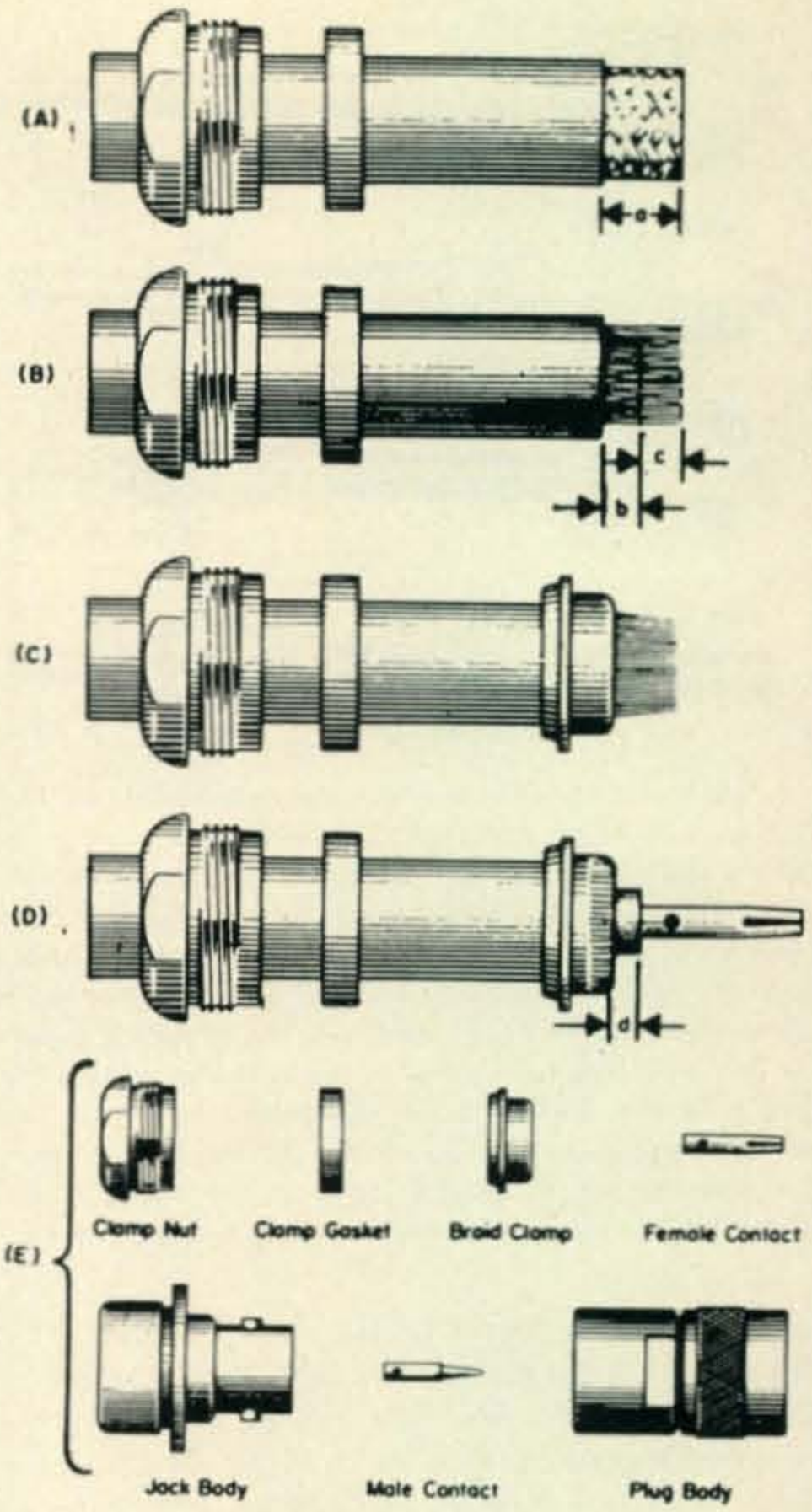


Fig. 11—Assembly technique for the Amphenol type "C" connector is shown above. This unit is suitable for high power above two meters and is an ideal weatherproof unit. Slide the nut and gasket over the cable as shown in (A) and cut the jacket to dimension *a*. For RG-8/U this is 5/16" and for RG-58/U, ⅜". Comb out the braid as shown in (B) and cut the insulator. For RG-8/U *b* is 5/32" and *c* is 5/32" while for RG-58/U *b* is 7/32" and *c* is 5/32". Pull the braid wires forward and taper them towards the center conductor. Place the clamp over the braid and push it against the cable jacket as shown in (C). Illustration (D) shows how the braid is folded back, trimmed and formed over the clamp. The contact is then soldered to the center conductor. Dimension *d* should be 3/64" for RG-8/U and 9/64" for RG-58/U. Insert the cable and parts into the connector body making sure the sharp edge of the clamp seats properly in the gasket; tighten the clamp nut. The component parts should be arranged in the order shown in (E).

Results of the
1965 CQ World Wide DX (Phone) Contest

BY FRANK ANZALONE,* W1WY

THIS year's contest should be titled "The Battle of the Giants." Not to take anything away from all the other activity, and there was plenty of it, but the "Big Guns" really planned for this one. There scores reached levels never before attained in contest operation. It's no longer a question of breaking a million, but how many million.

Rather than go into details regarding the standings of the leading stations, we have expanded the break-down by bands. A study of these charts will tell the story better than a dozen pages of explanation.

Luck was with us this year and George Jacob's prediction of possible good conditions materialized for most of the contest period.

The spirited rivalry between two groups in Caracas also settled the championship of the world. The same group that manned YV5AKU, last year's Champs, moved all their equipment, towers and auxiliary generator to a new location in the hills outside Caracas and came on the air with the new call YV5AFH. While the Radio Club Venezulano gang, YV9AA expanded its single transmitter set-up that won them top honors last year. Using the same location, a few hundred miles south into the interior, away from the shielding mountains and local QRM.

Both these stations had their share of problems and each is a story in itself, much too lengthy to cover here. Can you possibly visualize the planning, work and transportation problems involved in moving a complete station with five to six separate operating positions? It was a well deserved victory. Hail to the new Champion, YV9AA.

The XE2BC operation was also an elaborate DX-pedition setup planned by WA6SBO and K6EVR and moved south of the border to take advantage of all those 2 pointers north of them. They racked up the 2 pointers OK but fell short on their multiplier to make it pay off.

The ZD8AR group really had something going, but evidently were short on manpower and a little too far away to get the most out of the lower bands.

Stateside it was a ding-dong battle between the two perennial rivals, K2GL and W3MSK. Ed Bissell and his boys did just edge out Buzz Reeves and his gang by the narrowest of margins. And even though both stations were operating from their home QTH, there were weeks of planning and preparation put in by both parties.

The battle for single transmitter honors was also a very close one. With the advantage of all those 3 pointers north of them the ET3USA boys managed to nose out IØFGM group. The special call IØFGM was issued by the Ministry of Communications in commemoration of the 70th anniversary of the first radio telegraphic transmission, and was sponsored by the Fondazione Guglielmo Marconi. A group from Bologna headed by I1LCK, set-up a station in the very place, actually in the same room from which the first radio signals were sent by Marconi. A very noble enterprise which we at *CQ* are happy to be indirectly associated with.

According to schedule, CX2CO went all band this year. Need we say more? Another Trophy for the Champ from Uruguay. Ricardo will still give me an argument when I say that there are certain advantages in being located in the southern hemisphere, but regardless, it still takes a pro to roll up a record breaking score of that magnitude.

TROPHY WINNERS

Single Operator, All Bands, U.S.A.
Potomac Valley Radio Club Trophy
won by James L. Lawson, WA2SFP

Single Operator, Single Band (14 mc)
W2GHK, Stuart Meyer Trophy
won by Robert Lane, F7BL

Single Operator, All Band
W2SKE, Bill Leonard Trophy
won by Ricardo Sierra, Jr. CX2CO

Multi-Operator, Single Transmitter
W6YY, John Knight Trophy
won by ET3USA, Kagnew Radio Club
(Operators: WA3ELH & K4FMA)

Multi-Operator, Multi Transmitter
K2GL, "Buzz" Reeves Trophy
won by YV9AA, Radio Club Venezolano
(Operators: YV5AGD, 5ANF, 5BBU, 5BNW, 5BPG, 5BPJ, 5BPU, 5CDK)

Jim Lawson, WA2SFP winner of the Potomac Valley Radio Club Trophy for the highest Single Operator, All Band score in the United States.

*14 Sherwood Road, Stamford, Conn. 06905.

XE2BC—The gang, and we mean gang, that manned the biggest mass movement in the history of the contest. A few statistics: QTH—Rosarito Beach, Baja, Calif. WX-110°F. Water—None, substituted beer (ever try brushing your teeth with beer?). Customs—6½ hrs. of frustration. Mosquitos—150 per operator. Condx—Poor, especially to Europe. However, they did make 3491 contacts and had a run of 145 per hour on 20 by K4TWF and 143 per hour on 15 by WA6SBO. (QSL via WA6SBO).

Along with the scores of DJ6QT and DJØNO (Walt of LX fame and Gene, ex-5A1TW) and the other Top Teners, I consider the performance of WA2SFP, winner of the USA Trophy, an outstanding one.

A surprise opening on 28 mc made everybody happy, especially Jaycee, LU1DAB, king of the 10 meter band. But it was mostly a north/south affair, the east/west path is still slow coming around.

The 21 mc band was in good shape during the day hours, with the Europeans seemingly to have the best of it as attested by DL6EN's score. But once again it was the 14 mc band that produced the most activity. Raul YV5BIG, last year's all band winner went single band for this one and had a good thing going on 20, but its F7BL that takes home the trophy for the top scorer on a single band. No one expected that record breaking score from Europe, Bob Lane really pulled a surprise. KX6BQ thinks its impossible to win top honors from a Pacific location. Nevertheless Martin placed third in his second try from that area.

And how about that 7 mc score from up Greenland way by OX3JV. Joergen said his total would have been higher if the VE's and other stations that are permitted to wander around the 40 meter band would have taken time out to listen to other sections of the band. As a matter of fact the 40 meter operation would be greatly improved for all if the overseas stations would indicate what portion of the American band they are tuning.

Stateside, K2GXI and W3PHL milked the band of every available contact and once again Bob shaded Fred by a close margin.

Very few stations concentrated on 3.8 mc alone, except a few of the Europeans. Of these ON4UN was by far the most impressive. The all banders found the band most productive for additional multipliers as you can see from the box scores.

Some of the boys tried to stir up some activity on 160 but conditions were not favorable. YV9AA was putting a signal into the East Coast, but could not hear K2GL and others who were pleading for a contact. GW3PMR was the lone entry on 160.

Don Miller activated a rare one in XW8BF, but unfortunately his log got delayed in route and has not been received in time to make this report.

Another one of a kind, FP8CQ appeared on many logs but his entry never showed up, and

STATION	BAND	CONTACTS	ZONES	COUNTRIES	POINTS
CX2CO 1,815,288	3.8	26	12	17	57
	7.0	73	16	24	186
	14	785	33	87	2211
	21	594	25	61	1749
	28	371	20	49	1074
	TOTAL	1849	106	238	5277
DJ6QT 934,677	3.8	133	11	45	179
	7.0	118	18	47	235
	14	484	33	88	1337
	21	251	23	61	694
	28	42	14	29	88
	TOTAL	1028	99	270	2533
DJØNO 899,208	3.8	116	12	46	191
	7.0	130	20	54	285
	14	438	34	88	1104
	21	310	21	60	851
	28	20	11	16	53
	TOTAL	1014	98	264	2484
I1BAF 808,572	3.8	64	6	28	85
	7.0	91	16	37	188
	14	885	29	79	2460
	21	128	17	27	365
	28	13	9	10	36
	TOTAL	1181	77	181	3134
HB9ZY 769,384	3.8	33	5	22	46
	7.0	52	13	25	108
	14	501	31	91	1330
	21	343	29	57	957
	28	25	12	23	57
	TOTAL	954	90	218	2498

STATION	BAND	CONTACTS	ZONES	COUNTRIES	POINTS
YV5AXT 656,702	1.8	1	1	1	0
	3.8	53	9	13	146
	7.0	157	13	23	435
	14	503	20	58	1413
	21	391	15	29	1118
	28	52	7	13	139
	TOTAL	1157	65	137	3251
WA2SFP 652,176	3.8	14	8	13	38
	7.0	45	15	30	118
	14	334	29	85	968
	21	211	23	73	609
	28	77	19	41	208
	TOTAL	681	94	242	1941
OA4KY 644,130	3.8	33	9	11	82
	7.0	83	16	23	223
	14	308	28	69	862
	21	276	22	39	805
	28	194	15	23	554
	TOTAL	894	90	165	2526
OD5BZ 628,056	3.8	37	3	16	107
	7.0	26	3	9	78
	14	375	25	69	1094
	21	446	25	61	1200
	28	33	12	21	95
	TOTAL	917	68	176	2574
W4BVV 581,434	1.8	3	2	2	2
	3.8	26	11	19	69
	7.0	43	16	24	115
	14	254	31	83	722
	21	195	26	71	551
	28	80	20	44	207
	TOTAL	601	106	243	1666

Breakdown of the Top Ten Single-Operator, All Band scores.

Top Ten
ALL BAND SINGLE OPERATOR

CX2CO	**1,815,288**	YV5AXT	656,702
DJ6QT	934,677	WA2SFP	652,176
DJØNO	899,208	OA4KY	644,130
I1BAF	808,572	OD5BZ	628,056
HB9ZY	769,384	W4BVV	581,434

Top Six
MULTI-OPERATOR SINGLE TRANSMITTER

ET3USA	**1,222,843**	DL1JW	947,568
IØFGM	1,129,323	HC1EY	710,874
4X4HW	1,000,050	PAØHBO	705,024

Top Six
MULTI-OPERATOR MULTI-TRANSMITTER

YV9AA	**4,795,200**	XE2BC	2,091,764
YV5AFH	3,480,948	W3MSK	1,868,256
ZD8AR	2,839,005	K2GL	1,848,149

U.S. Winners & Runners-up

All Band	K8HIR	519,100
28 Mc	W5JWM	7,938
21 Mc	W1RIL	88,889
14 Mc	W1ZFV	154,700
7 Mc	K2GXI	18,659
3.8 Mc	K8YWG	7,007

Continental Leaders—Single Band

28 Mc

LU1DAB	74,816
DL7BA	17,136
WA4SUR	14,091
9M4LP	8,215
9Q5TJ	7,326

21 Mc

DL6EN	219,090
OD5EG	169,936
CX3BH	150,156
WA4PXP	114,360
CR6DX	101,158
ZL1AGO	79,050

14 Mc

F7BL	**703,056**
YV5BIG	532,352
KX6BQ	449,306
VP7NS	326,821
CR6BX	185,373
JA2AEY	175,642

7 Mc

OX3JV	37,332
I1AIM	26,465
JA2BTV	23490
ZL4BO	11,232

3.8 Mc

ON4UN	56,700
4X4AS	29,040
YV5BTS	14,784
W1AQH	9,000
UW9DZ	871

1.8 Mc

GW3PMR	360

for a good reason no doubt. We do not believe he was legit. That call does not appear in the latest *Callbook*.

Iris and Lloyd Colvin on the Yasme World Wide DX-pedition, stopped over at Truk and gave us another rare one in KG6SZ/KC6.

This was Chuck's swan song as VP7CC, after 2½ years and over 10,000 contacts. He expects to show up as a VP5. (All QSLs via K6UTO).

As usual Murphy's Law took its toll. A storm knocked PY3BAD off the air for 6 hours. Sig could not load the 40 meter beam at W3WJD, and WAØKXZ had to climb the tower each time the skip changed, his rotor had jammed. WAØKDI had his hands full, what with the XYL in the hospital, an S9 power leak and a loud local giving him competition. (Hope XYL all OK Hal).

While some of the fellows had frustrating power failures, equipment breakdowns, etc. PY2CQ didn't have a single complaint. "Can't understand it," says Jose, "rig worked perfectly,

[*Text cont. on page 103—Scores overleaf*]

YV5AFH—Joe YV5AJK and Johnny YV5AKU, engineers in charge of the power plant which conked out at 2 o'clock in the mornng.

STATION	BAND	CONTACTS	ZONES	COUNTRIES	POINTS
YV9AA 4,795,200	1.8	2	1	1	0
	3.8	151	13	33	413
	7.0	351	19	57	1010
	14	1651	32	110	4817
	21	958	24	75	2813
	28	607	23	56	1747
	TOTAL	3720	112	332	10,800
YV5AFH 3,480,948	3.8	151	12	23	409
	7.0	253	20	49	723
	14	1559	31	112	4461
	21	643	24	66	1851
	28	553	16	33	1574
	TOTAL	3159	103	283	9,018
ZD8AR 2,839,005	3.8	39	10	9	108
	7.0	132	15	22	383
	14	1166	30	85	3276
	21	1120	27	80	3295
	28	416	21	46	1167
	TOTAL	2873	103	242	8229
XE2BC 2,091,764	3.8	544	15	22	1115
	7.0	789	19	40	1633
	14	1249	25	59	2635
	21	764	20	47	1735
	28	145	15	19	326
	TOTAL	3491	94	187	7444
W3MSK 1,868,256	1.8	4	2	1	0
	3.8	88	16	39	223
	7.0	101	19	40	251
	14	593	35	113	1685
	21	526	28	104	1487
	28	133	20	51	346
	TOTAL	1445	120	348	3992
K2GL 1,848,149	1.8	9	2	3	4
	3.8	144	17	40	386
	7.0	122	19	50	327
	14	496	32	103	1438
	21	530	25	99	1534
	28	131	20	51	320
	TOTAL	1432	115	346	4009

Mult-Operator Multi-Transmitter top six.

Number groups after call letters denote the following: Band (A-all); Final Score; Number of QSOs; Zones and Countries. Certificate winners are listed in **bold face.**

Phone Results

SINGLE OPERATOR

North America

United States

K1HVV	**A**	**239,430**	**365**	**73**	**157**
W1JYH	A	122,100	242	59	126
K1DFC	A	75,336	202	49	97
W1MRQ	A	66,080	221	38	80
W1WY	A	28,454	106	38	64
W1MX	A	7,900	57	16	34
W1PLJ	A	7,150	50	18	32
W1RIL	**21**	**88,889**	**304**	**25**	**78**
W1HQV	21	29,900	168	22	43
K1OWM	21	10,062	79	15	28
W1ZFV	**14**	**154,700**	**426**	**30**	**100**
W1BPW	14	122,130	356	29	89
K1FLT	14	71,331	263	24	69
W1AQH	**3.8**	**9,000**	**68**	**15**	**35**
WA2SFP	**A**	**652,176**	**681**	**94**	**242**
K2SUX	**A**	**201,262**	**366**	**63**	**143**
WB2MDH	A	104,300	261	43	97
W2FZJ	A	85,613	179	68	113
W2YCW	A	80,442	241	39	84
WB2APG	A	42,333	148	38	65
WA2WMT	A	39,312	143	37	67
K2MGE	A	32,994	103	44	73
K2IML	A	32,240	118	36	64
W2LQP	A	30,710	131	25	58
W2SKE	A	21,600	93	27	48
W2WZ	A	21,312	99	25	47
W2GKZ	A	20,944	85	35	53
W2QKJ	A	18,576	89	24	48
WA2EOQ	A	7,680	46	25	35
WB2OLN	A	5,536	52	15	28
W2LJF	A	4,205	32	12	23
WB2FAJ	A	3,828	35	19	25
K2DGI	A	2,926	28	15	23
W2JB	A	2,070	25	14	16
WA2CYQ	**21**	**45,982**	**198**	**24**	**59**
WB2IQB	21	33,774	151	24	54
WA2PXI	21	5,969	46	16	31
WB2QXX	21	3,712	41	9	23
W2TQR	**14**	**112,972**	**323**	**30**	**92**
WA2HUV	14	22,500	107	23	52
W2WE	14	20,703	110	23	44
W2DOD	14	18,340	92	21	49
W2AGM	14	15,960	95	18	42
WA2WVL	14	8,874	58	20	38
WB2NDO	14	7,495	65	15	28
WB2EPG	14	5,830	40	20	35
WA2EFN	14	480	11	7	9
K2GXI	**7**	**18,659**	**107**	**20**	**47**
W2ZPO	**3.8**	**4,191**	**54**	**12**	**21**
W3AZD	**A**	**414,780**	**490**	**93**	**217**
K3TPS	**A**	**391,534**	**501**	**92**	**194**
K3TPL	A	276,345	385	86	181
W3LOE	A	214,082	299	82	181
K3BNS	A	181,800	356	57	123
W3AYD	A	120,328	261	55	114
W3WPG	A	112,000	247	60	104
W3KMV	A	107,950	231	61	109
W3KDF	A	78,522	209	50	88
W3GRS	A	68,530	163	52	102
W3KT	A	59,040	177	40	80
W3MVB	A	57,112	180	45	76
W3MCG	A	54,135	143	51	84
W3CGS	A	45,859	132	40	81
W3IYE	A	42,024	145	34	68
K3UZY	A	28,128	117	37	59
W3PN	A	26,660	111	29	57
K3MCO	A	13,608	78	20	43
W3GHD	A	7,076	43	24	37
W3LNE	A	4,385	39	17	26
K3JYZ/3	A	3,564	31	21	23
W3BYX	A	1,488	21	10	14
K3JLI	A	52	16	4	7
W3ECR	**21**	**18,040**	**114**	**22**	**46**
W3KFQ	**14**	**41,246**	**178**	**24**	**58**
WA3BTA	14	144	6	4	5
W3PHL	**7**	**17,085**	**99**	**21**	**46**
W3ZNB	7	2,178	28	14	19
W4BVV	**A**	**581,434**	**601**	**106**	**243**
W4BFA	**A**	**238,108**	**371**	**81**	**160**
K4SHB	A	171,656	311	69	143
K4AQQ	A	142,350	263	64	131
W4MVB	A	142,222	295	61	117
K4ZJF	A	102,828	230	52	112
W4ZYS	A	88,560	191	58	106
W4FRO	A	84,525	199	59	102
WA4QAB	A	83,664	206	51	93
K4JEY	A	75,500	182	51	100
WA4HO	A	47,492	146	50	74
W4LVV	A	38,266	138	37	69
W4DS	A	31,752	104	43	65
WA4MSU	A	24,800	107	27	53
W4PTR	A	22,556	103	36	53
W5ILR/4	A	21,024	85	37	59
W4BJ	A	20,576	99	31	52
W4HVU	A	18,705	76	31	56
WA4UFW	A	7,198	46	26	33
W4YDD	A	5,334	48	16	26
WA4SUR	**28**	**14,091**	**87**	**20**	**41**
WA4WIP	28	6,512	56	17	27
K4QVK	28	2,070	26	10	20
WA4PXP	**21**	**114,360**	**339**	**28**	**92**
K4ISV	21	80,036	278	26	81
W4NQM	21	79,680	291	25	71
WA5JRB/4	21	73,801	326	22	69
K4RLO	21	73,748	256	27	76
W4HKJ	21	56,508	199	26	76
WA4GCS	21	38,313	144	26	73
K4HNA	21	36,660	141	24	70
W4DRW	21	30,258	132	24	58
W4ZXI	21	25,753	100	24	67
W4DRK	21	18,936	96	22	50
K4HJE	21	2,400	28	13	19
W4WSF	21	187	7	5	6
W4BCV	**14**	**131,052**	**351**	**32**	**102**
WA4NGO	14	114,708	333	28	93
K4IKR	14	49,200	178	29	71
WA4WAO	14	37,107	145	26	67
K4RZK	14	27,650	130	21	58
W4QD	14	20,496	80	24	60
WA4HRZ	14	9,300	72	19	31
W4PJG	14	7,450	53	19	31
W4LDL	14	7,191	52	16	35
WA4WWK	14	817	17	7	12
W4RLS	**7**	**3,204**	**40**	**12**	**24**
W4BYB	7	1,938	28	14	20
K5BXG	**A**	**141,245**	**258**	**71**	**134**
W5KC	A	111,475	252	63	112
WA5BYV	A	35,524	116	47	60
W5LEF	A	33,744	112	46	68
W5LZZ	A	16,247	75	32	45
WA5MUE	A	11,109	63	29	40
W5BRR	A	10,660	59	24	41
W5RO	A	7,810	56	27	28
W5IPH	A	5,640	37	28	32
W5JWM	**28**	**7,938**	**58**	**18**	**36**
W5EQT	28	456	12	10	9
WA5ALB	**21**	**38,442**	**165**	**25**	**61**
K5BZU	21	19,668	108	22	44
W5WLD	21	19,140	108	21	45
W5NOP	**14**	**57,834**	**205**	**28**	**74**
W5CCP	14	24,272	121	24	50
W6ITA	**A**	**372,690**	**564**	**90**	**156**
K6AHV/6	**A**	**290,884**	**455**	**89**	**153**
K6ERV	**A**	**206,456**	**367**	**74**	**123**
W4YZE/6	A	147,875	298	72	103
W6LDA	A	123,413	258	66	101
W6WX	A	106,237	251	59	90
W7WJB/6	A	101,948	239	57	96
K6SSJ	A	96,600	255	54	86
W6UMI	A	74,240	212	49	79
W6YMV	A	72,324	190	62	85
W6VUW	A	69,552	205	54	72
K6HZP	A	66,103	194	59	79
W6PQT	A	65,124	178	55	79
W6LDD	A	53,865	181	42	63
WA6EYP	A	42,434	158	37	61
W6LCF	A	33,966	122	41	61
W6ZER	A	31,968	119	44	52
W6ISQ	A	26,560	112	34	49
W6PLS	A	17,813	91	31	42
WB6NRK	A	15,620	89	32	39
W6BSY	A	14,756	84	25	37
WA6AUD	A	11,232	65	24	30
WB6KBG	A	10,871	61	27	34
WB6LCS	A	3,534	37	18	20
WB6IUH	A	3,458	32	18	20
W6JKJ	A	3,200	37	15	17
W6ERS	A	1,104	18	10	13
K6HOR	A	1,026	18	7	11
K6CT	**28**	**2,760**	**37**	**14**	**16**
W6RGG	28	25	3	2	3
K6CYG	**21**	**60,312**	**252**	**24**	**60**
WA6EKL	21	43,632	216	22	50
WB6JRL	21	40,062	220	23	43
W6PQW	21	37,843	188	23	48
W6LCX	21	22,204	128	24	37
WB6EFA	21	9,287	89	14	23
W6OHU	21	4,392	44	16	20
WA6OHJ	**14**	**46,191**	**195**	**27**	**62**
WB6CWD	14	42,160	187	25	55
WA6WXP	14	24,780	144	22	37
WA6QWN	14	23,588	132	23	40
K6OHJ	14	7,098	60	17	25
WA6VAT	14	6,478	57	16	25
WB6PHU	14	3,848	55	12	14
K6VT	14	2,520	38	10	14
K6BPR	**3.8**	**1,971**	**40**	**13**	**14**
W7ESK	**A**	**103,124**	**293**	**44**	**83**
W7CNM	A	24,752	89	51	61
WA7BKG	A	15,576	85	29	37
W7KOI	A	8,906	55	28	33
W7LNG	A	2,310	30	13	17
WA7CGR	A	966	20	11	10
W7PHO	**21**	**15,165**	**118**	**16**	**29**
W7AZG	21	10,486	83	19	30
W7MKI	**14**	**61,640**	**239**	**29**	**63**
W7TDK	14	55,088	229	28	60
W7RQN	14	49,772	190	30	62
W7YBI	14	37,596	171	25	53
K7VAL	14	35,130	184	27	53
K7ADL	14	34,336	167	25	49
WA7ABW	14	13,140	81	22	38
W7MX	14	9,184	82	17	24
W7WLL	14	5,928	58	17	22
W7DLR	14	5,750	45	21	30
W7GUV	14	4,370	41	15	23
K8HIR	**A**	**519,000**	**540**	**112**	**246**
W8OCT	A	141,456	305	51	117
WA8AJI	A	102,336	226	45	119
W8KYY	A	29,140	108	36	58
W8FRJ	A	14,091	69	27	50
W8LZE	A	336	8	7	7
W8DGP	**2.8**	**6,160**	**57**	**15**	**29**
K8CFU	2.8	3,212	34	12	24
K8VDV	**21**	**58,195**	**193**	**26**	**77**
W8ECA	21	20,672	109	21	47
K8WVF	**14**	**49,350**	**187**	**26**	**68**
K8WOT	14	15,975	81	25	46
W8EW	14	5,781	53	16	25
K8YWG	**3.8**	**7,007**	**57**	**19**	**30**
W9EWC	**A**	**198,050**	**317**	**78**	**155**
W9WGQ	A	183,084	318	69	140
K9ZJV	A	35,802	134	35	67
WA9HJM	A	35,600	139	42	58
W9KXK	A	33,853	129	35	62
W9BPU	A	25,984	88	41	71
WA9MFY	A	12,644	74	31	41
K9DWG	A	1,917	27	13	14
K9BTU	28	1,980	26	11	19
W9LKI	28	1,144	19	9	13
W9AQW	28	12	2	2	2
K9ECE	**21**	**46,560**	**175**	**25**	**72**
K9PPX	21	45,924	189	23	66
W9ZTD	21	42,804	179	23	64
W9HTF	21	11,616	65	21	45
K9DDB	21	9,333	68	18	33
W9IRH	**14**	**28,196**	**138**	**24**	**52**
WA9ISM	14	25,056	123	24	48
K9IYK	14	2,821	30	12	19
WA9FTS	14	640	15	8	8
K9VFF	**7**	**1,242**	**23**	**10**	**13**
WØLBB	**A**	**32,544**	**119**	**50**	**63**
WAØHVR	A	30,968	119	35	63
WAØKDI	A	27,610	98	44	66
WAØGQJ	A	9,275	70	23	30
KØYIP	A	3,344	32	19	25
WAØHWZ	A	1,612	24	11	15
WØLBS	**21**	**41,405**	**167**	**27**	**64**
KØUKN	**14**	**43,989**	**176**	**28**	**65**
WØAIH	14	10,738	69	22	37
KØIFL	14	10,545	67	22	35
WØQVZ	14	7,803	56	20	31
KØIFL	14	6,683	59	14	27
WØGNX	7	897	16	10	13
KØJPL	7	792	22	9	13

Alaska

WA6LBD/KL7	**14**	**14,140**	**170**	**15**	**20**

Bahamas

VP7CC	**A**	**212,415**	**669**	**51**	**96**
VP7NS	**14**	**326,821**	**1199**	**28**	**93**

Canada—Zone 5

VE2WA	**A**	**168,454**	**312**	**70**	**139**
VE2AFC	**21**	**25,823**	**194**	**15**	**34**
VE1ACE	21	15,965	240	12	19
VEITG	**14**	**144,343**	**565**	**24**	**83**
VE2WY	14	84,410	250	29	86
VE2BV	14	47,112	245	21	57
VE2BCK	14	26,248	141	18	50
VO1AQ	14	10,850	80	14	36

Canada—Zone 4

VE3LZ	**A**	**331,516**	**488**	**81**	**187**
VE3BMB	A	53,055	162	49	82
VE4SK	A	6,370	55	21	28
VE3EVK	**28**	**4,620**	**44**	**15**	**27**
VE40X	**14**	**42,320**	**215**	**23**	**57**
VE3DYB	14	22,080	125	16	48
VE3BSJ	14	13,050	92	16	42
VE6IN	14	1,924	27	13	13
VE6YZ	**7**	**882**	**53**	**5**	**4**

* Operated by VE3CDX

Canada—Zone 3

VE7CE	**A**	**29,904**	**134**	**32**	**52**
VE7NW	**14**	**40,542**	**174**	**26**	**61**
VE7BW	14	20,832	136	20	36
VE7NH	14	5,670	49	18	24
VE7AHH	**7**	**1,833**	**71**	**8**	**5**

Canal Zone

KZ5AY	**A**	**66,822**	**427**	**31**	**43**
KZ5PW	**14**	**71,037**	**400**	**20**	**61**

Dominican Republic

HI8XAL	**A**	**135,850**	**417**	**41**	**102**

Greenland

OX3JV	**7**	**37,332**	**194**	**23**	**45**

Guatemala

TG8IA	**A**	**1,280**	**28**	**10**	**10**
TG8RH	A	1,120	25	10	10
TG8CJ	A	330	16	6	4
TG9CB	**14**	**5,130**	**90**	**12**	**15**
TG8LS	14	5,024	69	13	19

Honduras

HR1RP	**A**	**169,037**	**672**	**50**	**71**
HR2GK	**14**	**34,866**	**439**	**16**	**23**

Mexico

XE1ZE	**A**	**254,400**	**748**	**55**	**104**
XE1HHH	**14**	**74,497**	**441**	**25**	**54**
XE2YP	14	54,016	376	23	41
XE1FFW	14	12,667	102	19	34
XE1HD	14	3,744	55	13	19

Nevis Island

VP2KJ	**A**	**305,252**	**1130**	**57**	**77**

VS6AJ—Herb found operating from Hong Kong a lot more exciting but a little more difficult than from his home QTH as OZ7SM.

Nicaragua

YN9JUL	A	16,170	147	21	28

Panama

HP1JC	A	77,568	196	49	79

Puerto Rico

KP4CL	A	401,685	1020	64	119

Turks Island

VP5AR	A	94,990	352	39	79

AFRICA

Angola

CR6DA	A	139,308	420	39	75
CR6DX	21	101,158	459	21	53
CR6BX	14	185,373	488	31	98

Cameroon

TJ1AC	14	92,868	296	30	79

Congo Republic

TN8AA	21	3,135	40	11	22

Kenya

5Z4JW	A	1,519	23	13	18

Liberia

EL8AF	A	56,238	226	32	59

Libya

5A3TX	A	328,680	668	44	124

Morocco

CN8BB	14	15,840	100	18	37
CN8CZ	14	4,704	49	11	21

Mozambique

CR7FR	A	14,630	96	17	38
CR7IZ	A	8,484	70	13	29

Republic of Congo

9Q5YL	A	121,312	327	39	97
9Q5TJ	28	7,326	84	11	22
9Q5PA	21	744	42	4	2

Rhodesia

ZE1JE	A	563,152	803	74	170
ZE2JE	14	104,864	315	31	85

Sierra Leone

9L1HX	14	112,752	400	26	61

Somalia

606BW	A	72,600	226	43	77

South Africa

ZS2HI	A	25,330	110	35	51
ZS6VX	14	102,366	301	31	90
ZS4JB	14	72,459	259	27	70
ZS2MH	14	323	9	8	9

Togo Republic

5VZ8CM	14	12,780	89	21	29

Uganda

5X5IU	A	155,077	364	46	105

Zambia

9J2FK	A	414,111	661	66	157

ASIA

Aden

VS9AWR	A	301,240	798	43	101

Hong Kong

VS6AJ	A	275,535	643	64	131
VS6DS	14	9,198	110	13	29

Israel

4X4ON	21	50,224	245	17	56
4X4FV	14	42,201	186	20	61
4X4VS	14	31,563	178	15	48
4X4AS	3.5	29,040	206	9	39

Japan

JA1IBX	A	142,632	412	52	74
JA1DMX	A	63,983	204	42	67
JA1HGX	A	32,936	139	40	52
JA4BJO	A	17,211	132	51	77
JA1EZT	A	9,843	72	23	28
JA1JAN	A	9,196	89	17	21
JAØAC	A	3,900	34	21	31
JA5ANO	A	2,444	34	13	13
JA1ANA	28	480	16	5	7
JA1QBG	28	80	5	5	4
JA2CWX	21	50,260	255	24	46
JA1MIN	21	40,365	206	23	46
JA7UJ	21	37,170	192	25	45
JA5BJC	21	26,572	145	23	43
JA2DDN	21	25,641	149	24	39
JA1LPZ	21	24,418	148	22	36
JA1RJO	21	21,224	135	20	36
JA9JX	21	19,323	120	37	47
JA1DQL	21	18,360	123	23	29
JA1KSO	21	17,192	111	22	34
JA1MHV	21	16,680	105	24	36
JA2BGW	21	15,105	104	19	34
JA1BYT	21	13,585	90	21	34
JA3AYL	21	9,840	85	17	24
JAØBLU	21	8,145	76	20	25
JA7MA	21	7,866	65	20	26
JA6QT	21	6,837	60	17	26
JA6AL	21	4,380	53	13	17
JA1EZL	21	4,257	45	13	20
JA1NDO	21	3,479	31	21	28
JA7BEI	21	3,132	41	12	17
JA6ATL	21	1,932	29	9	14
JA1SYK	21	1,760	32	9	11
JA1TAC	21	396	13	6	6
JA7CQE	21	336	10	8	8
JA6NL	21	112	6	5	3
JA8BLH	21	52	5	2	2
JA2AEY	14	175,642	581	31	75
JA8AA	14	147,680	522	29	75
JA2CJB	14	98,700	405	29	55
JA1ALX	14	14,580	98	23	37
JA1NEC	14	13,359	83	26	35
JA4OK	14	9,690	75	20	31
JA6AV	14	8,112	63	21	26
JA3BOY	14	7,238	60	17	30
JA1LPO	14	6,321	58	18	25
JA7RH	14	6,084	67	15	21
JA7DY	14	4,941	75	13	14
JA6YFL	14	4,914	55	17	22
JA3AJB	14	4,608	59	16	20
JA8FC	14	3,993	54	13	20
JA1DUH	14	2,916	36	16	20
JA1AKH	14	1,325	29	11	14
JA8BB	14	1,290	16	12	14
JA1IZ	14	600	15	9	11
JA4DZ	14	480	14	5	10
JA1PSZ	14	130	10	4	6
JA2BTV	7	23,490	142	23	35
JA2BAY	7	8,177	78	17	20
JA1ADD	7	3,542	56	11	11
JA3KEV	7	6	1	1	1
KA2JH	A	88,344	303	39	69
KA2DJ	A	45,746	200	32	49
KA5ZS	14	140,910	459	32	73
KA2RJ	14	121,152	445	29	67

Korea

HL9US	14	127,156	665	25	58

Lebanon

OD5BZ	A	628,056	917	68	176
OD5EG	21	169,936	672	24	61
OD5CN	14	121,800	420	26	74

Malaysia

9M2LO	A	85,860	257	51	108

Ryukyu Islands

KR6DB	A	152,358	514	52	82

Singapore

9M4LP	28	8,215	72	19	34

Trucial Oman

MP4TBO	A	132,544	319	43	109

UNION OF SOVIET SOCIALISTIC REP.

Asiatic

UA9HA	A	67,158	236	34	83
UA9WS	A	594	14	7	11
UA9RR	21	11,250	120	11	34
UA9VX	21	4	2	1	1
UW9DZ	3.8	871	23	4	9
UAØEH	A	142,845	651	41	66
UAØGF	A	4,482	131	11	16
UAØSH	14	53,569	279	21	62
UAØAI	14	7,569	83	9	27

Azerbaijan

UD6BR	A	42,828	181	21	62

Kazakhastan

UL7FA	A	124,230	389	42	88
UL7LA	14	12,766	118	8	32

Turkoman

UH8BO	14	27,531	163	17	52

Uzbek

UI8AG	14	16,638	115	16	43

EUROPE

Aland Island

OHØNC	A	112,200	366	55	149
OHØNI	A	79,156	365	40	114
OHØNF	14	80	7	3	5

Austria

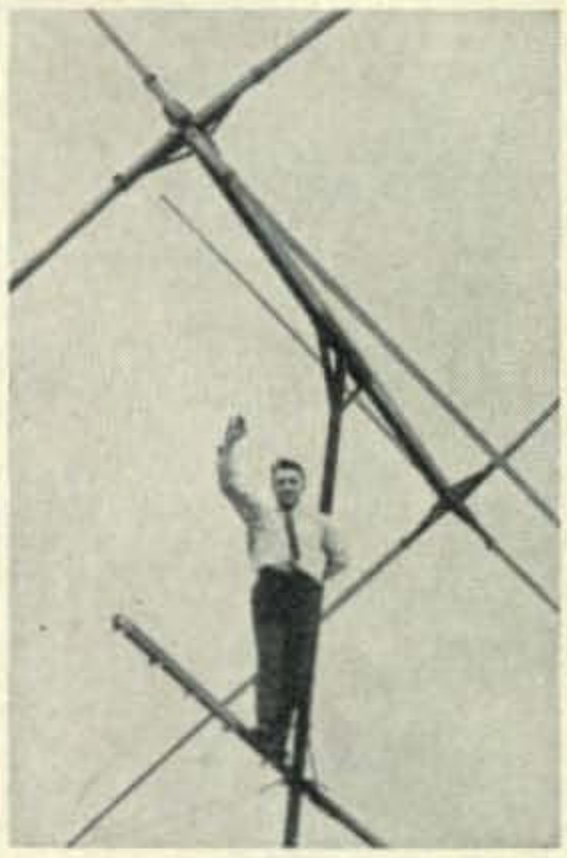
OE5CK	A	246,806	534	72	166
OE1PC	A	13,824	135	18	54
OE1KW	21	32,300	186	22	54

Belgium

ON4SZ	A	349,920	570	65	177
ON5KY	21	100,350	430	23	67
ON5GA	14	29,714	205	23	60
ON4VS	14	21,170	128	21	52
ON4NM	14	7,251	78	23	44
ON4UN	3.8	56,700	637	15	55

Bulgaria

LZ2KBA	A	20,636	243	16	61



YO3LM — Sergui, the only single operator phone entry from Roumania.

Czechoslovakia

OK3CDR	A	174,810	471	61	155
OK1ADM	A	89,284	253	56	146
OK1AHV	A	40,110	293	19	86
OK2QU	A	12,200	112	19	42
OK2BBI	A	572	20	7	15
OK1MP	21	4,440	64	11	26
OK1VB	21	3,276	50	12	27
OK1VK	21	2,106	49	6	12
OK2QX	21	966	41	5	16
OK1ADP	14	93,291	313	31	80
OK3KAG	14	23,115	238	17	50
OK3DG	14	17,719	229	13	46
OK2BDB	14	11,300	160	14	36
OK1FV	14	8,234	102	15	31
OK3CAD	14	4,945	84	12	32
OK3YE	14	3,696	53	12	32
OK1ABP	14	2,624	60	9	23
OK1UT	14	2,370	36	10	20
OK1AHZ	14	2,070	44	8	22
OK2BEN	14	224	13	5	9
OK1NR	3.8	19,734	455	8	38
OK2RO	3.8	7,105	196	7	28
OK1AAE	3.8	2,310	78	6	24
OK1AFB	3.8	1,740	60	4	26
OK2LN	3.8	25	6	2	3

Denmark

OZ4FA	A	244,800	554	60	140
OZ3SK	A	125,766	458	37	100
OZ7BG	A	45,600	158	49	103
OZ3KE	A	20,592	133	25	63
OZ4DX	A	90	8	4	5
OZ5GT	14	88,044	382	28	64
OZ7HT	14	51,480	315	21	51
OZ3Y	14	24,376	128	25	63
OZ6RL	14	12,168	105	18	34
OZ7DX	14	6,200	70	17	33
OZ5TZ	14	1,170	32	6	9
OZ2EN	14	1,092	45	5	16
OZ8RH	3.8	6,586	165	7	30

England

G3DYY	A	138,649	380	58	145
G3RHM	A	128,522	350	51	128
G3UML	A	115,588	311	49	93
G3TWV	A	97,730	334	40	105
G3TKK	A	31,390	176	32	54
G2AJB	A	30,804	155	32	70
G3SEP	A	13,184	135	19	45
G3MWZ	A	4,180	64	12	32
G30HP	28	6,681	50	16	35
G30AD	28	1,045	23	8	11
G3PEU	21	103,410	427	23	67
G3CAZ	21	55,126	255	23	63
G3PZO	21	6,552	85	10	29
G3HDA	14	146,176	422	34	94
G3NLY	7	20,440	223	19	54

Faroe Islands

OY7ML	A	42	3	3	3
OY2GHK	14	592	23	5	11

Finland

OH2XA	A	50,774	228	32	74
OH4OO	A	49,152	229	34	94
OH3AH	A	42,826	185	36	97
OH1OE	A	24,300	117	35	73
OH2QI	A	4,606	45	20	27
OH2AC	A	221	10	7	10
*OH2TI	21	44,073	266	57	26
OH2DX	14	137,480	426	36	104
OH5TJ	14	9,558	100	15	44
OH7PI	14	5,760	54	16	32
OH3YI	14	3,842	95	5	29
OH3XR	14	3,240	40	14	22
OH5VQ	14	2,160	40	8	28
OH1YO	14	391	19	5	12
OH3ZN	3.8	180	16	3	9

* Operated by OH2MM

France

F2MO	A	59,426	295	34	52
F3PK	A	55,700	228	29	71
F8WE	A	25,235	160	29	74
F9AP	A	3,680	42	18	28
F5BV	A	1,568	47	9	23
F8RU	21	24,408	142	18	54
F8CW	21	10,229	80	16	37
F8XP	21	9,234	92	12	45
F3JI	21	391	13	6	11
F2SI	14	82,896	445	24	65
F9YZ	14	33,866	312	13	46
F7EI	A	26,691	122	32	61
F7BL	14	703,056	1637	38	115
F7FP	14	17,728	146	16	48

Germany

DJ6QT	A	934,677	1028	99	270
DJØNO	A	899,208	1014	98	264
DJ2QZ	A	545,494	726	88	223
DL7AA	A	273,665	442	80	165
DJ5BV	A	220,500	446	70	182
DJ7ZG	A	219,336	386	72	156
DL8DX	A	216,200	450	54	134
DJ2YL	A	213,351	503	55	142
DL7BQ	A	196,650	443	61	129
DL8BS	A	109,646	321	41	105
*DLØDC	A	62,488	208	45	100
DJØPN	A	46,864	225	39	77
DL7DW	A	43,757	166	41	92
DL3OP	A	38,920	155	42	98
DJ3BB	A	36,448	168	41	95
DJ5HN	A	28,712	140	30	67
DJ2UU	A	27,795	205	23	90
DL1AM	A	20,601	129	32	77
DJ5JH	A	15,219	120	20	69
DJØJG	A	14,875	117	22	63
DL7KV	A	11,388	73	26	47
DL8JO	A	8,777	74	24	43
DJ5DA	A	6,667	63	18	41
DL7DE	A	4,747	49	15	32
DJ1FR	A	1,305	34	11	18
DL1MM	A	378	11	5	9
DL7BA	28	17,136	121	16	35
DL6EN	21	219,090	680	29	80
DJ1ZG	21	112,216	378	27	77
DL1CR	21	104,550	364	27	75
DJ3YL	21	34,500	139	26	74
DL9FG	21	20,355	118	20	49
DL1TA	21	13,888	101	18	38
DJ8OT	21	5,440	54	15	25
DL6LE	21	5,400	65	13	27
DJ6WD	21	2,800	32	14	21
DL1RO	21	147	7	4	3
DJ1SX	14	135,256	537	30	86
DJ7VY	14	76,626	362	28	77
DL1JF	14	35,340	217	21	47
DJ60K	14	22,260	193	19	51
DL6VP	14	14,665	150	15	20
DJ3YU	14	6,678	93	10	32
DJ3BW	7	7,946	106	14	44
DJ2BW	7	4,042	47	14	33
DL8UI	3.8	15,808	212	14	50

* Operated by DJ7BM

DM2ATD	**A**	**60,702**	**210**	**46**	**105**
DM2BRN	A	17,840	135	20	60
DM2AUD	A	2,255	70	14	27
DM2BDH	A	930	29	10	21
DM4LM	A	754	25	8	18
DM2BBD	A	168	12	7	7
DM3LOG	**21**	**5,408**	**83**	**10**	**22**
DM4PKL	21	6	2	1	2
DM4KL	21	6	1	1	1
DM3YA	14	90	9	4	6
DM2COL	14	63	6	4	5
DL4VV	**A**	**168,453**	**415**	**45**	**88**
DL4NS	A	88,960	277	42	97
DL4AN	A	23,474	107	32	65
DL4VR	**21**	**11,820**	**88**	**18**	**42**
DL5AO	**14**	**181,944**	**534**	**33**	**100**
DL5CL	14	44,880	229	26	62

Hungary

HA5DU	**14**	**5,850**	**90**	**14**	**36**
HA5AT	14	3,610	73	11	27
HAØKDA	14	1,071	41	6	15
HA5FE	**3.8**	**1,272**	**50**	**4**	**20**

Iceland

TF3AP	A	2,020	57	11	16
TF3EA	**14**	**35,406**	**208**	**23**	**59**

Italy

IIBAF	**A**	**808,572**			
			1181	**77**	**181**
I1AUM	A	103,054	418	35	84
II1KDB	A	75,852	486	28	70
I1EVK	A	51,831	206	40	87
I1KX	A	37,170	245	27	63
I1FUG	28	154	6	5	6
IINU	**21**	**147,511**	**606**	**29**	**62**
I1SF	21	53,934	251	22	79
I1SGZ	21	10,800	91	14	42
IIBOB	**14**	**110,192**	**437**	**26**	**71**
I1KG	14	64,800	312	30	70
I1LCF	14	44,556	280	19	60
I1TM	14	29,087	303	17	42
I1ZZZ	14	14,213	120	15	46
IIAIM	**7**	**26,465**	**266**	**20**	**59**

Liechtenstein

HBØABS	**14**	**22,077**	**176**	**17**	**38**

Luxembourg

LX1CO	**A**	**49,680**	**260**	**24**	**68**
DL5GO/LX					
	14	**31,284**	**265**	**16**	**50**
DL4MQ/LX					
	7.	560	35	3	13
DL4BJ/LX					
	3.8	**4,264**	**161**	**3**	**23**

Netherlands

PAØDEC	**A**	**52,200**	**228**	**38**	**62**
PAØXPQ	A	41,088	158	40	88
PAØZAV	A	11,999	100	22	49
PAØHTR	A	5,760	104	9	39
PAØZGD	A	1,620	26	12	18
PAØEEM	**14**	**159,732**	**560**	**32**	**84**
PAØHSJ	14	6,751	73	13	30

Norway

LA7VE	**A**	**68,516**	**225**	**55**	**117**
LA5HE	A	39,485	123	45	104
LA1NG	A	34,026	187	29	77
LA6U	A	672	27	7	17
LA4DJ	**14**	**31,023**	**175**	**25**	**56**
LA7JH	14	6,321	88	12	31
LA7HH	**3.8**	**1,180**	**60**	**2**	**18**

Poland

SP5XM	**A**	**10,956**	**123**	**21**	**62**
SP9ADU	A	40	7	4	6
SP7HX	**21**	**6,678**	**105**	**13**	**29**
SP5YC	21	1,736	32	9	19
SP9KDE	21	666	26	6	12
SP2PZH	14	858	35	6	16
SP8AJK	**3.8**	**4,200**	**91**	**8**	**34**
SP5AKG	3.8	320	20	2	8

Portugal

CT1PK	**A**	**117,963**	**346**	**43**	**110**
CT1IK	A	58,380	267	27	57
CT1LN	A	21,845	217	20	65
CT1NG	A	1,464	33	8	16

Roumania

YO3LM	**14**	**131,784**	**606**	**29**	**85**

Scotland

GM3BCL	**A**	**58,935**	**270**	**38**	**101**
GM3JDR	**14**	**34,112**	**278**	**21**	**61**
GM3SFH	14	20,706	207	16	42

Sicily

IT1GAI	**21**	**44,940**	**283**	**20**	**50**

Spain

EA7GF	**A**	**82,611**	**258**	**45**	**92**
EA7ID	A	10,920	78	23	29
EA4GZ	**14**	**67,947**	**345**	**22**	**65**
EA2CQ	14	57,150	263	27	63

Sweden

SM3BIZ	**A**	**188,497**	**414**	**62**	**171**
SM5FE	A	91,023	379	33	90
SM5CEU	A	53,784	247	33	75
SM5BPZ	A	23,108	145	30	76
SM5COL	A	18,075	132	19	56
SM5BDS	A	2,046	50	10	23
SM5OV	**21**	**20,382**	**126**	**22**	**57**
SM5DKH	21	1,416	46	7	17

G3UML—As you can see Laurie is a young chap. He attended classes Saturday morning, played rugby in the afternoon and still had enough energy left to operate in the contest the rest of the week-end.

SM6ALA/7					
	21	250	13	3	7
SM5AM	**14**	**253,313**	**689**	**34**	**103**
SM5ANH	**14**	**207,466**	**603**	**38**	**108**
SM5RK	14	90,396	404	30	78
SM6BCG	14	43,508	240	23	50
SM6CMK	14	21,616	147	18	38
SM5WT	14	14,168	97	23	54
SM5CZM	14	9,735	95	16	43
SM6CKS	14	8,723	61	22	39
SM7BIC	14	7,830	75	18	36
SM5GA	14	4,700	54	12	35
SM5BNX	14	984	19	11	13
SM6BER	14	368	16	5	3
SM5DRL	14	192	14	4	8
SM5BLH	14	64	4	4	4
SM5CAK	**7.**	**8,788**	**143**	**14**	**38**
SM5GZ	**3.8**	**1,917**	**58**	**6**	**21**
SM6CRA	3.8	1,080	54	3	17
SM5CXM	3.8	150	13	3	7

Switzerland

HB9ZY	**A**	**769,384**	**954**	**90**	**218**
HB9MO	A	224,030	459	65	150
HB9UD	A	26,280	129	35	85

Wales

GW3PSM	**A**	**38,962**	**288**	**30**	**91**
GW3SFC	A	18,542	152	19	54
GW3OCD	**14**	**24,180**	**191**	**18**	**44**
GW3PMR	**1.8**	**360**	**70**	**1**	**5**

Yugoslavia

YU3LB	**A**	**250,591**	**650**	**59**	**150**
YU3BC	**14**	**177,375**	**683**	**33**	**96**
YU2RAZ	**3.8**	**7,215**	**174**	**5**	**34**

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European

UA3RDO	**A**	**67,662**	**298**	**38**	**88**
UA1KBX	A	18,631	217	27	67
UA1TT	A	5,208	57	18	38
UA3KPC	A	288	10	8	10
UA3LBE	A	180	9	5	7
UA3FU	**14**	**3,280**	**42**	**13**	**28**
UA3KAG	14	2,376	35	12	24
UW3AX	14	2,262	59	8	18
UA4FQ	14	1,856	48	6	26
UW3TE	14	964	29	7	17
UA3KOO	14	572	18	6	16
UA3KFB	7	208	16	3	10

Lithuania

UP2KBC	**21**	**4,224**	**75**	**9**	**35**
UP20K	**14**	**150,684**	**627**	**32**	**84**

Ukraine

UB5KUT	28	54	3	3	3
UB5FG	**21**	**22,507**	**238**	**17**	**54**
UB5OD	**14**	**16,640**	**189**	**14**	**50**
UB5SJ	14	8,635	116	11	44
UB5WF	14	8,415	64	21	30
UB5KBE	14	1,792	53	7	21

White Russia

UC2BU	**14**	**20,175**	**174**	**24**	**51**
UC2WX	14	15,249	169	14	37

Australia

VK2APK	**14**	**133,770**	**456**	**28**	**77**
VK2VN	14	18,662	101	20	42
VK2WD	14	12,291	90	18	33
VK3ATN	**A**	**517,860**	**717**	**92**	**160**
VK3LW	14	4,284	41	15	21
VK3XB	14	3,465	39	13	20
VK3KS	14	704	16	7	9
VK4LT	**A**	**141,750**	**360**	**49**	**86**
VK4CK	A	5,049	51	17	16
VK4EL	**21**	**6,477**	**128**	**9**	**8**
VK4SD	**14**	**118,692**	**339**	**34**	**92**
VK5LC	14	3,116	28	16	22

Christmas Is.

VK9DR	**A**	**16,170**	**104**	**19**	**36**

Guam

KG6APJ	**A**	**208,568**	**618**	**44**	**80**
KG6APR	**14**	**285,835**	**793**	**34**	**95**
W6IBU/KG6					
	14	70,650	359	26	49

Hawaii

WØPAN/KH6					
	A	**38,123**	**213**	**27**	**40**
KH6AHQ	**21**	**64,324**	**430**	**20**	**32**
KH6EDW	21	19,003	210	12	19
KH6IJ	**14**	**136,765**	**728**	**20**	**43**
KH6BVS	14	104,788	555	23	44

Marshall Islands

KX6BQ	**14**	**449,306**			
			1125	**36**	**107**

New Zealand

ZL1ACI	**A**	**577,590**	**951**	**70**	**141**
ZL3GS	A	289,161	597	62	109
ZL1HW	A	64,821	254	36	57
ZL1AGO	**21**	**79,050**	**537**	**20**	**31**
ZL4BO	**7**	**11,232**	**106**	**17**	**22**

Philippine Is.

DU7SV	**A**	**63,145**	**315**	**27**	**36**

Wake Island

KW6EJ	**A**	**448,048**	**995**	**68**	**108**

South America

Argentina

LU1DGM	**A**	**221,610**	**503**	**59**	**111**
LU1DAB	**28**	**74,816**	**407**	**19**	**45**
LU8FAO	**14**	**78,679**	**281**	**30**	**71**
LU5FCE	14	10,915	80	20	39

Brazil

PY7AKW	**A**	**186,960**	**402**	**52**	**112**
PY1NBF	A	165,924	443	41	91
PY2PC	A	97,407	256	47	90
PY1CK	A	31,820	135	33	53
PY6NX	A	10,472	110	15	19
PY2DSQ	A	5,246	47	20	23
PY2DTP	**28**	**6,321**	**109**	**10**	**11**
PY1BAR	28	1,027	29	6	7
PY3OJ	**21**	**10,716**	**103**	**17**	**21**
PY2CQ	**14**	**371,269**	**937**	**34**	**105**
PY3AHJ	14	306,147	849	32	91
PY1CAD	14	279,672	754	34	95
PY4OD	14	229,944	609	34	98
PY2BPE	14	223,080	591	32	100
PY3BAD	14	139,216	450	30	82
PY7GV	*14*	*98,895*	*367*	*28*	*67*
PY3UY	14	15,045	96	21	38
PY7JZ	14	9,975	62	20	37
PY2BGO	14	9,080	82	17	23

I1BAF—Mino in the white hat and the boys assembling a 5 element array. It finally came to rest at the top of a 100 ft. tower.

Chile

CE30X	A	412,920	964	58	90

Colombia

HK4DF	14	19,296	115	19	48

Netherlands Antilles

PJ2CR	A	200,604	484	51	95
PJ3CD	3.8	4,560	70	7	15

Peru

OA4KY	A	644,130	894	90	165
OA4PD	A	24,300	93	36	64
OA4BS	14	25,816	164	21	35

Surinam

PZ1BK	21	2,205	45	8	13
PZ1BW	14	40,040	180	21	70

Uruguay

CX2CO	A	1,815,288	1,849	106	238
CX5AAY	A	18,778	228	15	16
CX2CN	28	33,201	226	18	33
CX3BH	21	150,156	607	25	61
CX2AY	14	44,156	216	26	57

Venezuela

YV5AXT	A	656,702	1,157	65	137
YV5CIY	A	108,885	330	46	73
YV9AY	A	306	12	7	10
YV9AF	A	240	9	8	8
YV5AST	21	56,956	353	21	37
YV5BIG	14	532,352	1,417	30	98
YV5BQF	14	354,322	811	35	114
YV2AS	14	95,046	359	24	69
YV5BTS	3.8	14,784	158	10	23

MULTI-OPERATOR

Single Transmitter

North America

United States

W7UXP/1	47,460	209	20	56
(W7UXP—WA4RHU)				
K2HLB	559,661	645	99	208
(K2HLB—W2JT—W2DEC—W2DNG—W2HTI—WA2ELS)				
WA2IZS	134,995	246	69	134
(WA2IZS—W2QDY)				
WB2FOV	121,910	261	57	110
(WB2FOV—WB2FON)				
WA2HOK	34,840	119	39	65
(WA2HOK—WA2RLQ)				
W2SZ	7,050	52	20	30
(WA2KIZ—WA2PJL—WA2YLL—WA4CLW)				
WA2HJF	1,984	26	13	19
(WA2HJF—K2QPN—K2SQS)				
K3NHL	470,256	554	88	214
(K3NHL—K3JCT)				
W3WJD	459,998	531	98	221
(W3WJD—K3JJG—K3MCO)				
W3HHK	246,295	413	76	141
(W3HHK—K3HTZ)				
W3MWC	101,430	255	75	132
(W3MWC—W3DQG—K3JLI)				
W3EQA	88,416	219	42	102
(W3EQA—K3ZXG)				
K3MBF	49,329	194	22	65
(K3MBF—K3LJZ)				
W8REE/4	50,955	152	48	81
(W8REE/4—WA4UHW)				
WA6IPY	252,056	461	76	120
(WA6IPY—WA6EPQ)				
K6EXO	89,280	350	30	66
(K6EXO—K6YRA)				
WA9GYZ	13,732	78	26	42
(WA9GYZ—WA9CNC)				
WØQUU	188,991	286	84	165
(WØQUU—WØBMX—WØNGF)				
WØEZO	164,318	325	74	119
(WØEZO—KØEZH—KØKKU)				
WØEMS	85,956	214	56	100
(WØEMS—KØHGW)				
WAØKXZ	76,958	182	61	100
(WØKXZ—WAØAHL)				
WAØBWM	23,086	96	42	55
(WAØBWM—WAØJHB—WAØKEQ)				

Alaska

KL7FDB	70,875	397	34	47
(W6EJU—W6JDO—K6GNC—W6UJU—WA6BZC—WA6JJH)				
KL7WAH	63,756	414	27	42
(KL7WAH—KL7EDV—K2YFE—K7MQY—W7WKW—K8INX)				

Canada

VE2BUS	54,188	177	44	80
(VE2BUS—VE2BRO—VE2AYK VE2AEW)				

Guadeloupe

FG7XL	405,072	899	62	132
(Jean & Monique)				

British Virgin Islands

VP2VD	457,094	1,327	56	102
(G3SBP—K4CAH—K4IIF)				

Africa

Ethiopia

ETSUSA	1,222,843	1504	77	206
(K4FMA—WA3ELH)				

Asia

Cyprus

ZC4MO	463,267	691	59	170
(Club Station)				

Israel

4X4HW	1,000,050	1159	83	212
(4X4BO—4X4TP—4X4WH)				

Japan

JA1YNE	9,628	66	24	34
(Club Station)				

U.S.S.R.

Asiatic

Club Stations

UA9KWA	3,193	92	22	40
UA9KCI	720	17	5	11
UA9KJA	660	19	4	11

Azerbaijan

UD6KAR	62,744	271	24	62

Georgia

UF6KAF	22,902	135	16	50
UF6KPA	812	20	4	10

Kazakh

UL7KAA	12,430	93	17	38

Tadjikistan

UJ8KAA	180,018	478	49	99

Europe

Bulgaria

LZ1KAA	5,400	140	6	30
(Club Station)				

Czechoslovakia

OK3KGI	6,724	101	13	28
(Club Station)				

England

G5BK	123,354	395	52	146
(Radio Society)				

Finland

OH2AM	600,054	927	78	236
(OH2BC—OH2BH—OH2BQ—OH2SB)				
OH1AA	258,390	735	52	146
(Club Station)				
OH1AG	21,296	183	23	65
(OH1VA—OH1WY—OH1-875)				

Germany

DL1JW	947,568	1173	89	215
(DL1JW—DL1KB)				
DL9JL	325,376	609	71	117
(DL9JL—6UN—DJ2VS—5PA—7DJ—8EQ—8GB)				
DL1UR	292,086	552	73	170
(DL1UR—DJ8SW)				
DJ8BQ	196,352	440	66	142
(DJ8BQ—DL9RE)				
DLØAG	168,940	499	42	93
(DJ9BR—DL2CV—8JU—80F)				
DL7EL	73,350	257	40	110
(DL7EL—DL7LU)				
DLØNS	57,980	244	32	98
(DL6QV—9YP—DJ1TY—1UF—4AN—7NX—7WM)				
DLØJD	56,442	188	45	93
(DJ1CY—1XI—4HO—9YK)				
DL4VJ	186,784	712	34	70
(K3CLX—K7HBG—DL4LU—4YV—4UB)				
DL5FL	162,626	485	43	79
(DL5FL—DL4LG)				
DL4OV	125,928	673	18	48
(DL4DS—4FU—4NO)				

Hungary

HA5KBB	375,760	940	61	159
(HA5BB—HA9-007—HA5DM—HA8-703—HA8WH)				

Italy

IØFGM	1,129,323	1788	79	220
(I1BER—CMF—LCK—ZSQ)				
I1DFD	219,561	639	49	114
(KL7DML—W2MPM—WA5CMX)				

I. T. U.

4U1ITU	124,362	470	40	101
(DL1YJ—F8RU—HB9QC—HB9UD—HB9YK—WA6QAU)				
HB3ITU	19,988	219	18	58
(HB9AEQ—VE3DA—OK1FY)				

Netherlands

PAØHBO	705,024	961	82	242
(PAØHBO—ØSNG—ØGMU)				
PI1PT	15,762	153	19	52
(Club Station)				

Northern Ireland

GI3SXG	155,040	510	41	95
(GI3SXG—GI3GAL)				

Norway

LA1H	72,664	346	37	87
(LA1LF—5FG—7RB—3SH—9JD—9OI)				
LA3T	11,067	115	17	34
(LA1CI—2CI—2NI—5II—6KE—6JI—9FJ)				

Poland

SP6PWR	33,522	197	36	75
(SP6AAT—SP8AWL)				

Roumania

YO3KAA	7,336	115	15	41
(YO2ABW—YO3JW)				

Sweden

SM6BJI	509,652	757	85	239
(SM6BJI—6AOE—6CAS—6CKV)				
SM5AZU	188,540	489	52	168
(SM5AZU—5ATN—5BGM—5MC)				
SM5DSF	95,635	371	38	117
(SM5DSF—5ACQ—5DUL)				

Wales

GW3NWV	515,134	926	64	154
(GW3NWV—GW3DIX)				

U.S.S.R.

Club Stations

Estonia

UR2KAA	135,592	513	35	91
(UR2CW—UR2DN—UR2-22700)				
UR2KBG	1,456	36	12	16

European

UA4KED	251,000	633	58	142
(UA4FW—UA4-14912—UA4913)				
UA6KTB	23,660	180	22	69
UA3KAO	17,740	139	24	56

Kaliningrad

UA2KAW	34,595	274	16	39
UA2KBD	3,298	74	10	24

Latvia

UQ2KAX	48,514	258	34	93
(UQ2AN—UQ2FX—UQ2-22456)				
UQ2KBI	10,290	122	17	53
UQ2KCC	9,570	151	15	40
UQ2KHE	2,211	55	10	23

Ukraine

UB5KKA	104,328	408	35	91
UB5ARTEK	62,521	331	29	74
UB5KUH	2,250	64	8	22
UB5KBV	567	21	7	14

Oceania

Christmas Island

VK9XI	561	14	6	12

Eastern Carolines

KG6SZ/KC6	115,170	381	38	72
(Iris and Lloyd Colvin)				

Guam

WA5DNH/KG6	304,160	633	59	111
(K5ETK—K5EWJ—K5TNP—W5YBF—WA5GTI—K6AUA)				

South America

Colombia

5J3LR	578,375	1141	62	113
(HK1QQ—HK3RQ)				

Ecuador

HC1EY	710,874	1665	51	95
(HC1EY—HC1LE—HC1RW)				

Peru

OA4PQ	610,245	1121	77	114
(OA4PQ—OA4RQ—OA4TG)				

Venezuela

YV3AJ	488,744	850	66	133
(YV3BS—3JA—3KV——3KX—3LD)				

MULTI-OPERATOR

Multi-Transmitter

North America

XE2BC	2,091,764	3491	94	187
(K4TWF—6EVR—6JIC—6KII—6SDR—6SEN—6TSY—W6NJU—6UED—6VPH—WA6SBO—KH6EVT—XE2IO—2NI—2QB)				
W3MSK	1,868,256	1445	120	348
(K1ANV—3EST—W3MSK—3QMG—3TMZ—3ZKH—6HOH)				
K2GL	1,848,149	1432	115	346
(K2GL—1YRO—2UYG—W1GYE—2GLM—2IWC—2SKE—6KFV—WA2RAU—WB2KJH—WB2MFX)				
VP9AK	898,610	1709	70	160
(VP9BO—9FU—9FW—9WB—WB2PXZ—W5HWR—WA5NOA—KH6DSE)				
W8NGO	329,072	448	83	181
(W8NGO—8ONA—8CLR—K8YEI)				
K5TYP	96,066	242	57	105
(WA1BBE—WB2FVO—K3SFC—WA6WAR—W7GIA—K9IDQ)				

Africa

ZD8AR	2,839,005	2873	103	242
(ZD8AR—ZD8BC—ZD8RD)				

Europe

OH5SM	842,634	1390	85	253
(OH5SM—5NW—5TM—5TW—OH2TU—2TH)				
DL5GK	106,400	401	39	86
(DL4FR—4JQ—4KG—5CR—5ES—5JJ—K4CRE)				

South America

YV9AA	4,795,200	3720	112	332
(YV5AGD—5ANF—5BBU—5BNW—5BPG—5BPJ—5BPU—5CDK)				
YV5AFH	3,480,948	3159	103	283
(YV5AFH—5AHG—5AJK—5AKP—5AKU—5AQS—5BED)				
HC5CRC	1,061,070	1629	72	154
(HC5EJ—5HC—5MP—5NW)				

Our thanks to the following stations and s.w.l.s for sending us their logs for checking purposes. W1FDL, WB2EGY, WA3BHY, W4HOS, W8FTQ, K8PXD, K8PYD, W1-7897, A3005, A3976, HA5-105, I1LX, KP4RK, KZ5LC, LU4DMG, LU9DAH, OH1TM, OH2AF, PY7AN, REF-15951, SM6BCG, SM6CKU/mm, VE3CEA, VP2SJ, W6KHS.

SWL W1-7897 logged 915 stations in 78 zones and 178 countries on all bands. A3005 and A3976 (England) logged over 500 stations on all bands. And HA5-105 had 163 stations to his credit. SM6CKU/mm made 216 contacts on all bands while in the Caribbean. Ben would like to see a category for maritime mobile stations. If enough interest is shown we might do just that. In the meantime Ben will get a certificate for his efforts, as will the s.w.l.s for their dedicated interest.

ADDING SELECTIVITY TO THE HQ-110

BY RAY L. MARTIN,* WØCTQ

The addition of a mechanical filter to the HQ-110 improves the selectivity so that along with its good sensitivity and its product detector it makes an excellent s.s.b. receiver.

THE amateur who likes to work s.s.b. or c.w. and owns a receiver such as the HQ-110 may become tempted to trade it off for a receiver that can separate the signals better. To this amateur, I say, "Don't give up hope—just install a mechanical filter." "How?", you say. Just read on.

You will admit the old receiver has good sensitivity, the product detector does a fine job and, after a normal warm-up period, the HQ-110 is stable. All it lacks is the high degree of selectivity needed to separate the s.s.b. or c.w. signals.

A mechanical filter can be added without any need to chop up the chassis and can be quickly removed if it is wished to copy a.m.

The mechanical filter unit is a plug-in adaptor that is inserted into the 6BA6 i.f. socket. The physical dimensions of this unit were worked out to use a Collins plug-in mechanical filter and to fit into the space allowable in the HQ-110. Other mechanical filters could be used such as the bath-tub type. This would mean some changes in the configuration of the mounting of tubes and filter. This unit is not only adaptable to the HQ-110, but it can also be used with any receiver having 455 kc i.f. using either a 6BA6 or 6AU6 as the i.f. amplifier.

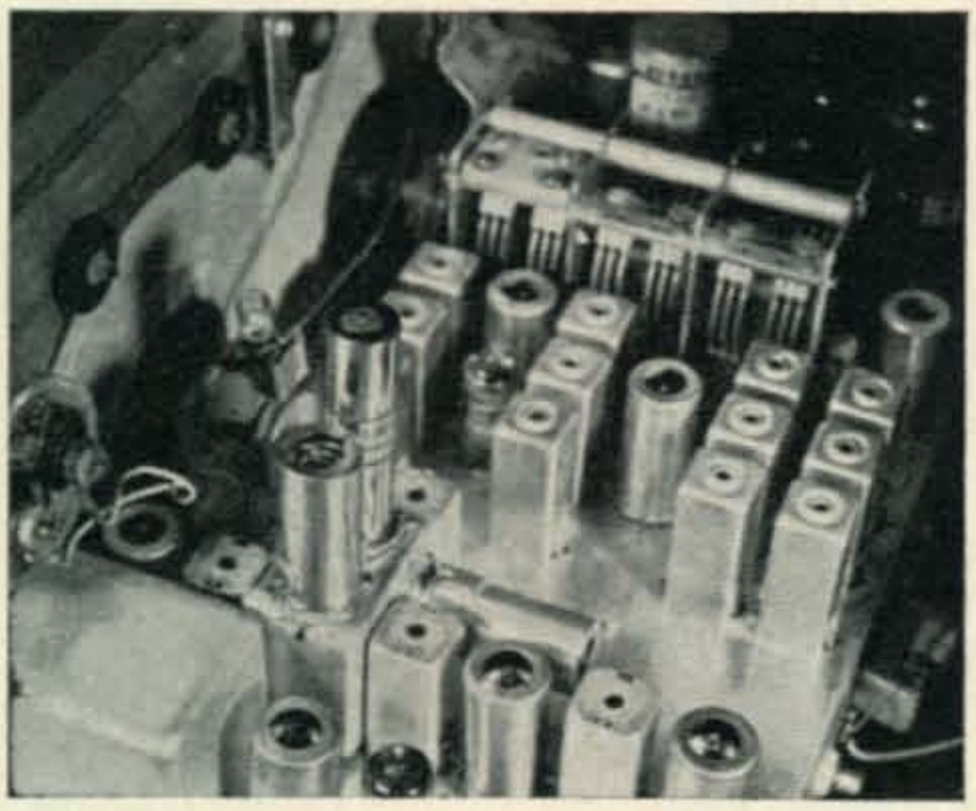
There is a signal loss inherent in the mechanical filter. This means that, in order to have the same gain characteristics with or without the filter, an extra i.f. stage is necessary when using the filter. The values of the interstage components were chosen so that the same magnitude of gain was measured through the receiver with or without the mechanical filter adaptor.

The mechanical filter plug-in adaptor contains two 6BA6 tubes, the mechanical filter, and the necessary resistors and capacitors to make it a completely self-contained unit that will plug into the receiver in place of the 6BA6 i.f. amplifier. The plug-in unit obtains its voltages for operation from the original socket connections.

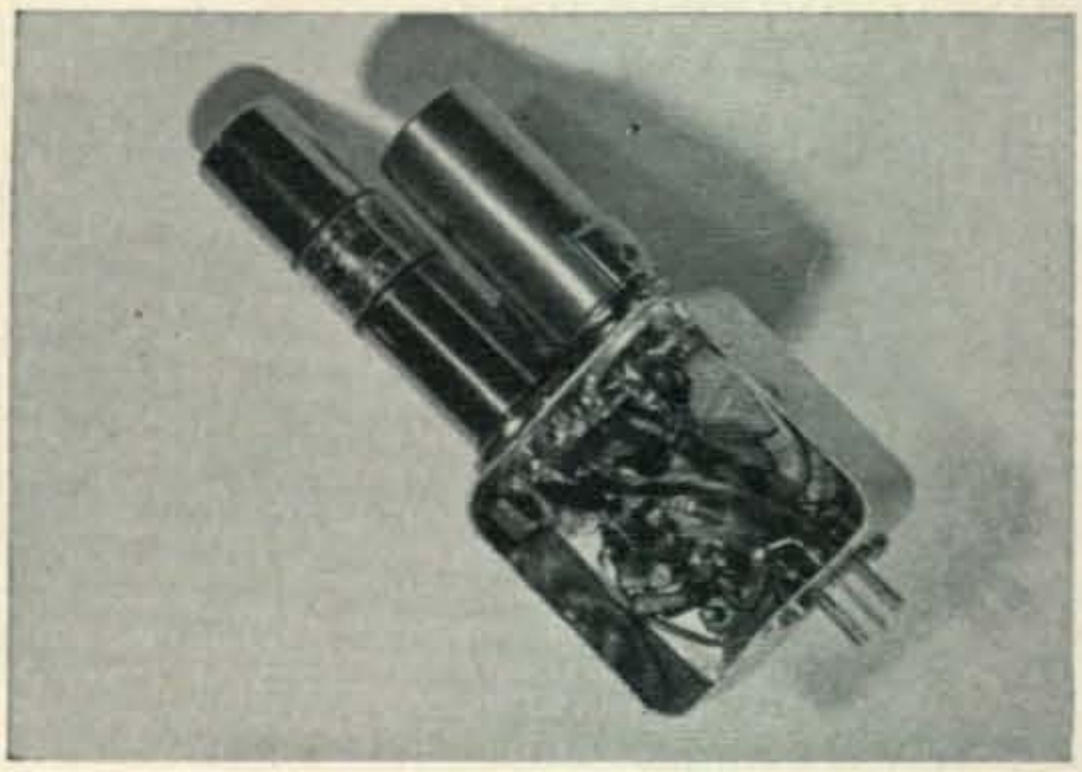
*7523 Pawnee Drive, Prairie Village, Kansas 66208.

Construction

Packaging to fit the limited space on this part of the chassis posed a bit of a problem. It was solved by mounting the socket for the mechanical filter and one 6BA6 on the top of the unit, while the other 6BA6 socket was mounted on one side. The location of this socket was chosen so that it just cleared the i.f. transformer when



View showing filter plugged into the i.f. socket of the HQ-110.



Interior view of the mechanical filter adaptor. Notice the copper shield from the base of the filter to plug P_1.

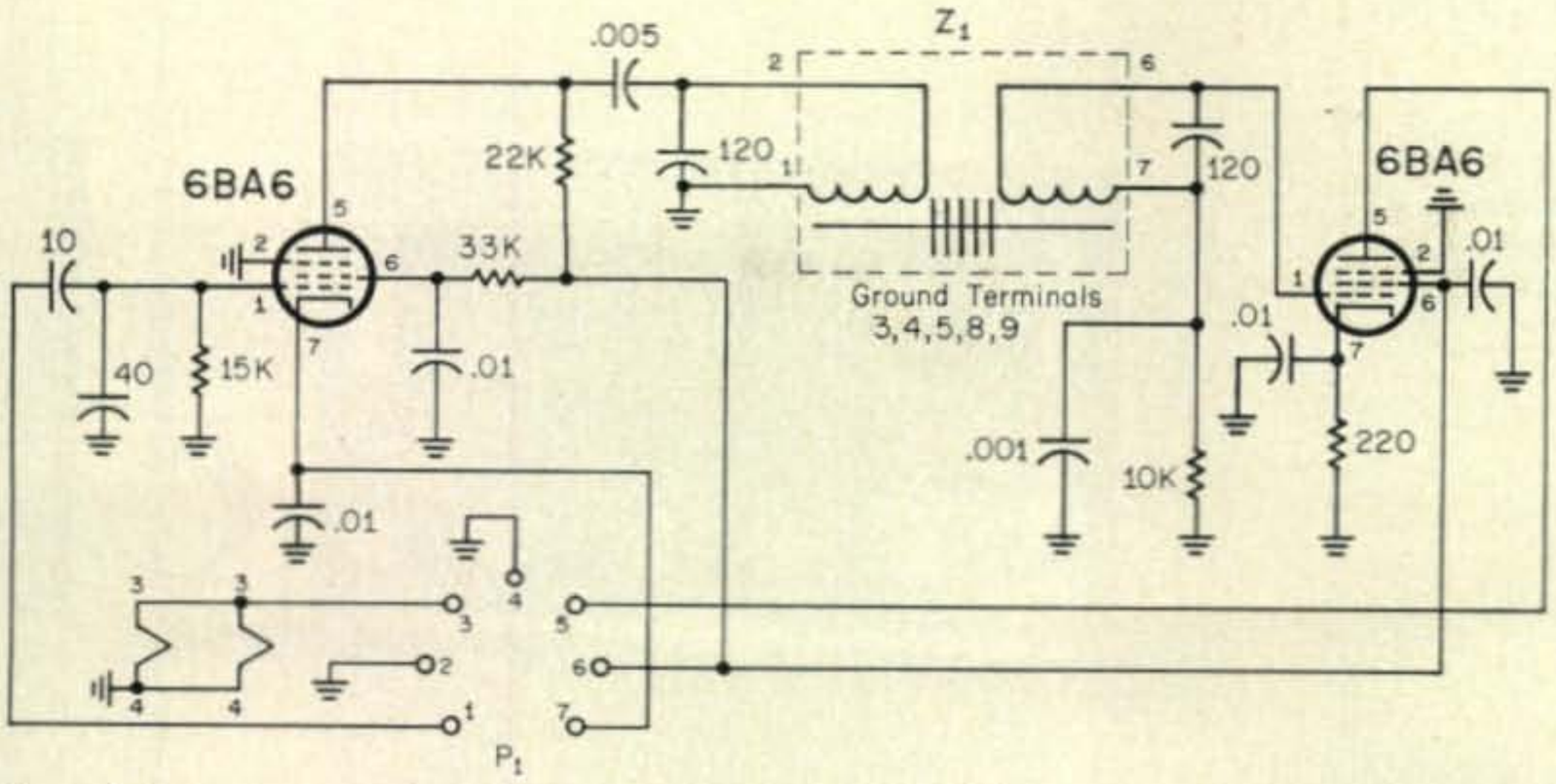


Fig. 1—Circuit for a mechanical filter plug-in adaptor for the HQ-110. All capacitors greater than one are in mmf and those less than one are in mf. All are ceramic types except the two 120 mmf capacitors which are silver mica. All resistors are ½ watt. Plug P_1 is a Vector #P7; Z_1 is a Collins F455J-31 and is plugged into a low loss socket, Elco Corporation #513SBC.

the plug P_1 was oriented properly to mate with the 6BA6 i.f. socket on the receiver chassis. It is necessary to bend over the spring fingers used for securing the tube shield on the original 6BA6.

The chassis for the adaptor was made by cutting off the top one inch of an aluminum shield can, two inch by two inch square, Vector No. C-12K1.02. A cover plate was fabricated from the part of the aluminum can which was left. It was cut to form a two inch by two inch square with mounting tabs left on two sides. These tabs were bent down 90° and holes were drilled in them for clearance of a 4-40 screw. Mating holes were drilled in the adaptor chassis and tapped 4-40.

Holes were punched in the top of the adaptor chassis for a 6BA6 socket and for the mechanical filter socket. There is just enough space for these two sockets. A hole was drilled in the two inch by two inch side of the chassis for the other 6BA6 socket. This was spaced so that the socket cleared the i.f. transformer. Another hole was punched in the bottom side of the chassis for installation of plug P_1. This hole must be located and oriented so the plug will engage the socket when the adaptor is plugged in. This location should be checked to be certain of the fit.

The sockets and plug were next installed in the adaptor chassis. Here, a word of caution is in order. The socket for the mechanical filter *must* be a low loss type. In addition, it is very important that a copper or brass shield be made and installed across the bottom of the socket to shield the input leads from the output leads. This shield should extend from the filter socket down to plug P_1 to completely isolate the input and output of the filter. All the terminals of the mechanical filter to be grounded should be connected to both the shield and ground.

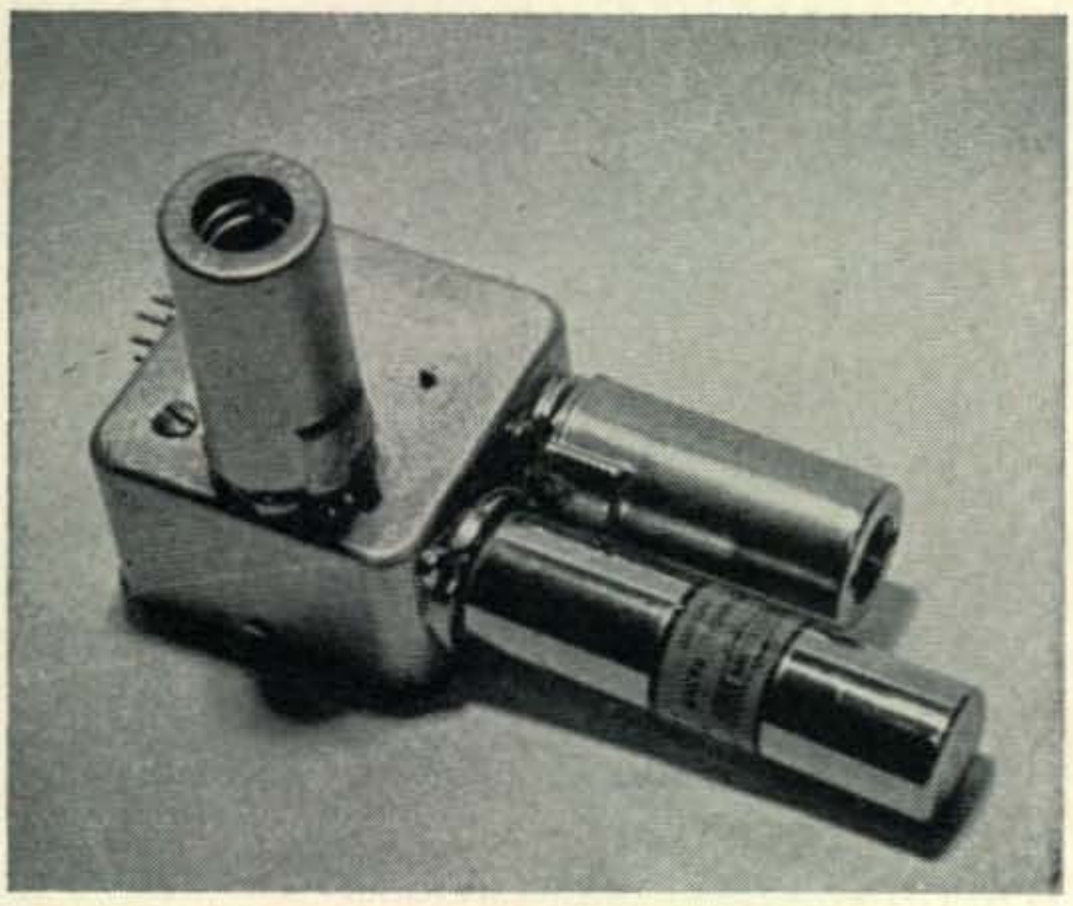
After the adaptor is wired, it should be checked for continuity and shorts before giving it the smoke test.

Installation

To install it in the receiver, it is only necessary to remove the 6BA6 i.f. tube from the receiver, plug it and a second 6BA6 and the filter into the adaptor, and then plug the adaptor into the receiver tube socket from which the tube was removed. Remember, you must bend out the tube shield contacts of lugs at the receiver socket in order to plug in the adaptor.

Now turn on the receiver and tune across the band. You will be pleasantly surprised at the selectivity your receiver now has. Another word of caution may be in order here. You may want to realign your receiver's i.f. strip. The last time it was aligned, it might not have been peaked on 455KC. If not, it will need going over again to realize the most from your efforts.

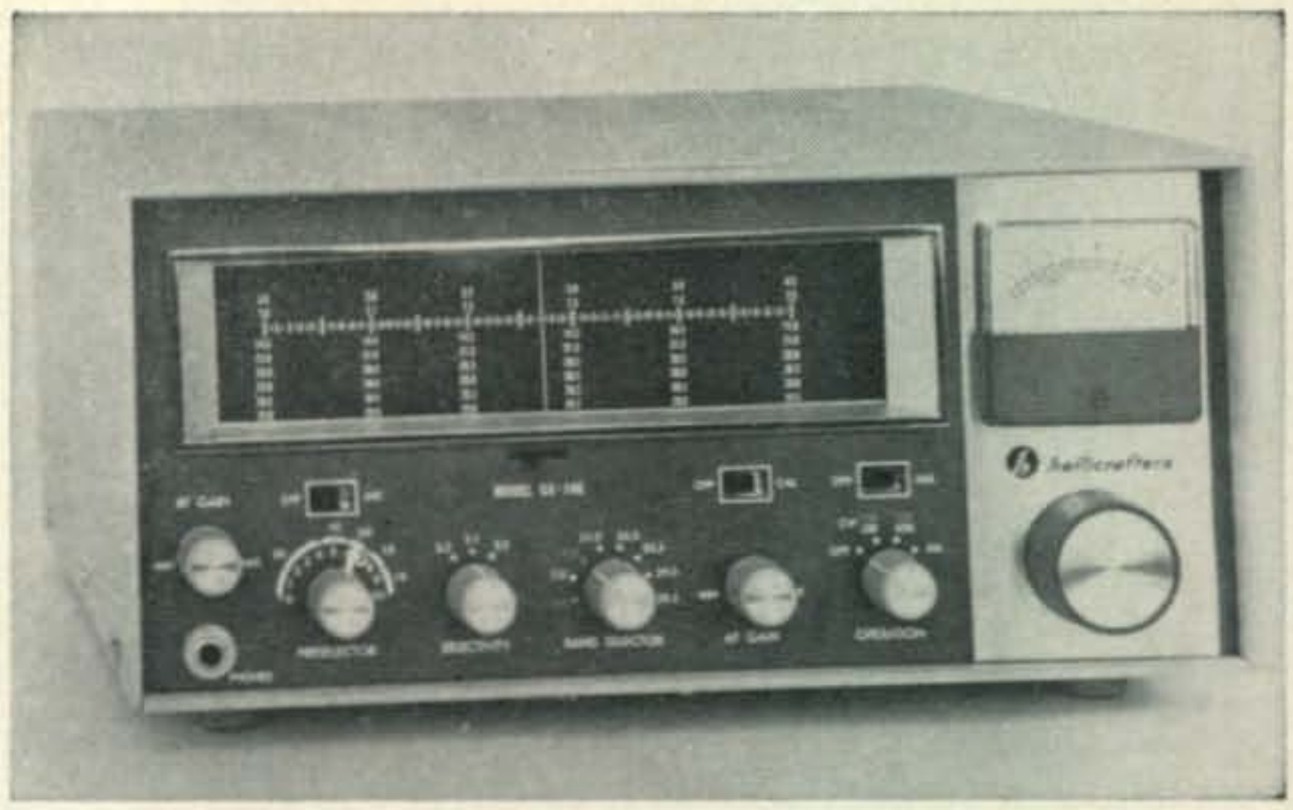
If you are strictly a c.w. man, you may wish to have a filter with a narrower band pass. These are available and will work in this adaptor. ■



Three quarter view of the plug-in filter showing location of the rear tube.

"Check your final, sir?"

The Hallicrafters SX-146 amateur-band receiver for s.s.b., c.w. and a.m.



CQ Reviews:

The Hallicrafters SX-146 Receiver

BY WILFRED M. SCHERER,* W2AEF

THE Hallicrafters SX-146 is basically an amateur-band-only receiver with complete coverage on each band, 80 through 10 meters, for use with s.s.b., a.m. and c.w. The set has been designed to permit its use in conjunction with a companion transmitter, the HT-46, for optional transceive or independent-frequency operation. In addition, provisions are also included to obtain general coverage in the 3.5 to 30 mc spectrum using an external heterodyning oscillator.

Pre-selector tuning is used for selectivity at the r.f. front end. Three degrees of i.f. selectivity are available with bandwidths of 0.5, 2.1 and 5 kc using separate crystal-lattice filters, each with six poles. Upper or lower sideband is available on all ranges. There is a product detector for s.s.b. and c.w., an envelope detector and a noise limiter for a.m.

The tuning range for each band covers 500 kc (4 segments on the 28 mc band) with a constant tuning rate. Frequency calibration is obtained from a slide-rule dial marked off in 5 kc steps, that are about 1/16" apart, and smooth flywheel tuning is used with a string drive that has a ratio that requires approximately 2½ turns of the tuning knob per 100 kc.

Although not an entirely new approach, a feature different than in most current ham-band-only receivers with identical tuning increments is that single *signal*-conversion is used with the frequency controlled by a v.f.o. that functions on one range. See fig. 1. This is accomplished by using a 9 mc i.f. and a heterodyning v.f.o. covering 5.0 to 5.5 mc, in which case the sum or difference frequencies provide operation on the 14 and 4 mc bands respectively. For the other bands the v.f.o. output is "pre-mixed" with appropriate crystal-controlled frequencies to provide variable heterodyning frequencies that will produce the 9 mc i.f. when 7, 21 and 28 mc signals are received. The setup amounts to one *signal*-conversion plus a variable-*oscillator* conversion. The stability is mainly dependent on the v.f.o. characteristics and thus is virtually identical on all bands.

*Technical Director, *CQ*.

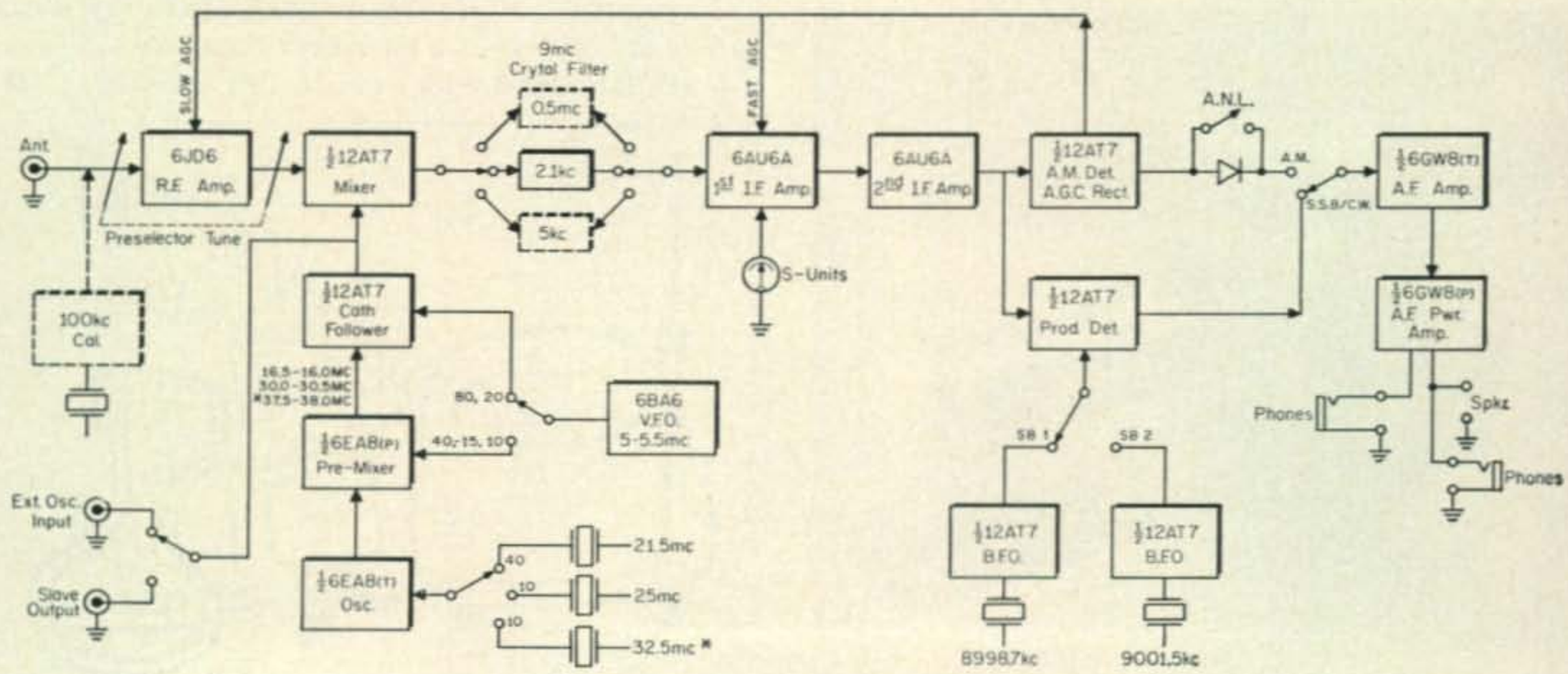


Fig. 1—Block diagram for the SX-146 receiver.

The arrangement also is simpler and less costly than double conversion using a variable 2nd i.f. and it is less apt to produce overload or cross modulation than multiple *signal*-conversion affairs.

The r.f. stage uses a 6JD6 frame-grid tube and the mixer is one triode section of a 12AT7, with the signal applied to the grid and the oscillator injection made at the cathode. A cathode follower provides isolation and the proper impedance match between the oscillator output and the receiver-mixer cathode. Variable-frequency output also is taken from the cathode follower and is routed to a rear-apron phono jack to provide "slave"-frequency control of the companion transmitter when transceive operation is desired.

Bandswitching the r.f. circuits is done in a simple manner that minimizes the required number of switch decks, saves space and is less costly. This is carried out using inductively-coupled r.f. transformers between the antenna and the r.f. stage grid and between the r.f. stage plate and the mixer grid. These cover the 3.5 mc range when tuned with the preselector capacitor. For the other bands, inductance is shunted across each of the transformer secondaries to lower the total inductance and thereby raise the resonant frequency for the desired band. Each shunting inductance is made up of three series-connected coils with their junctions connected to the bandswitch as shown at fig. 2. L_1 and L_2 are airwound coils mounted directly on the bandswitch wafer. Series-tuned traps are shunt-connected at the grid of the r.f. stage and that of the mixer to attenuate 9 mc signals at the i.f.

The crystal filters after the mixer are switched in according to the desired selectivity; however, only the 2.1 kc filter is normally supplied with the SX-146. The filters are plug-in units, so the extra ones may be easily installed at the user's option. The bandwidth of the s.s.b. filter supplied with the set is 2.1 kc at 6 db down and has a bandwidth ratio of 1 to 1.8. The optional filters at 6 db are 0.5 and 5 kc wide.

A triode product detector is employed, with the r.f. signal applied to the grid and the carrier inserted at the cathode. The b.f.o. is crystal controlled using two separate triode oscillators on 8998.7 and 9001.5 kc. One or the other oscillator is switched on according to the desired sideband; however, when sidebands are thereby changed, the v.f.o. is not shifted as required to stay at zero beat with the s.s.b. signal, so the receiver must be returned by 2.8 instead.

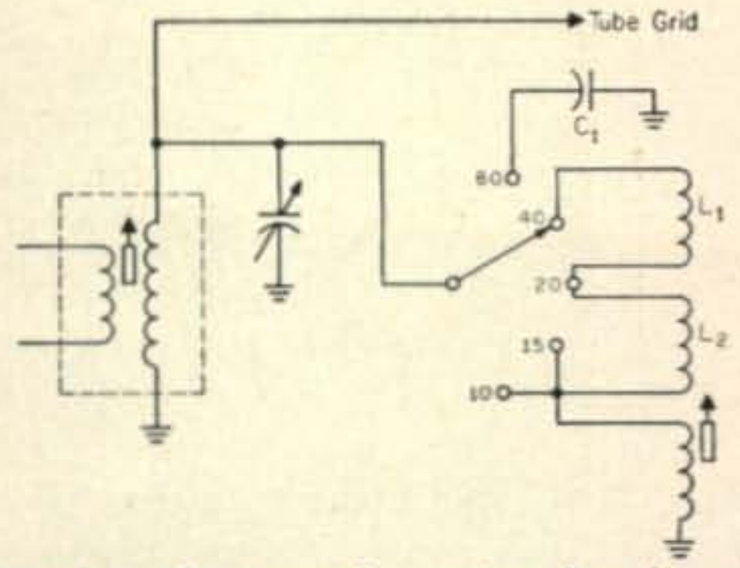


Fig. 2—Bandswitching configuration for the r.f. preselector circuits used in the SX-146.

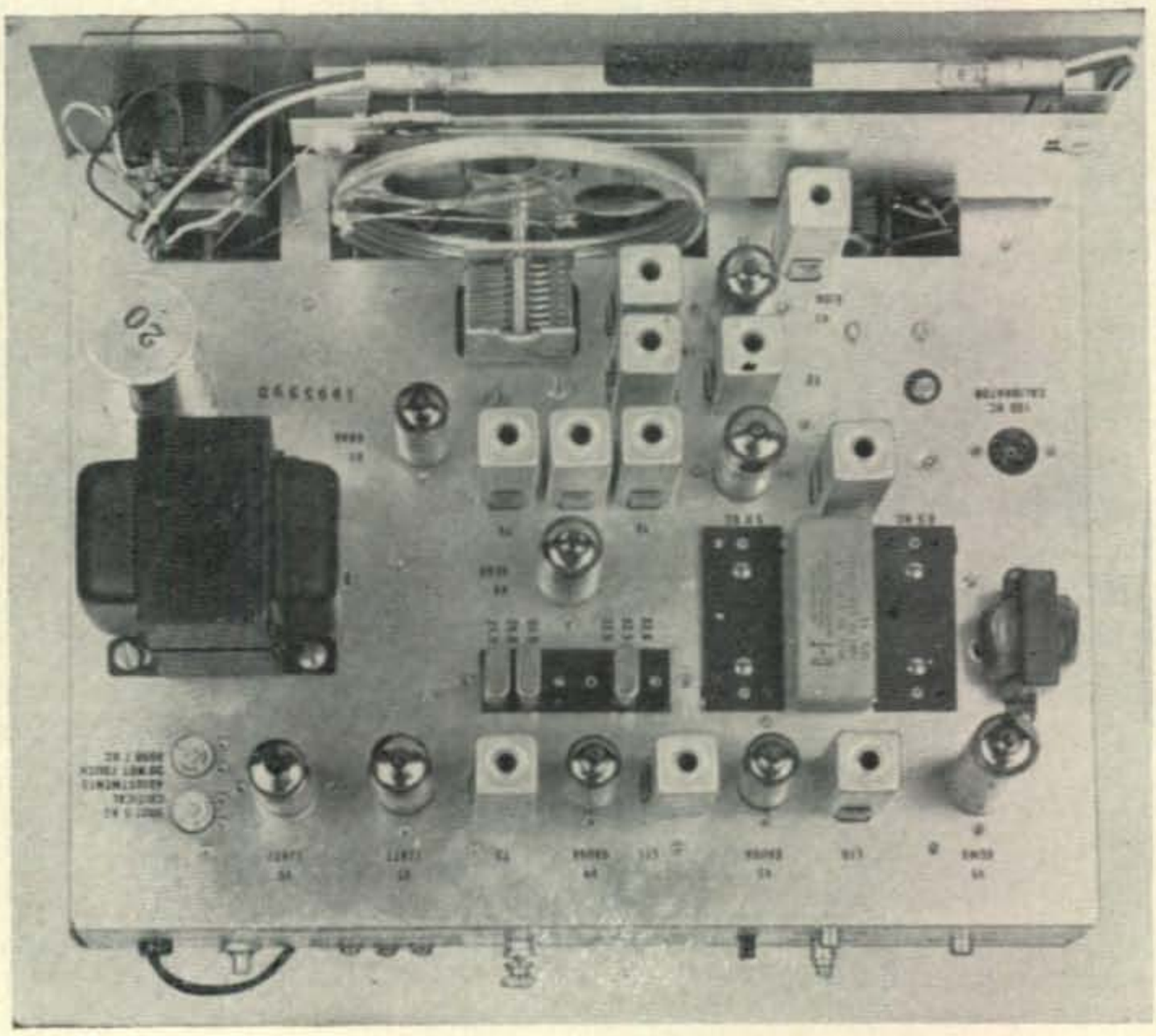
A diode-connected triode provides envelope detection for a.m. A series-type noise limiter is included for a.m. only—there is no s.s.b./c.w. noise limiter.

A.G.C. and S-Meter

The a.m. detector also functions as the a.g.c. rectifier with the a.g.c. voltage applied to the r.f. stage and the first i.f. where the S-meter is connected in the cathode circuit of the i.f. tube. An unusual departure here is that the a.g.c., applied to this i.f. stage, has extremely fast attack and release times that permit the meter to closely follow the signal peaks. On the other hand, the a.g.c. voltage applied to the r.f. stage has a long time constant to provide smooth a.g.c. action without pumping, but the delay time has negligible effect on the S-meter operation. A switch is provided to disable the a.g.c. if desired.

R.F. Gain and Muting

The r.f. gain varies the cathode bias on the r.f. stage and the 2nd i.f. There also is a 470,000-



Top view of the SX-146. The simplicity of the setup is indicated by the relatively few components. The v.f.o. tuning capacitor is next to the large string-driven wheel. The oblong-shaped component near the lower right is the 2.1 kc crystal filter at both sides of which are sockets for plugging in extra optional filters.

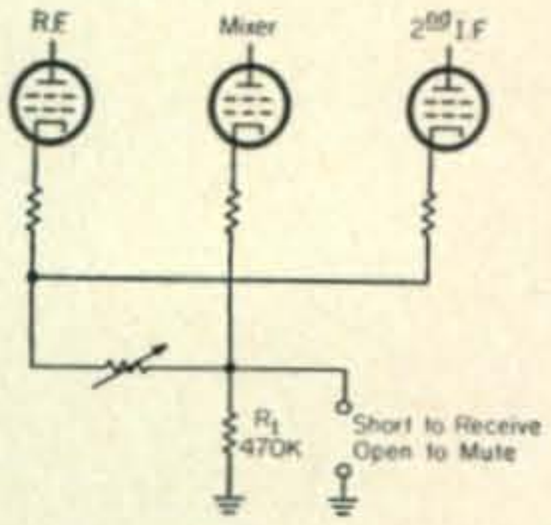


Fig. 3—R.f. gain and muting circuitry for the SX-146.

ohm resistor in the ground-return of the gain control which is shorted out during normal operation. See fig. 3. When it is desired to mute the receiver during transmissions, the short is automatically removed by the associated transmitter. Cutoff bias is then produced to deactivate the r.f. stage, the 2nd i.f. and the mixer, the cathode return for the latter also being connected to the high end of the 470 K resistor. The overall gain of the SX-146 is equalized for all hands by automatically altering the cathode resistance in the r.f. stage when the bands are switched.

The receiver also may be used for coverage on most frequencies between 3.5 and 30 mc. To do this, an external oscillator must be used to supply the heterodyning frequencies which are injected to the mixer cathode via a rear-apron phono jack. The oscillator may be a v.f.o. for continuous tuning or crystal-controlled for fixed-frequency reception. The required signal-injection level is 0.5 v. r.m.s. into an 82-ohm load. The necessary oscillator frequencies fall in the 10-27 mc range as listed in the manual according to the desired signal frequencies. The preselector provides continuous tuning from 3.5 to 30 mc; however, reception in the 8-10 mc range will be somewhat degraded, due to the 9 mc traps in the r.f. stages.

A receptacle is furnished on the chassis for plugging in an optional 100 kc crystal-calibrator accessory. For calibrating purposes there is a small tab that protrudes through the panel by which the entire slide-rule scale may be moved to the left or right as needed to fall in line at the 100 kc points.

On the 3.5 and 7 mc bands the tuning and the dial calibrations increase in frequency going from left to right. On the other bands it goes from right to left. This occurs because either the sum or difference frequency mixtures are used for *signal* conversion which also causes the individual sidebands to be reversed on some ranges. Therefore, the u.s.b. and l.s.b. positions at the sideband-selector switch are color-keyed to the band identifications at the range switch. When the band identifier is in white, the white lettering at the sideband switch indicates the correct sideband. Similarly, red band-numerals correspond to red sideband markings.

Performance

As we've experienced before with Hallicrafter gear, the technical specifications appear to be conservatively rated with the measured performance generally turning out better than the manual stated.

For the SX-146, the a.m. sensitivity, rated at less than 1 μv for 10 db s./n., at worst was 0.25 μv for 10 db s./n. (using the 2.1 kc filter), and on s.s.b. and c.w. where the rating is less than 0.5 μv for 20 db s./n., it ran between 0.25 and 0.3 μv for 20 db s./n. on all bands and averaged 0.1 μv for 12-14 db s./n.

Unwanted-sideband suppression at 1 kc, not rated, was at least 52 db. I.f. signal rejection (9 mc), rated at better than 50 db, was 52-55 db on 7 and 14 mc, 65-80 db on the other bands. Image rejection, not rated, was at least 80 db on all bands.

In-band tweets, although rated at 0.25 μv equivalent signal, were conspicuous by their absence, except at 21.3 mc which was 0.3 μv instead of 1 μv as rated. Spurious-signal rejection, rated at better than 50 db, was confirmed with readings of 60 or more db.

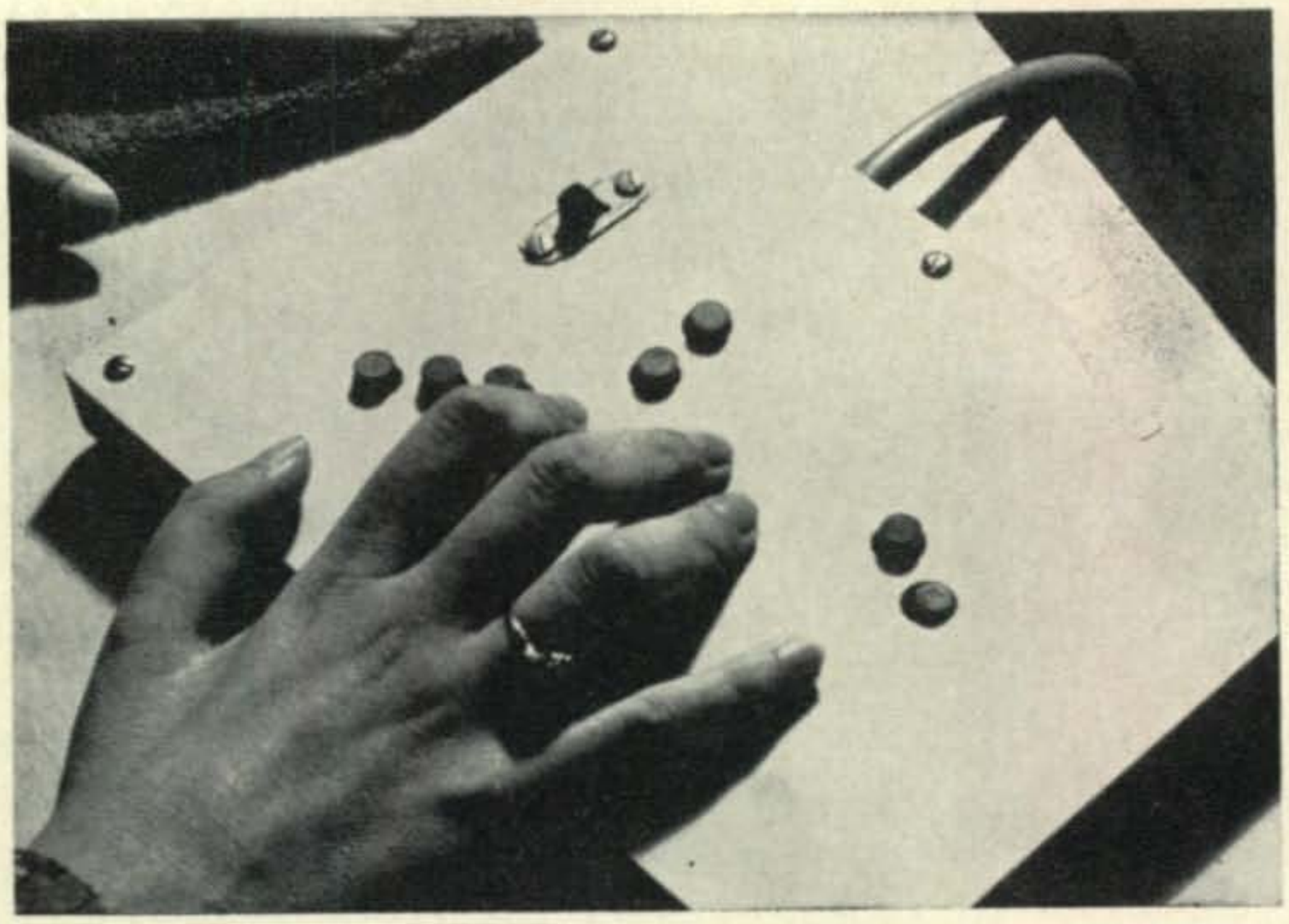
Frequency stability, rated at 500 c.p.s. drift the first hour after 15-minute warmup and 100 c.p.s. per hour thereafter, was 300 c.p.s. for the first 15 minutes starting cold from 68° F. ambient, 160 c.p.s. the next hour and 25 c.p.s. or less each subsequent hour. This was essentially the same on all bands. With $\pm$10% line-voltage variation a $\pm$10 c.p.s. shift was found on 4 & 14 mc, $\pm$35 c.p.s. on the other bands, indicating that the crystal-controlled oscillators shifted more than the v.f.o., even though voltage regulation is not used on the v.f.o.! Banging the table or the cabinet indicated excellent mechanical stability also.

As may be seen from the figures, the set has plenty of sensitivity with low noise which can be very helpful when you're digging for those weak signals. This was also confirmed in practice where weak-signal reception was better than with a number of other high-quality receivers. In view of the high sensitivity, we had expected to encounter more than the usual susceptibility to overload and cross modulation; however, in use it had proven to be excellent in this respect.

On s.s.b., a.g.c. operation is one of the smoothest heard to date and the a.f. quality is exceptionally pleasant with a natural sound and an absence of the stridency usually experienced with receivers in which a h.f. filter is employed. The S-meter is quite lively following the s.s.b. peaks around and the readings closely approach the true crest values. Incidentally, approximately 50 μv of signal indicates S-9 and the intermediate points fall nearer to 3 db per S-unit than the target steps of 6 db.

Since only the 2.1 kc s.s.b. filter was furnished, operation on a.m. and c.w. with the 5 and 0.5 kc filters could not be evaluated; however, in spite of the narrow s.s.b. filter, a.m. signal quality was good and better than often realized under such circumstances.

The SX-146 receiver is priced at $269.95. Four crystals are required for complete 10-meter band coverage, only one is supplied with the unit for 28.5-29.0 mc. The plug-in 100 kc calibrator accessory is $19.95. The manufacturer is Hallicrafters, Inc., Fifth and Kostner Aves., Chicago, Ill. 60624. —*W2AEF*



The authors have helped Mrs. Zweigle learn to operate this simple keyboard even with her limited use of three fingers over c small area. The keyboard keys were positioned exactly for Mrs. Zweigle's particular need, but can be easily adapted for anyone else.

"TELE-TYPING" FOR THE DISABLED

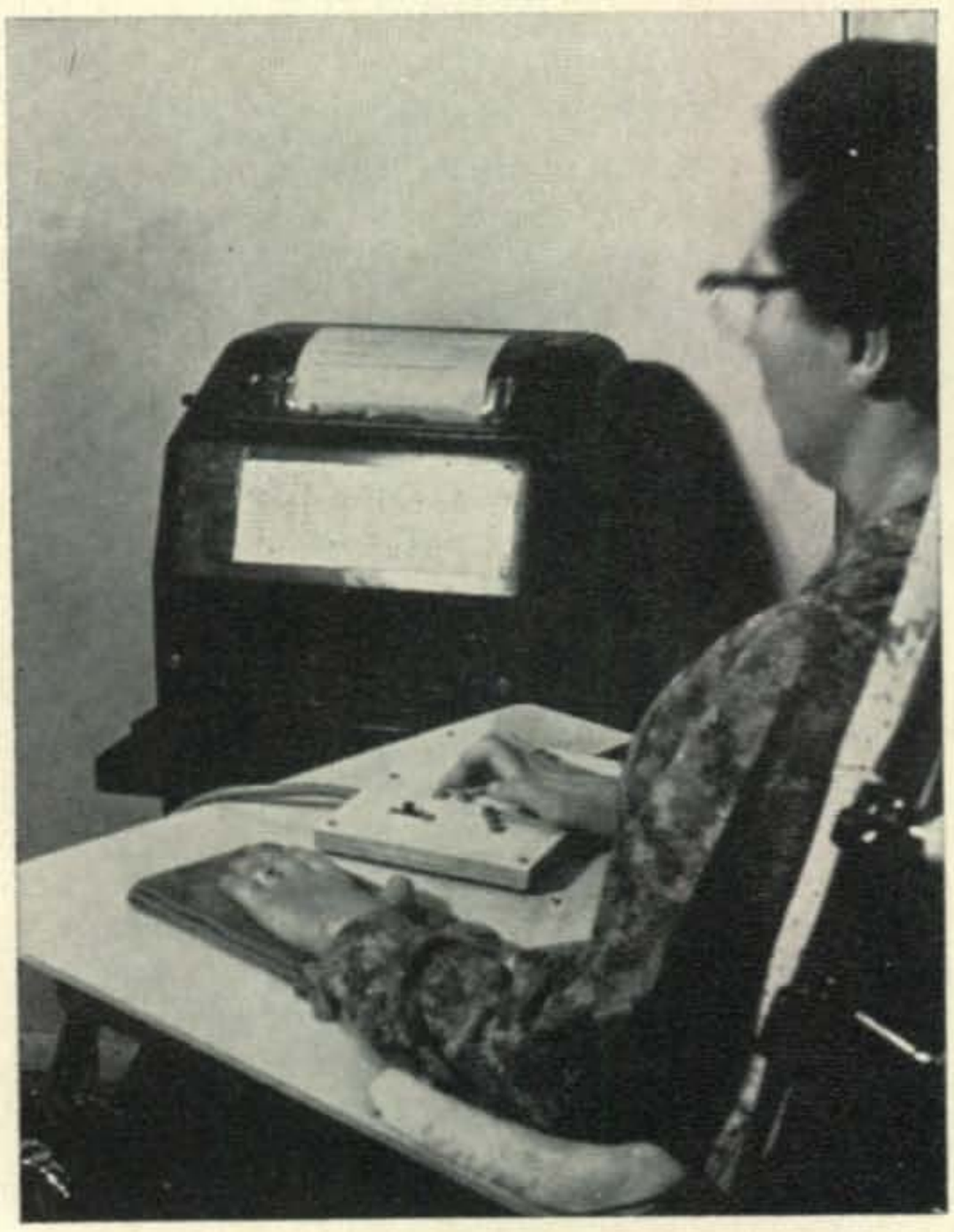
BY LAWRENCE W. ADAMS, K8SQB*; EDWARD W. KOCH, W8QMI†;
AARON BROOKS, W8AYY‡

The following article details the modification of a Model 15 printer to a special typewriter which can be used by those afflicted with polio or other partially disabling conditions.

FACED with the basic premise that a polio victim would be unable to move his hand or hands sufficiently to cover a full typewriter keyboard, even if the latter were specially designed to fit in the smallest possible area, and with the further requirement of a feather-light keyboard touch, how could typing be accomplished? The Teletype five-unit code came to mind—why not have five keys setting up the code for each character on a page printer, another key to actuate the printer, and another to cancel errors in setting up the code? The feather-touch requirement indicated electrical code switching rather than mechanical.

For those unfamiliar with the operation of a Model 15 Teletype page printer, the following sequence of events occurs when the "letters" key is pressed: (1) all of the locking levers are placed in their open position; (2) the clutch mechanism is tripped to permit one revolution of the keyboard cam assembly; (3) the "start-stop" contacts are opened; (4) the five code contacts are in turn closed, then opened; (5) the "start-stop" contact is closed; and (6) the clutch mechanism stops the rotation of the cam assembly. All contacts are in parallel, opening or closing one circuit.

Analysis of the above showed it possible to electrically isolate the contact assemblies and to selectively switch in any combination of them, as shown in Figure 1. A solenoid could be used to trip the clutch mechanism, thus printing the character electrically set up by the keyboard. The locking levers remain in the open position



Mrs. Zweigle with remote keyboard and Model 15 Teletype in the background.

*9 Dennis Court, Midland, Michigan.
†2911 Dartmouth Drive, Midland, Michigan.
‡Deceased.

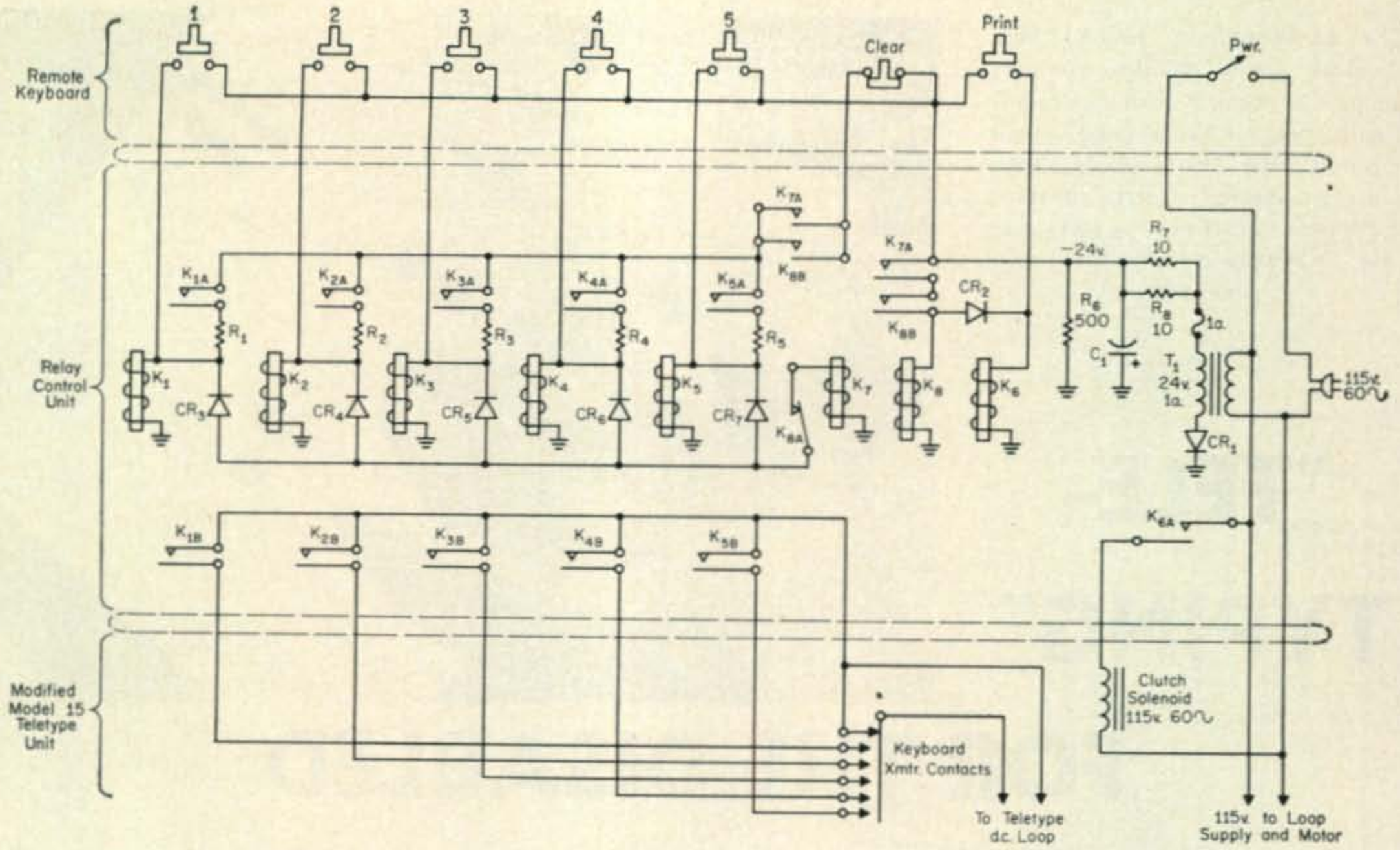


Fig. 1—Diagram of relay unit and Teletype contact modification.

C_1—1000 mf 50 volt electrolytic capacitor.
CR_1—2 amp. 200 volt p.i.v. silicon diode.
CR_2 thru CR_7—1N537 diodes.
Clutch solenoid—115 volt 60 cycle.
K_1 thru K_6, and K_8—24 volt d.c. relays, d.p.d.t. coil resistance approximately 180 ohms.
K_7—24 volt d.c. telephone type relay, fast make, slow release (see text)
R_1, R_2, R_3, R_4 & R_5—47 ohm ½ watt carbon resistors.
R_6—500 ohm 2 watt resistor.
R_7, R_8—10 ohm 2 watt resistors.
T_1—115 volt 60 cycle primary, 24 volt 1 amp. secondary Transformer.

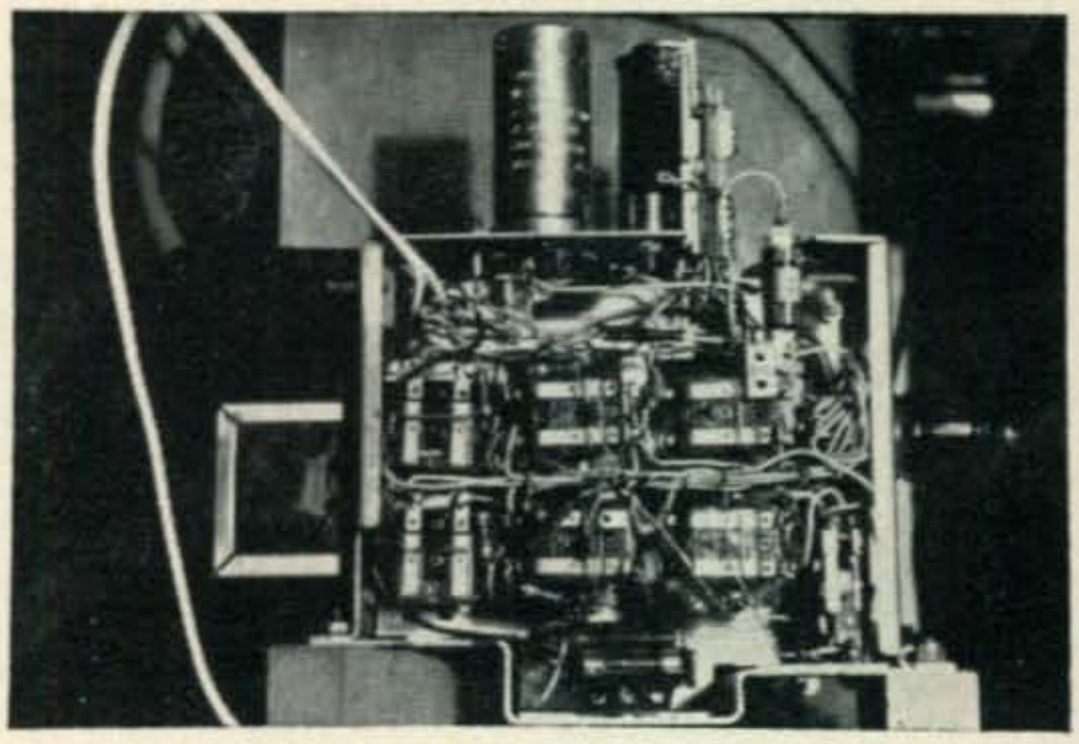
until another key is pressed on the printer keyboard. Here, then, was a practical solution to the problem of how to type with a 7-key keyboard having a feather-light touch!

Modifications To Model 15 Printer

The first step in changing the printer keyboard is to disassemble the contact mechanism. Unsolder and remove both leads. Carefully note the arrangement of parts so you can replace them properly. The outer contact assembly (the stiff one) is hacksawed into individual contacts as shown in Figure 2. Then replace the entire assembly, making sure with ohmmeter checks that each contact is electrically isolated. Resolder the contact leads, adding an extra lead to the outer one. Solder separate leads to each of the five outer code contact arms. These leads should be about 9" long, terminating in a Jones socket to be mounted behind the keyboard. A matching plug is wired with leads long enough to reach a terminal strip at the rear of the printer base. The socket and plug arrangement permits easy removal of the keyboard from the printer base.

The next step in the keyboard conversion is the installation of a solenoid to operate the clutch mechanism. A small 115-volt a.c. solenoid should be tested to see if it has sufficient power to trip the clutch. Be sure to do this with the machine actually running, since this requires more power than when the printer is turned off. If the solenoid is suitable, determine the mounting location with the keyboard fully inserted in the printer base, checking for clearance with all parts, moving and otherwise.

A clutch arm of 1/16" sheet steel is the next requirement, and is shown in the photo. It is silver-soldered to the clutch mechanism and linked to the solenoid armature with a 1/16" diameter stiff wire. The clutch spring must have enough tension to return the armature of the solenoid upon release, positioning the armature for the next stroke. A travel-limiting device to prevent the solenoid armature from slipping out is bent up from a piece of wire and bolted to the keyboard base.



Relay unit.

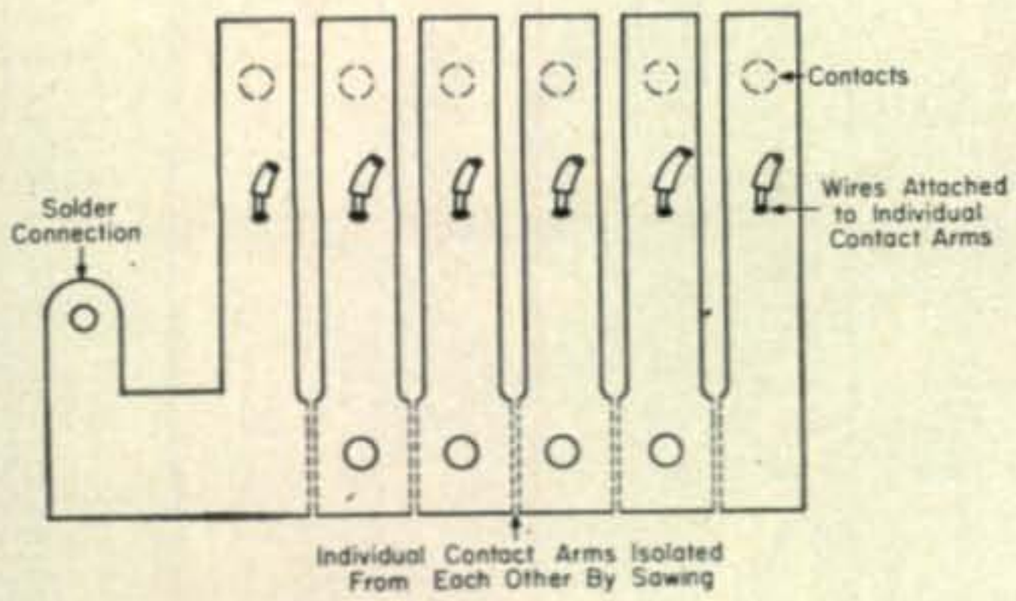


Fig. 2—Modified Teletype keyboard transmitter contacts.

The Keyboard

The lead photo shows the remote keyboard which was tailor-made to fit the finger movements of Mrs. Zweigle. This particular keyboard measures 10" wide, 6¾" deep, ⅞" high. It includes seven pushbutton switches disposed in a pattern to best fit the finger or fingers which can be moved. A 115-volt slide switch was also included to give complete control of the unit to the operator, after the hand is placed on the keyboard.

The keys were positioned by placing a sheet of paper under the operator's hand and marking the seven positions which can be reached by one or more mobile digits. These positions were marked preferentially for finger mobility in the following order: PRINT, 1, 2, 3, 4, 5, and CLEAR. It is not necessary to locate the five code keys in numerical order. You will note 4 and 5 are out of order because this seemed to fit Mrs. Zweigle's finger mobility best. 1, 2, and 3 keys are actuated by the thumb; 4 and 5 by the index finger, and PRINT and CLEAR by the little finger. The center finger acts as a sort of fulcrum.

The keyboard designer should try out various keys on the operator, making certain they can be comfortably operated with a light pressure that will not unduly tire the operator. In this case, it was determined that keys made by reassembling matching leaves from old telephone relays required less pressure than available pushbuttons. Their shallow depth helped in minimizing the height of the remote keyboard.

The interior view shows how the keys were mounted on a ¼" plywood bottom plate with 6-32 bolts and nuts. The finger buttons were fabricated out of ⅜" wood dowel stock. The bottom of the button was drilled for a snug fit on the 3/16" diameter by ⅛" black insulated spacers attached to the spring leaves.

The top plate can be plywood or plastic, with holes large enough to clear the buttons. Thin sponge rubber feet were glued on the bottom plate. Suitable size plastic tubing was used to cover the control cable wires.

A study of the Teletype 5-unit code shows the number of units used by a letter generally follows the frequency of use. However, there are two exceptions—K and V with 4 units, while Y has 3, and Z only 2 units. There are 5 letters or functions using 1 unit, 10 using 2 units, 10 using 3 units, 5 using 4 units, and 1 using 5 units.

Although Mrs. Zweigle has been a polio victim for almost 11 years, she has experienced no particular difficulty in operating the keyboard, other than the finger muscles tiring after 15 or 20 minutes use per day. This condition is improving with continued use. After six weeks, she can operate the keyboard for about three 30-minute periods per day without excessive fatigue.

Mrs. Zweigle found it rather easy to learn the 5-unit code. After about a week's practice, she watched the print rather than the buttons. Her printing speed is now about 10 words per minute. This should improve with practice and exercise of the finger muscles.

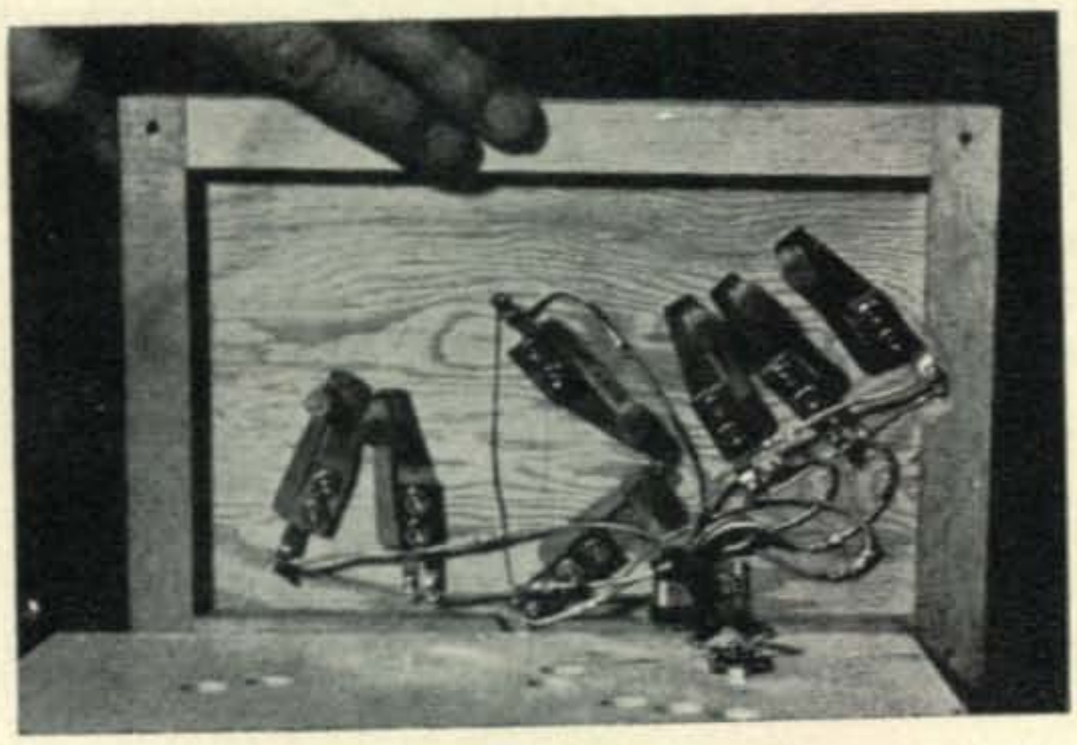
Mrs. Zweigle is developing the touch needed to hold the PRINT button down slightly over 163 milliseconds so duplicate letters can be printed, like "oo" in "too", rather than set them up separately each time.

Remote Keyboard Circuit

The remote keyboard unit consists of six normally-open, momentary-make pushbuttons or "keys" and one normally-closed, momentary-break, pushbutton or "key". Five of the momentary-make keys are numbered 1 through 5 and correspond to the Teletype code signals. The sixth momentary-make key is labeled "Print". The momentary-break key labeled "Clear" permits the operator to clear the keyboard if an incorrect code signal has been set up.

Relay Control Unit

Relays were selected for the initial construction of the memory control unit because of their availability and the simplicity of design. Low level voltage on the contacts of the keyboard was felt desirable in order to minimize the shock hazard to the operator. Relays K_1 through K_6 and K_8 are surplus 24-28 volt relays having a coil resistance of about 180 ohms. These relays are equipped with double-pole, double-throw contacts. Relay K_7 is a slow-release 24-volt telephone-type relay having release delay time of about 300 milliseconds (minimum delay required



Interior view of remote keyboard, showing keys and wiring.

would be greater than 163 milliseconds for 60 w.p.m. Teletype).

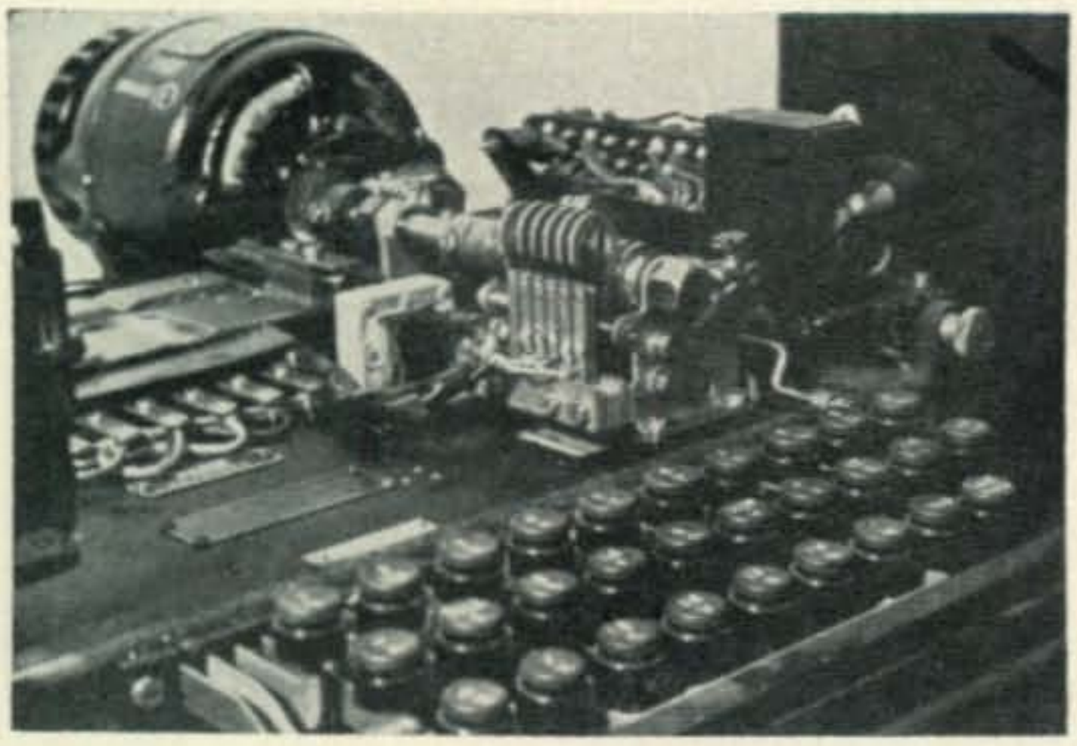
Teletype Code Set-Up

When code set-up key No. 1 is momentarily depressed, relay K_1 is energized and maintained energized by means of hold-in contact K_{1a}. The 47-ohm resistor R_1 reduces the current required for hold-in operation, thus reducing the load requirement of the d.c. power supply. Relay contact K_{1b} is connected in series with the No. 1 keyboard transmitting contact of the Model 15 Teletype keyboard. Relays K_2 through K_5 operate in a like manner. A diode network is used to energize relay K_7 when any of the relays K_1 through K_5 become energized. Note that this diode network would not be needed if relays K_1 through K_5 had an additional normally-open contact. If an error has been made in setting up the proper Teletype code, the CLEAR key is depressed. This operation opens a normally-closed contact, thus de-energizing the hold-in circuit for all code set-up relays K_1 through K_5.

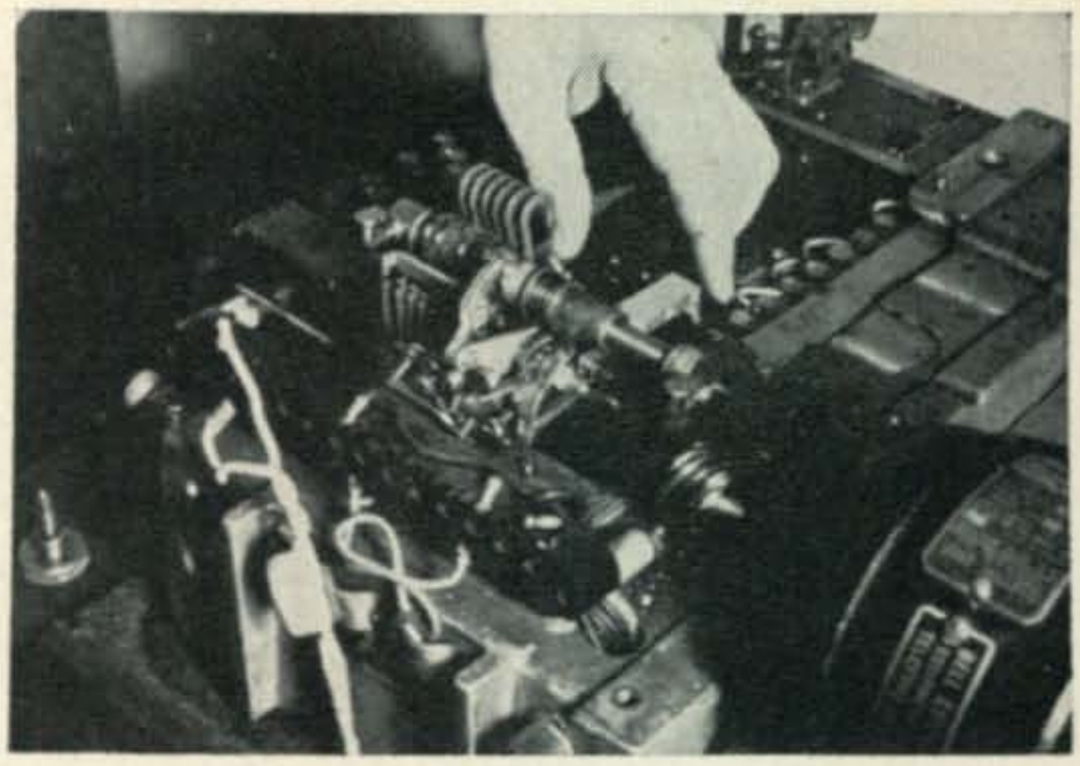
Print Cycle

When the desired Teletype code has been set up on the remote keyboard, the PRINT key is depressed, thus momentarily energizing relay K_6. Relay K_8 is also energized through diode CR_2. Normally-open contact K_{6a} closes, thus energizing the clutch solenoid mounted on the Teletype keyboard. This 115 volt 60 cycle solenoid trips the clutch mechanism, allowing the Teletype keyboard transmitting contacts and relay contacts K_{1b} through K_{5b} to be interrogated for the print cycle. Only a momentary operation of the print key is necessary to initiate the print or interrogate cycle of the Teletype keyboard.

Relay K_8 is momentarily energized through diode CR_2, and is maintained energized by means of circuit through relay contacts K_{7a} and K_{8b}. When relay K_8 becomes energized, relay K_7 becomes de-energized due to the opening of contact K_{8a}. However, K_7 is a slow-release relay (200 to 300 milliseconds delay recommended), thus giving a time delay before relay K_8 and relays K_1 through K_5 become de-energized. Please note that relay contact K_{6b} will remain



Solenoid mounting on Teleprinter keyboard base plus wiring of teletype keyboard transmitter contacts.



View of clutch arm and clutch mechanism.

closed as long as the PRINT key is depressed, thus overriding the operation sequence of relays K_7 and K_8 described above. This permits repeated printing of the particular code signal set up on the remote keyboard.

A problem is frequently encountered on repeated printing in that the manual release of the PRINT key de-energizes relays K_1 through K_5. This may occur while the Teletype transmitter contacts are still being interrogated, thus causing an ambiguous print or operation of the keyboard. In actual use of the keyboard, the momentary operation of the PRINT key has not been a serious problem. This problem can be overcome by adding a momentary-open contact on the Teletype keyboard clutch mechanism. This arrangement would allow relays K_1 through K_5 to become de-energized only after the interrogation of the Teletype keyboard contacts and relay contacts K_{1b} through K_{5b} had been completed.

It is well to note that the "Letters" key of the Model 15 Teletype keyboard *must* be manually depressed before the remote keyboard can function properly. This is necessary for the sequential interrogation of all five of the Teletype transmitter contact circuits.

Power Supply

The power supply employs a single 2-ampere 200-p.i.v. diode in a halfwave rectifier circuit. The chassis was made positive to provide a solid electrical and heat sink connection of the diode to the chassis. The two 10-ohm resistors R_7 and R_8 serve as surge protection, while the slo-blo fuse protects the capacitor in the event of diode failure. A fullwave bridge rectifier arrangement may be preferred and gives better voltage regulation. However, the halfwave circuit was satisfactory. ■

RTTY From A to Z

BY DURWARD J. TUCKER*, W5VU

PART XXIII

The typing unit was introduced in last month's installment. This month we discuss, in detail, the most important part of the typing unit, the selector mechanism.

THE teletypewriter is a mechanical device whose proper operation depends upon the exact movement, within close tolerances, of precision made parts. In addition, there is a prescribed sequence that the moving parts must follow. Finally, the movements or sequence of the moving parts of one machine must be in synchronization with each and every other machine within a teletype communication system.

It was stated earlier that the keyboard transmitter mechanism is, in a sense, half of a teletype machine. In that same sense, the selector mechanism is the other half. It is appropriate that the selector mechanism be given the same thorough coverage as was given the keyboard mechanism.

Selector Unit

The selector unit is, first, a part of the typing unit as pointed out earlier. Secondly, to pinpoint it further, it is a part of the receiving unit of the typing unit as illustrated in fig. 134. Figure 135 shows a detailed view of the selector unit with some of the parts identified. Basically, the selector unit is composed of a *d.c. operated electromagnet*, called the selector magnet, and an associated ingenious mechanism. The mechanism will be covered in due course. The selector magnet has a reliable and fast acting armature that faithfully follows (when properly adjusted) the coded impulses that are received by the selector magnet coil. Figure 18 shows the location of this unit on the left side of a Teletype Model 15 receiving mechanism and fig. 23 shows a close-up view of the selector unit of a Teletype Model 14 typing reperforator. The next several figures will show various mechanical details of the selector mechanism of a Model 15 teletype machine. Do not be surprised or concerned if there is a slight difference between some of the illustrations and your Model 15 as there are variances here and there, depending upon the vintage of the machine.

A cross-sectional view of the selector unit is shown in fig. 136 and a side view is shown in fig. 137. The details of the locking lever operation are given in fig. 138. A sequence chart outlining the operation of the selecting mechanism is given in fig. 139. This chart should also be helpful in studying the various figures. Figure 140 gives details of the typing unit clutch.

The selector unit (figs. 135 to 138) is located on the left end of the typing unit (fig. 18) and

*6906 Kingsbury Drive, Dallas 31, Texas.

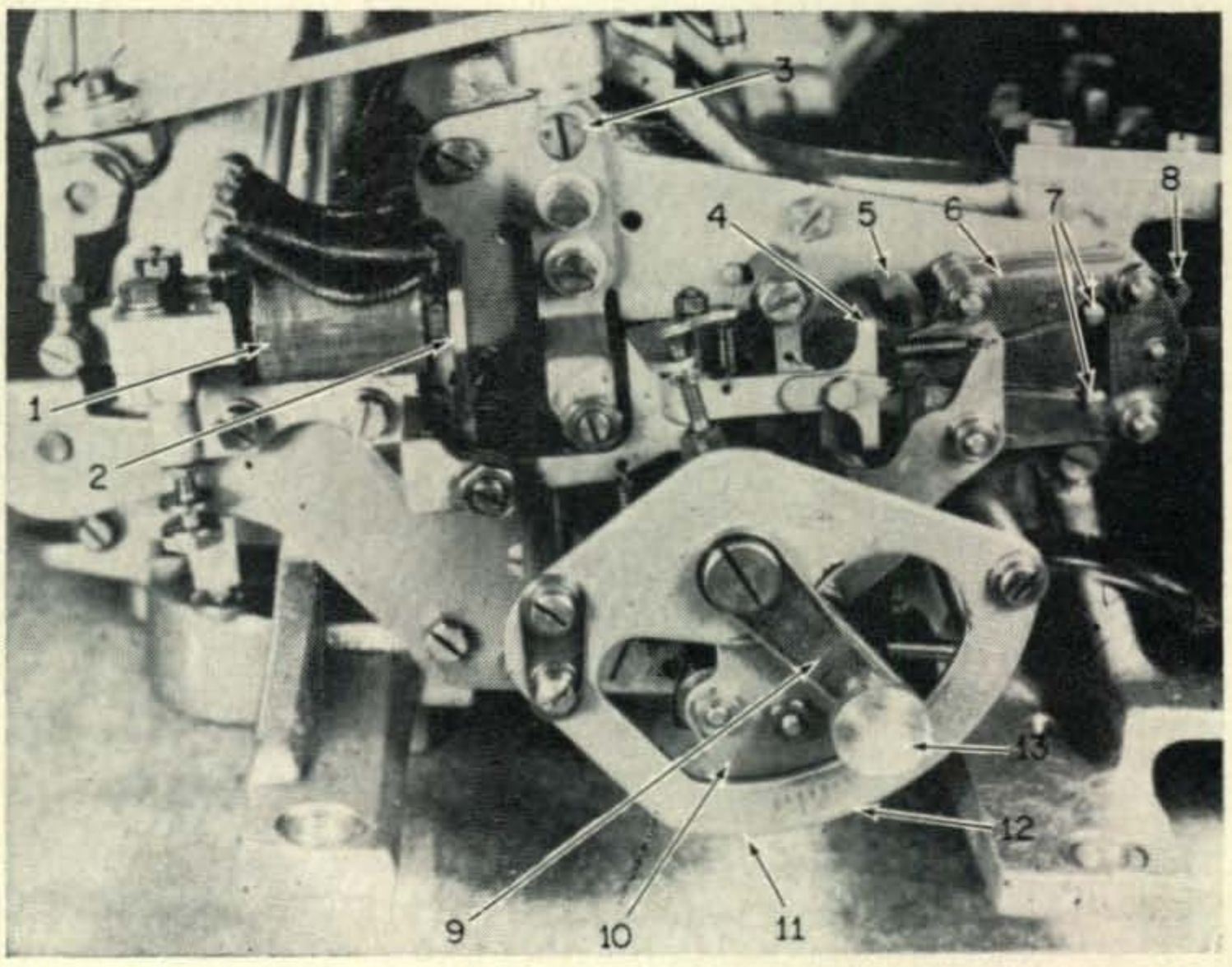


Fig. 135—The selector unit of the Model 15 with the important parts identified.

1. Magnet.
2. Armature.
3. Eccentric screw.
4. Armature extension.
5. Sword arms.
6. Selector separator plates.
7. Stop posts.
8. Selector T-Levers.
9. Range Finder adjustable arm.
10. Stop lever bracket.
11. Range finder assembly.
12. Scale.
13. Thumb screw.

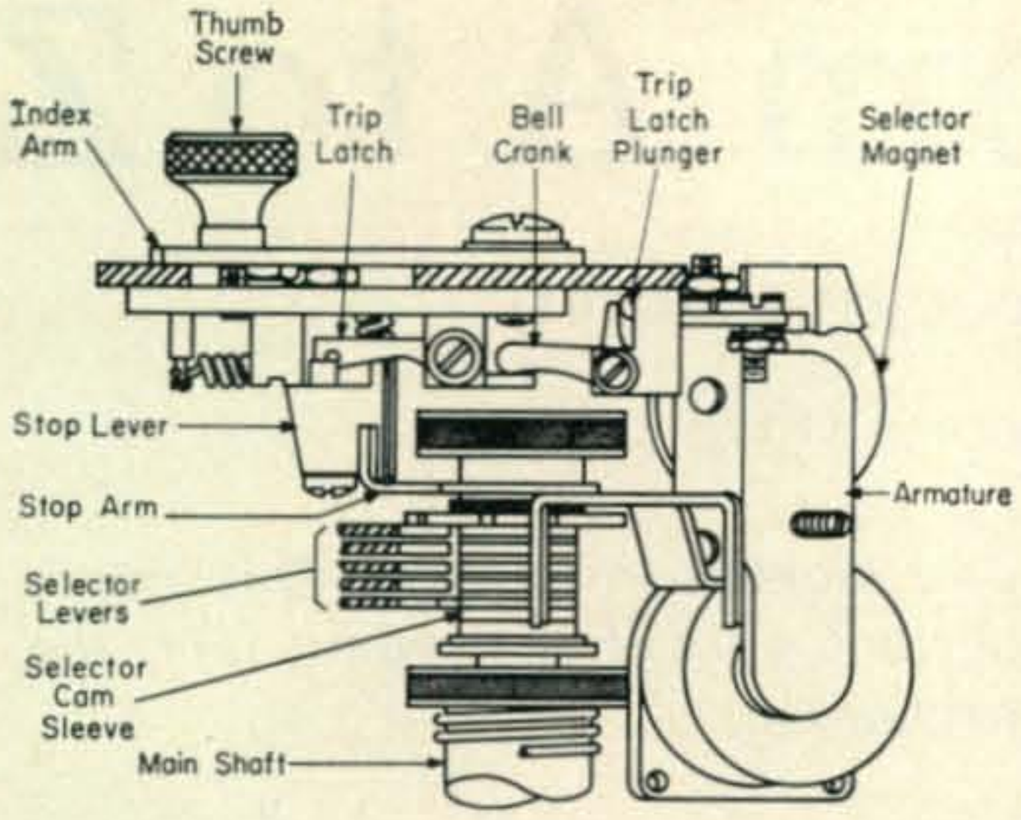


Fig. 136—Cross section of the selector unit from the Model 15, identifying the various parts.

consists of a selector magnet, a selector armature, five selector levers, five swords, five T-levers, a selector mounting plate with posts and springs, and the range finder assembly. The selector mechanism is designed to translate the marking (current) and spacing (no-current) impulses, received from the line, into a series of mechanical motions which will cause the vanes on the front of the typing unit to be positioned in accordance with the *character* or *function* assigned to each *combination of five selecting impulses.*

The selector mechanism is controlled by the armature of the selector magnet which receives the code impulses from the line. As shown in fig. 136, the armature of this magnet is normally pulled up and the stop arm is against the stop lever which in turn is held by the trip latch. Because the stop arm, which is a part of selector cam sleeve, is engaged with the stop lever, the cam sleeve does not revolve.

When a start impulse, which is spacing (no-current), is received, the armature is released and pulled away from the magnet pole pieces by the armature spring. The trip latch is moved out of engagement with the stop lever, releasing the stop arm, and allowing the cam sleeve to revolve with the shaft. Each of the vanes in turn is operated by a selector cam through a T-lever, a sword, and a selector lever. (See fig. 137).

As an example of how the selector unit operates, assume that the code for the letter E is received. Upon the reception of the start impulse (no-current impulse), the armature moves away from the magnet and pushes the trip-latch plunger (fig. 136), which causes the trip-latch bell crank to move the trip-latch out of engagement with the stop lever, releasing the stop arm. The selector cams start to revolve and the No. 1 selector cam engages No. 1 selector lever, when the first impulse (marking or current) of the letter E has been received from the line. The magnet armature is pulled up, bringing the upper end of the armature extension up into the path of the upper sword arm. When the No. 1 cam engages the No. 1 selector lever, this lever is turned counterclockwise, carrying with it the sword which strikes the upper end of the armature extension and is turned clockwise about its pivot. (See fig. 137, point A). The sword is then positioned so that when the No. 1 cam clears the selector lever, the selector lever spring moves the sword against the T-lever and brings the front edge of the No. 1 *vane down.* Since no current is received while Nos. 2, 3, 4, and 5 cams are engaging their selector lever, the magnet armature is released and the armature extension moves down so that the lower end of the armature is in the path of the lower sword arm. (See fig. 137). As the Nos. 2, 3, 4, and 5 cams engage the Nos. 2, 3, 4, and 5 selector levers, the Nos. 2, 3, 4, and 5 vanes are moved so that the front edges are *up.* With the front edges of the vanes up, the corresponding *code bars are moved right* by the connecting bell cranks *to the un-operated position.* With the front edges of the vanes in lower position, the corresponding *code bars are moved left to to the operated position.* With the No. 1 code bar to the *left,* and Nos. 2, 3, 4, and 5 code bars to the *right,* one notch in each code bar is *opposite the E pull bar.* The sixth cam (fig. 140), releases the mainshaft clutch, allowing the printing bail and function bail to make *one complete revolution.* The printing bail cam permits the printing bail to be pulled forward by its spring. The E pull bar pulled down by its spring into the path set up by the code bars, and the pull-bar bail moved by the printing bail, carries the pull bar forward, causing the type bar to strike the platen, printing the letter E.

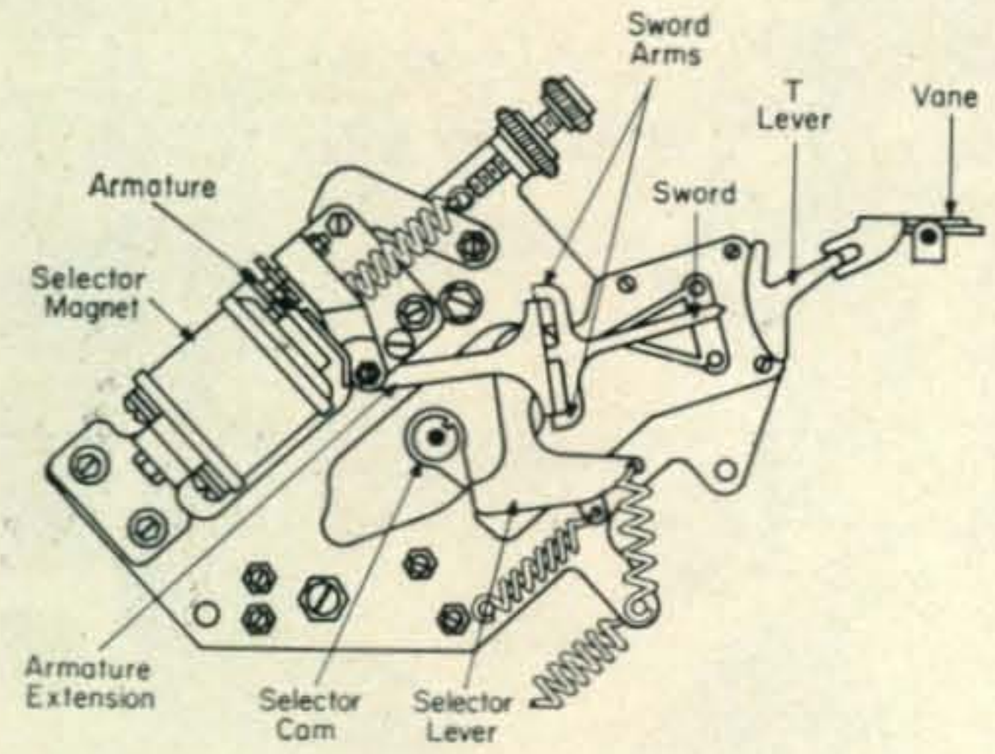


Fig. 137—Side view of the selector unit from the Model 15, identifying the various parts.

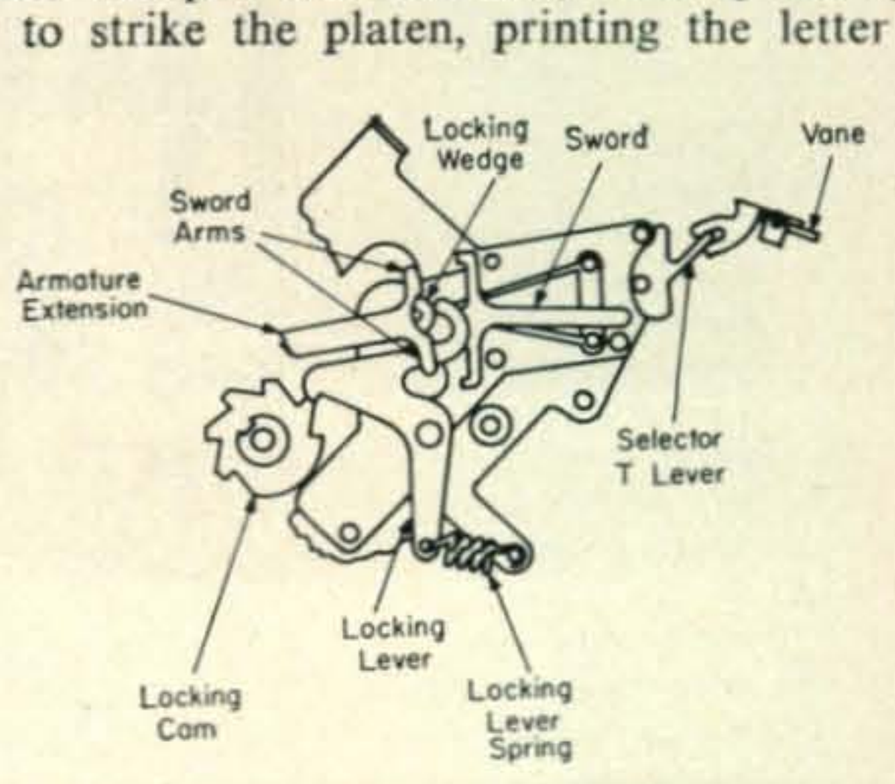


Fig. 138—Details of the locking lever from the selector unit.

All of this happens in just about the time it takes to bat an eyelash—163 milliseconds, in fact, at 60 w.p.m.

The operations of the selector unit in forming other characters is essentially the same, except for the coded sequence or order in which the character-forming parts operate. In addition to the characters or symbols, as determined by the type pallets, that can be received and printed, there are the eight *functions,* such as typing carriage return and line feed to be performed from the operations of the selector unit. These eight specific functions were listed under the "Typing Unit" section earlier in the text. Here again the operations of the selector unit are essentially the same, except for the order in which the intelligence-giving parts operate.

Locking Cam and Locking Lever

The locking cam has five high and five low portions on its periphery against which the locking lever is held by its spring. (See fig. 138). The purpose of the cam and locking lever is to hold the armature extension arms firmly in position while the swords are being positioned by striking the armature extension arms.

During that part of each code impulse when the swords are being positioned by striking the armature extension arms (at the time when any cam is operating the corresponding selector lever), a low portion of the locking cam is in

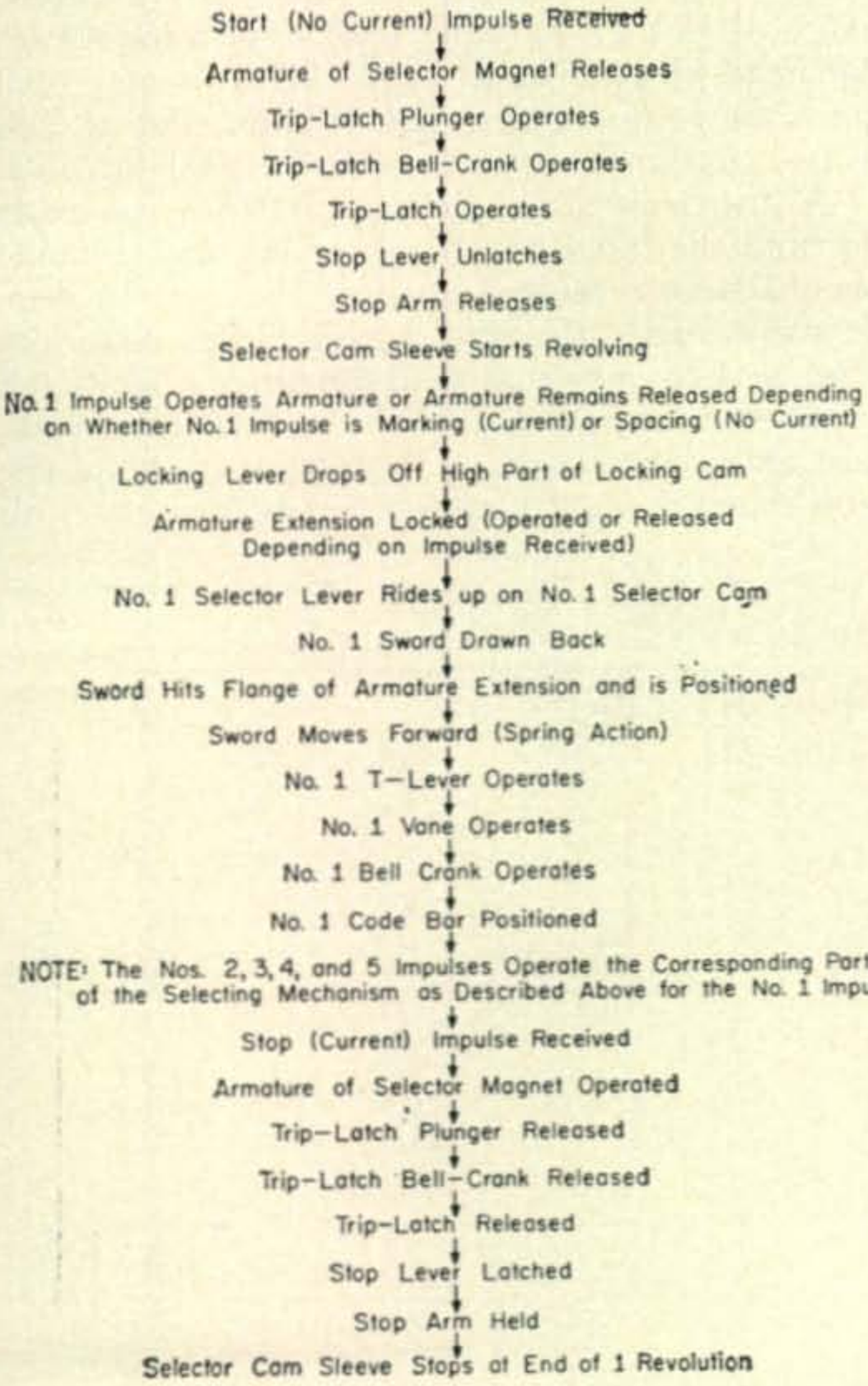


Fig. 139—Sequence chart outlining the operation of the selecting mechanism.

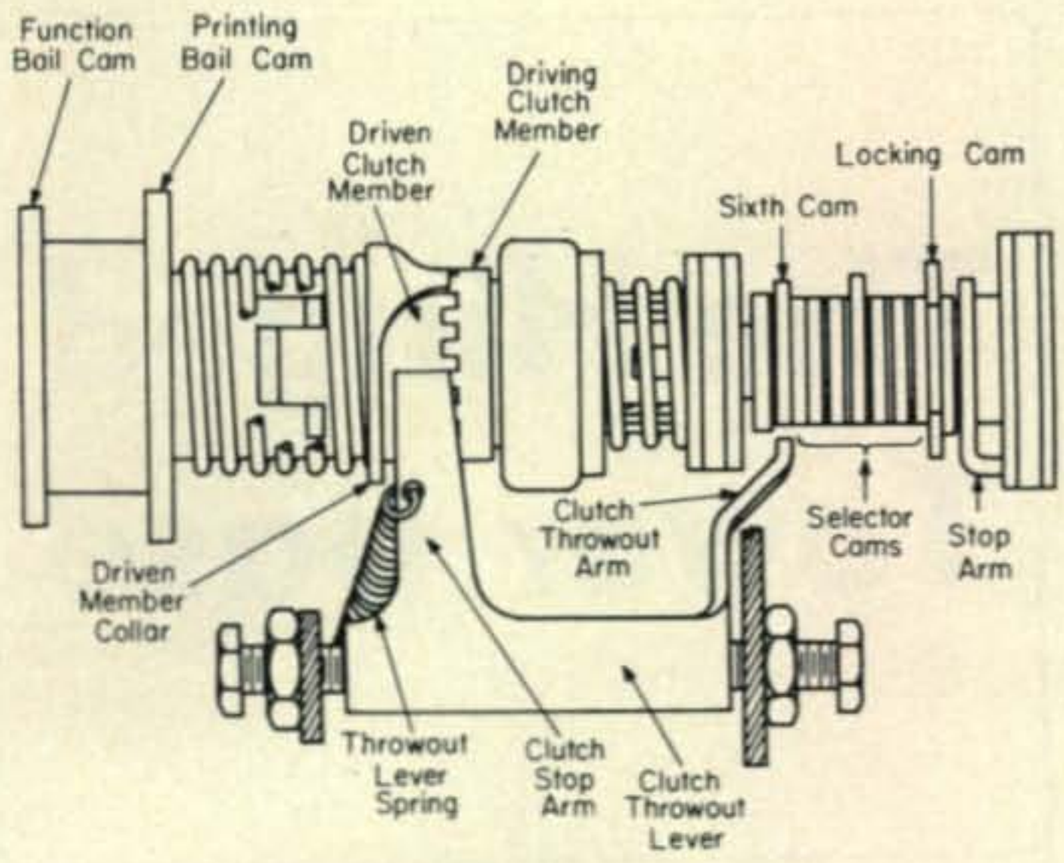


Fig. 140—Crossection of the main shaft showing the typing unit clutch.

contact with the locking lever. The armature extension is then held firmly in position by the U-shaped extension of the locking lever engaging the locking wedge on the armature extension. When the locking lever is riding on the high portion of the locking cam, the locking-lever extension is held away from the locking wedge and the armature is free to move in response to the impulse being received.

Main Shaft Clutch Throw-Out Lever

The main-shaft clutch throw-out lever (fig. 140) consists of the clutch-stop arm, throw-out lever spring, and throw-out arm. It is designed so that the extension of the clutch-stop arm rides on the driven clutch member of the main shaft and the throw-out arm rides on the sixth cam. The clutch throw-out lever cams the driven clutch member out of engagement with the driving clutch member. After caming the driven member out of engagement with the driving member it blocks the rotation of the printing and function-bail cams until all five impulses have been received by the selector mechanism. This insures that printing or function will not be performed before all the impulses are received.

The sixth cam on the selector cam sleeve releases the main-shaft clutch, allowing the printing and function-bail cams to make one complete revolution (See fig. 140). At the end of each revolution of the printing and function-bail cams, the clutch-stop arm engages the cam surface on the driven clutch member and moves it out of mesh with the driving clutch member. Immediately after the fifth impulse has been received, and just as the fifth selector lever is sliding down from the peak of its cam, the peak of the sixth cam strikes the clutch throw-out arm and moves the clutch-stop arm out of engagement with the projection on the driven clutch member. The spring then moves the driven clutch member into mesh with the driving member. Immediately after the completion of the selection of any character or function, the printing and function-bail cams (fig. 140) turn

[*Continued on page 100*]

The Hinged Tower Base

BY SUMNER WEISMAN,* W1VIV

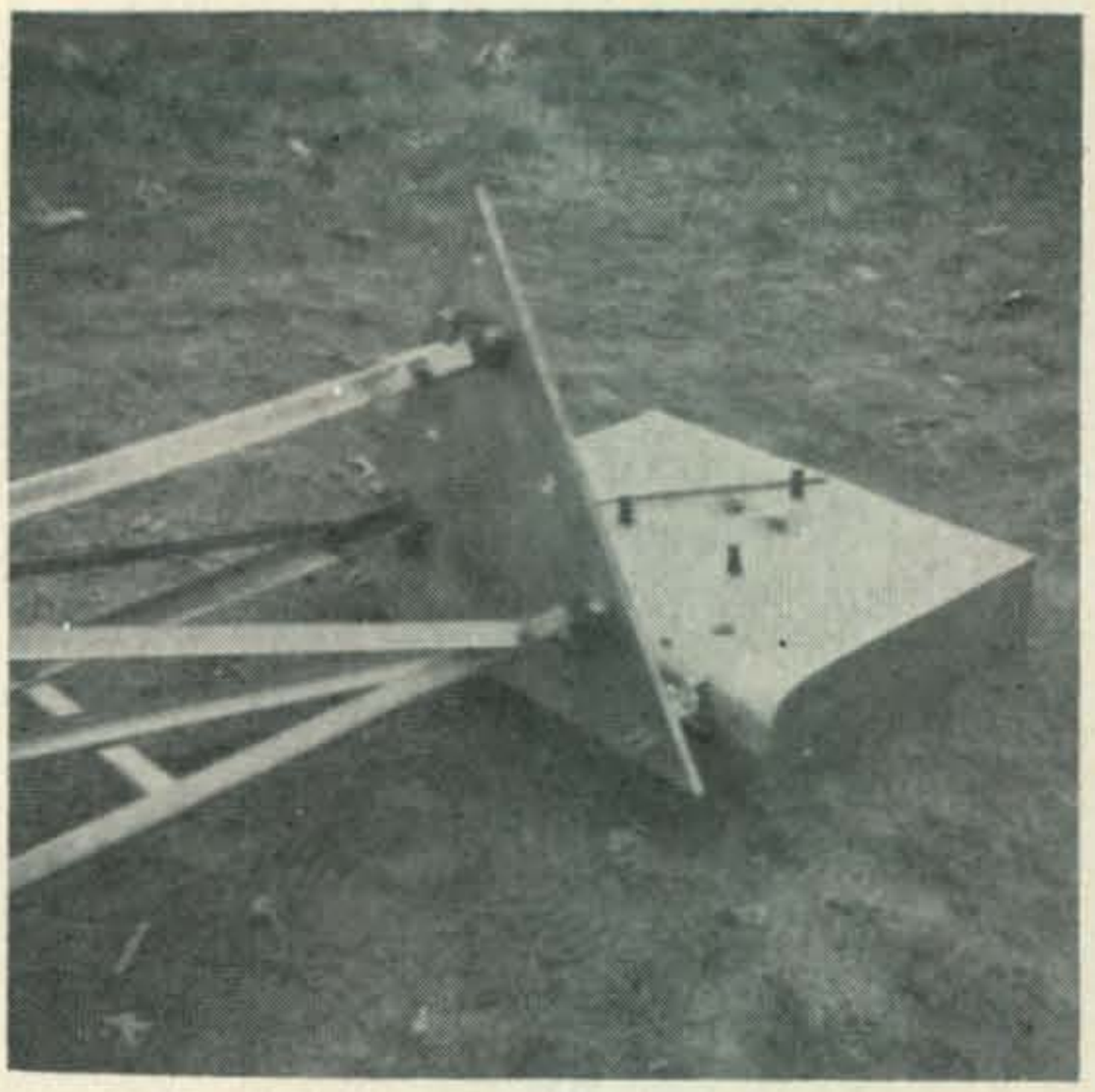


Fig. 1—Completed base with tower mounted and ready for raising.

THERE are several popular ways to put up towers. One involves imbedding the bottom section in concrete, and then erecting one section at a time with a removable gin pole. Another is to assemble the tower on the ground, lash down the bottom end, and then walk or hoist it up. The guy wires are then tied down, and finally the bottom end is lifted on to a concrete base and bolted down. The first method is extremely time consuming, and a very strong gin pole, about the length of one tower section, must be fabricated. A method must be found to securely fasten it to the tower, without damaging the tower, yet it must be easily removable. The latter method, while faster, has been known to bend the bottom couple of feet of the tower beyond recognition.

After much thought on the subject, it was decided to fabricate a very rugged hinge, and to swing the tower up in one piece. The hinge had to be weather resistant, dependable, and very strong. Several approaches were considered, and the end result described here has fulfilled all requirements.

*43 Agnes Drive, Framingham, Mass.

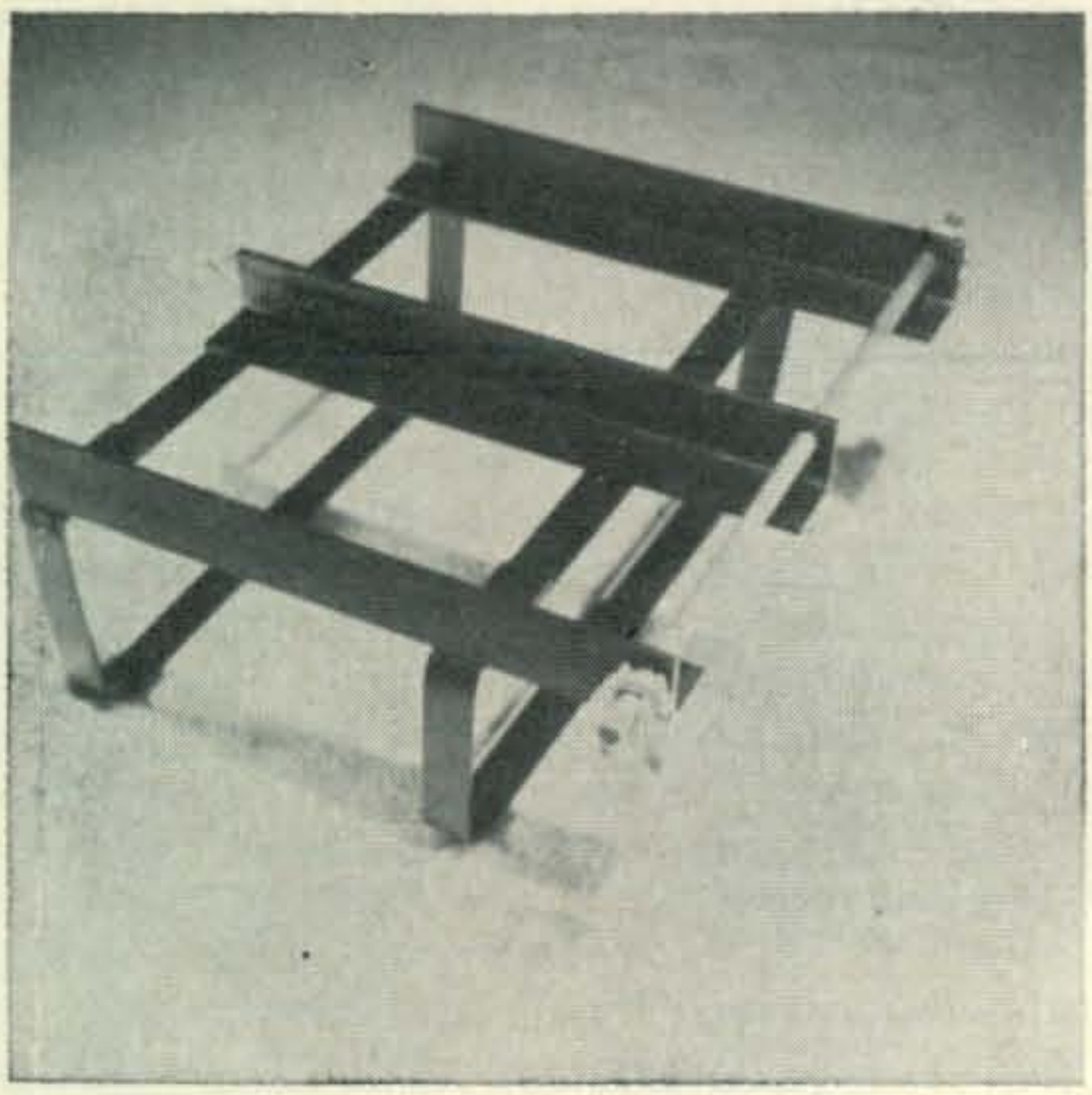


Fig. 2—Hinge framework. The angle irons are attached to 1¼ inch strap iron loops made from 3 foot lengths also embedded in the concrete for increased holding strength as shown in fig. 4.

Construction Details

The drawings and photos show details of construction. Not all dimensions are given, as these are somewhat arbitrary and depend upon materials available and the tower chosen. Except for cutting out the half-inch thick slab of aluminum, all work was done with only a hack saw, file, and electric hand drill. All iron and steel parts are coated with a rust resistant enamel, and galvanized material was used wherever possible.

A strap iron and angle iron platform was made to hold the hinge together, so that the concrete would have a large amount of surface to grip. It was designed to avoid motion in any direction. The ⅝ inch bolts that hold the hinge plate to the concrete base have ¼ inch holes drilled through, just above the heads. A large washer is slid on, and then ¼ inch threaded rod is fastened with

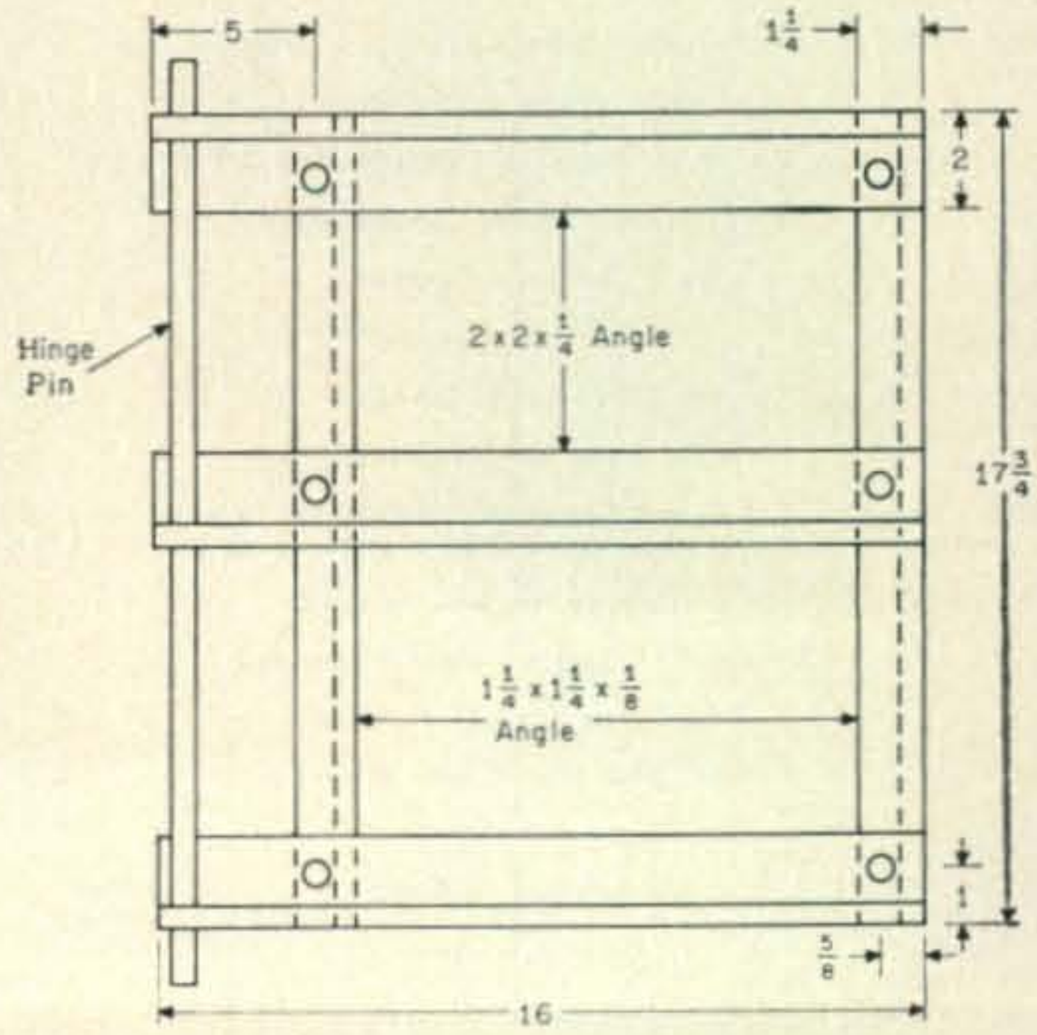
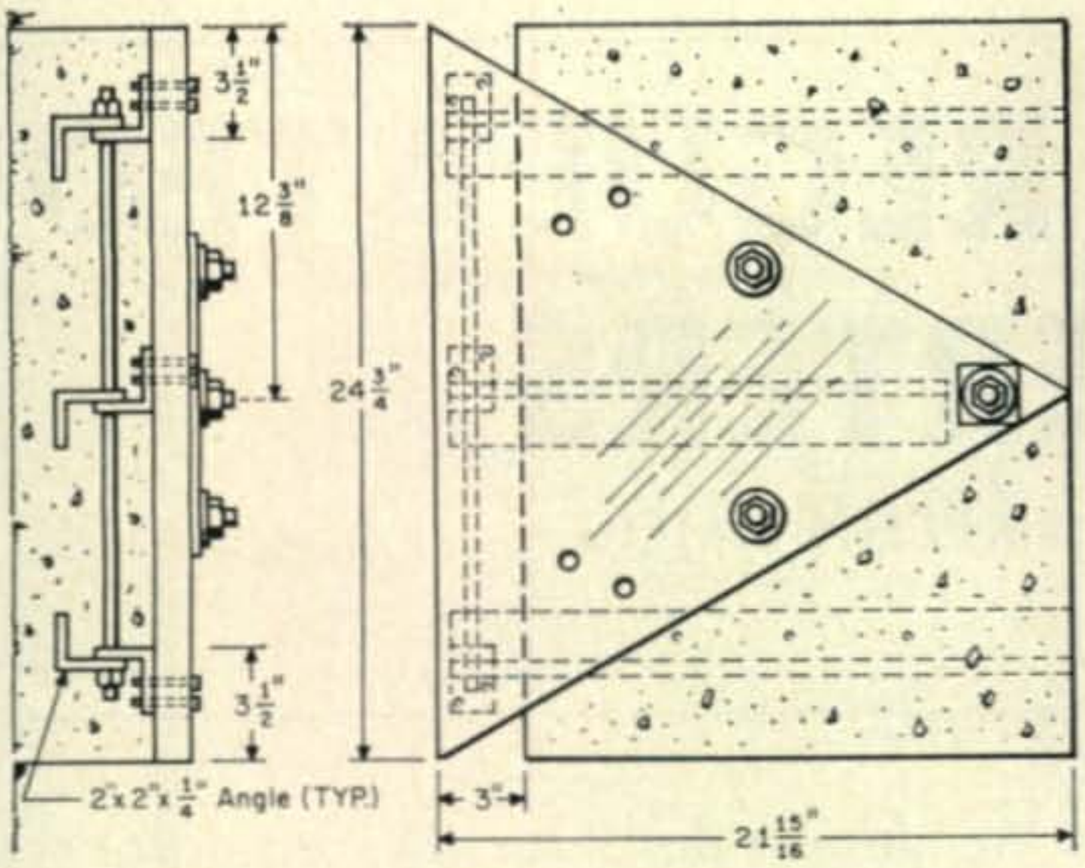


Fig. 3—Hinge framework dimensions. All parts are galvanized or painted with rust resistant enamel.



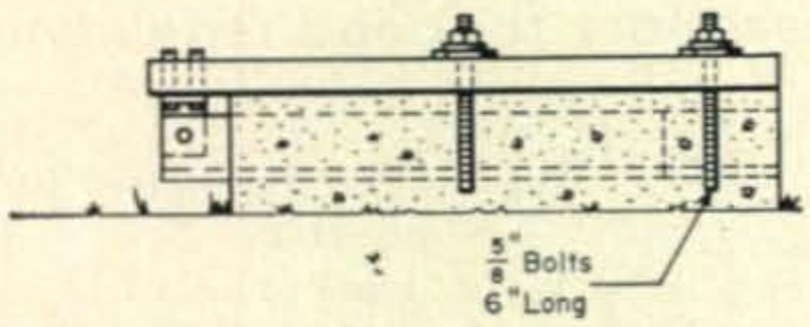


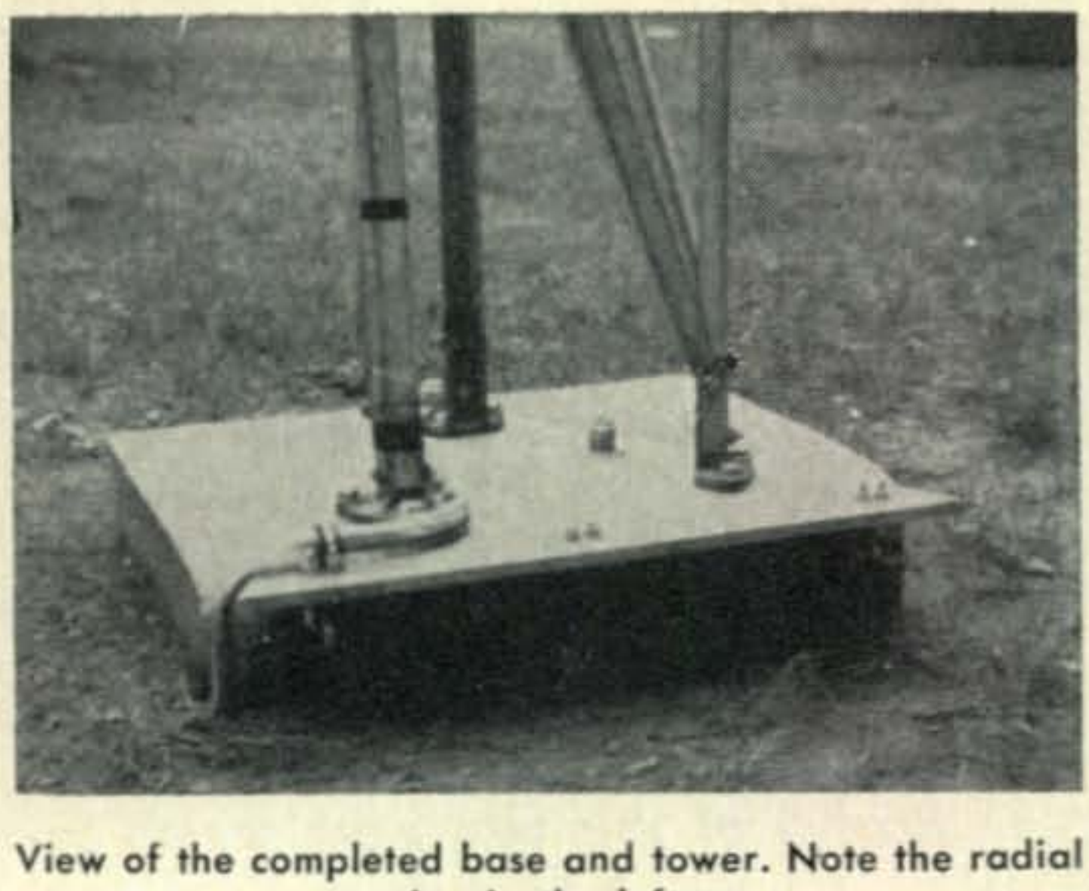
Fig. 4—Construction and mounting detail of the hinge and base plate. The hold-down bolts embedded in the concrete are shown in fig. 5.

nuts to the bolt. This prevents rotary as well as vertical motion once set in the concrete, so that ⅝ inch nuts can be installed after the tower is raised. The holes for these bolts in the hinge plate are made somewhat oversize to avoid binding. A ½ inch diameter galvanized rod is used as a hinge pin. The ends are clamped with U-shaped ½ inch cable clamps to secure the pin.

Installation Details

A spot is very carefully chosen so that the tower, when assembled on the ground and attached to the hinge, will not overlap on a neighbor's lot. Also, the axis of the hinge should be exactly perpendicular with an imaginary line between the tower base and a large, nearby tree, if possible. This allows a block and tackle, attached to the tree, to do most of the work.

A hole is dug about 4½ feet down. (This was



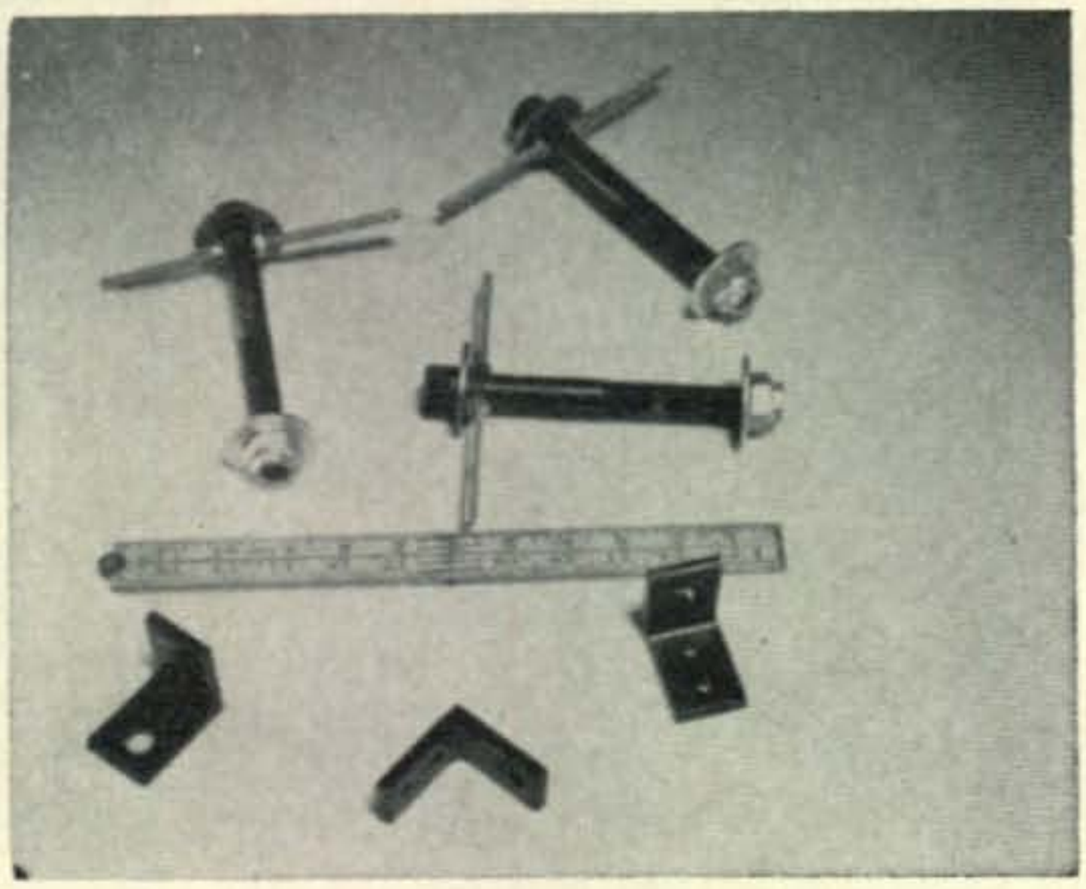
View of the completed base and tower. Note the radial connection in the left corner.

done not only for strength, but because of the frost line in New England. In some parts of the country 2 feet would suffice.) The width of the hole should exceed that of the hinge by several inches.

A good ground system is important. Three radial holes are made with a ½ inch steel rod, 5 feet long, starting about 2 feet down the sides of the hole. The rod is removed, and 3 lengths of ¼ inch copper tubing are inserted in the holes, meeting in the center. Using a torch, they are soldered together with copper strap, which is then brought up to the surface. The free end is fastened by means of a bolt to the base of the hinge.

Cover the bottom of the hole with gravel, for drainage. Before pouring concrete, wet down the sides of the hole. Rocks can be mixed with the concrete while pouring. When the hole is nearly full, insert the hinge frame, using a level to keep it straight, and making sure the direction of the hinge axis is correct. A wood frame is used to form the concrete above ground, and is later removed. With the concrete all poured, insert the hinge pin and plate. This will show where to insert the hold-down bolts into the con-

[*Continued on page 100*]



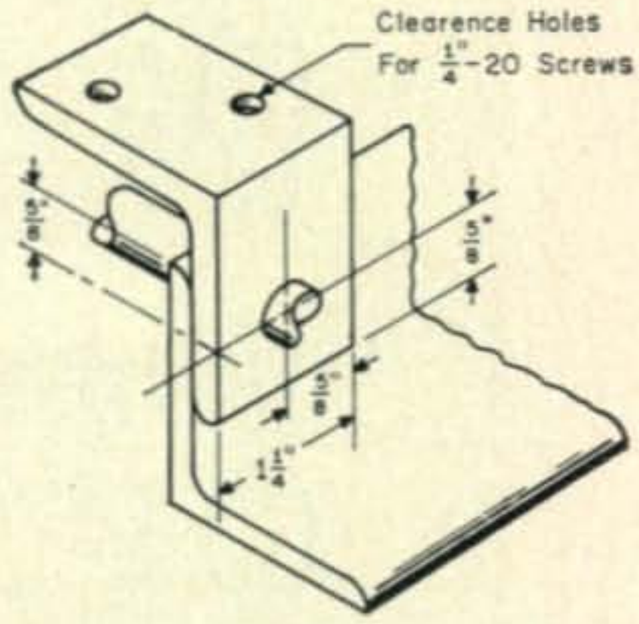


Fig. 5—The ⅝" × 6" hold down bolts are prepared as described in the text. The ¼" threaded rod running through the bolt, just under the head, prevents rotary movement of the bolt after the concrete sets. The drawing on the right shows the hinge parts mounted on the base slots. They are made from angle iron.

D.C. to D.C. REGULATED CONVERTERS

BY CANTRELL SMITH,* K4JQG

Part II

Part II of this two part series covers the design data for the regulator circuit and the adjustments necessary for good regulation

THE circuit and circuit operation of the regulated d.c. to d.c. converter was covered in Part I of this two part article. Part II covers design considerations.

Design Considerations

The design of the basic power supply was fully covered in a previous article[1]. The only considerations here will be the components of the regulator and the different winding ratios necessary for proper performance. For this design we will consider an input of 13.8 v.d.c. as a design center voltage with a possible range of 11.0 to 16.6 volts. The primary winding *(W3)* will be 24 turns wound bifilar to make 24 turns each side of the center tap. The output from the bridge will be 32 volts at 1 ampere and the low voltage output will be 24 volts at 0.3 amperes.

If the output is to be regulated at 32 volts and 24 volts then obviously the ratio of *W3* to *W4* should be sufficient to deliver these voltages at the minimum input voltage of 11 volts. The power supply should have an efficiency of approximately 85%, therefore, the secondary turns will be:

$$N_{s1} = N_p \left(\frac{E_{s1}}{E_{IN}}\right) \frac{1}{eff.}$$

$$= 24 \left(\frac{32}{11}\right) \frac{1}{.85}$$

$$= 82 \text{ turns}$$

$$N_{s2} = N_p \left(\frac{E_{s2}}{E_{IN}}\right) \frac{1}{eff.}$$

$$= 24 \left(\frac{24}{11}\right) \frac{1}{.85}$$

$$= 62 \text{ turns}$$

Where: N_{s1} = total number of turns on secondary $W4$.
N_{s2} = number of turns between S and $T4B$ of $W4$ or F and $T4A$ of $W4$ (Fig. 2).
E_{s1} = the high voltage output.
E_{s2} = the low voltage output.
E_{IN} = the d.c. input voltage to the supply.

The number of turns on the feedback winding is usually about one third of the primary turns for a power supply using germanium transistors. However, in this case we have an impedance in the feedback circuit to control base current. This means that we need excessive feedback capability if we are to be able to control it. The turns needed can be calculated to a fair degree of accuracy but this is not necessary. As a practical matter the number of turns will be about twice normal. In this case the feedback turns will be:

$$N_f = \frac{N_p}{3} \times 2$$

$$= \frac{24}{3} \times 2$$

$$= 16 \text{ turns bifilar}$$

At this point care must be taken to be sure that the feedback turns are not sufficient to exceed the V_{ebo} rating of the switching transistors. There should be no problem if the V_{ebo} rating of the transistors is at least double the peak voltage induced across one half of the feedback.

$$E_{fb} = \frac{N_f}{N_p} \times E_{IN} \times \frac{1}{eff.}$$

$$= \frac{16}{24} \times 11 \times \frac{1}{.85}$$

$$= 8.64 \text{ volts peak}$$

The V_{ebo} rating must be at least 2×8.64 volts or 17.28 volts.

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[1]Smith, C., "Practical Design of a D.C. to D.C. Converter," *CQ*, Part I, May 1963, p. 29; Part II, June, 1963, p. 28; Part III, July 1963, p. 22.

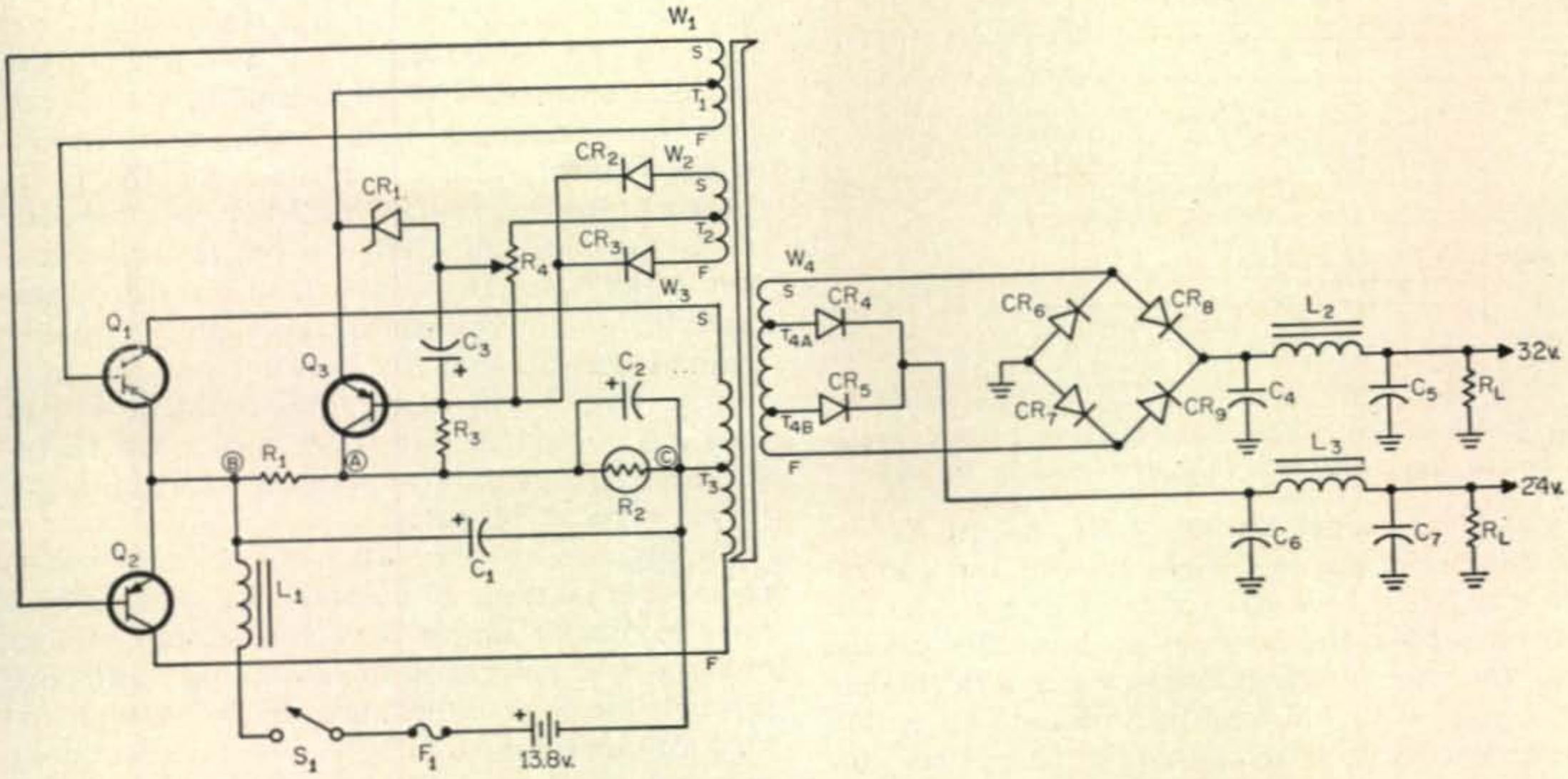


Fig. 2—Circuit of a d.c. to d.c. convert with a regulator circuit (Q_3) as part of the switching circuit. Insertion of the regulator in the primary controls both d.c. outputs.

The Control Winding

The change in control voltage across R_4 for a given change in input voltage will be almost directly proportional to the ratio of *W2* to *W3*. This ratio should be made as high as practical in order to obtain a greater change in control voltage per unit change in input voltage. However, if this voltage becomes excessive the number of turns on the feedback winding becomes critical and the zener diode, CR_1, must be unnecessarily large and expensive. Experience with several different power supplies indicates that a ratio of *W2* to *W3* of 2 to 1 is ample for supplies in the 25 to 100 watt range. The number of turns on the control winding will be:

$$\begin{aligned} N_c &= N_p \times 2 \\ &= 24 \times 2 \\ &= 48 \text{ turns each side of center.} \end{aligned}$$

The control voltage will be:

$$E_c = \frac{N_c}{N_p} \times E_{IN} \times \frac{1}{eff.}$$

$$= \frac{48}{24} \times 11 \times \frac{1}{.85}$$

$$= 26 \text{ volts}$$

The control voltage should be just sufficient for zener breakdown at 11 volts input to the supply. Since the control voltage and the feedback voltage are in opposition, the zener voltage should be:

$$\begin{aligned} E_z &= E_c - E_{fb} \\ &= 26 - 8.6 \\ &= 17.4 \text{ volts} \end{aligned}$$

In order to leave some room for winding tolerances and have some adjustment range for control R_4, the actual zener voltage should be somewhat lower. A 15 volt unit should do nicely. A wattage rating of 0.5 watts will usually be sufficient but a 1 watt unit would be more reliable for extended operation at high input voltages and high ambient temperatures.

Other Components

Transistor Q_3 can be the same as Q_1 and Q_2 but it does not normally need to have such high power capabilities. Its V_{ceo} must be at least equal to the peak voltages applied to the bases of Q_1 and Q_2 and it must have a current rating equal to or greater than the maximum expected base current for Q_1 and Q_2.

Capacitor C_3 is not particularly critical. A value between 20 and 50 mf, and a voltage rating at least equal to the peak control voltage from *W2* will be sufficient.

Resistor

R_4 should be large enough not to load the control circuit excessively. However, if it is made too large the resolution will be poor and its setting will be critical. A 1000 ohm potentiometer should be a good compromise here. Since the setting of the arm will normally be near the negative end, a 200 ohm potentiometer could be used with a 1000 ohm fixed resistor in series going to the base of Q_3.

The value chosen for R_3 is very important and depends to a great extent on the characteristics of Q_3. If all the parameters of Q_3 are known its value can be calculated, but there is a more practical way of choosing the optimum value. Temporarily connect a variable resistor with a range of 0 to about 5000 ohms for R_3. Set it for zero resistance between the base and collector of Q_3.

Adjustment

The design is now complete and the only things left to do are to determine the value of

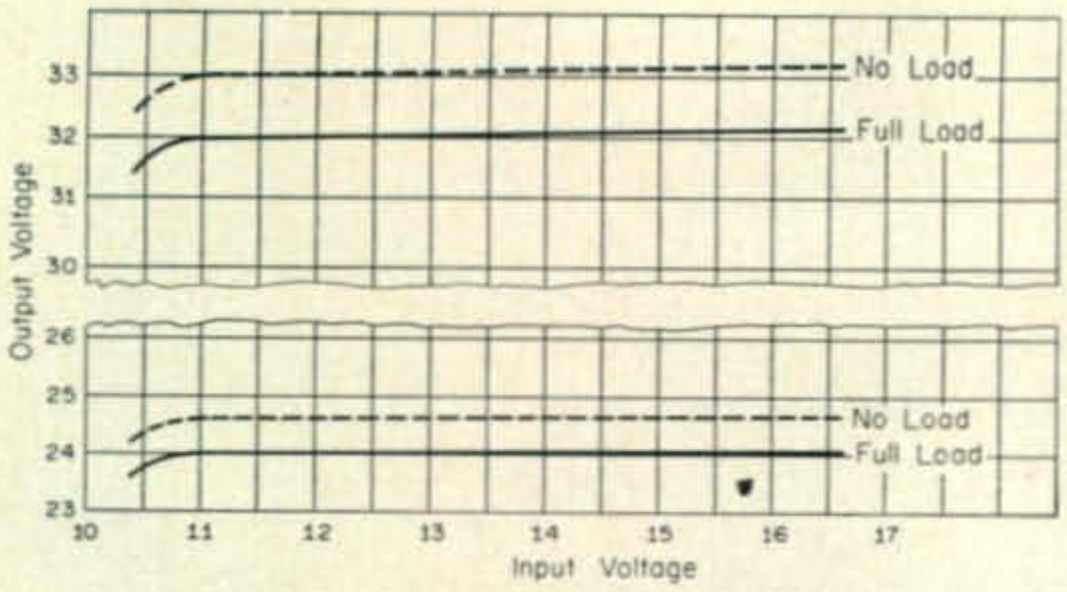


Fig. 3—Variations in output voltage versus input voltage for no load and full load described in the text.

R_3 and the proper setting of R_4. Adjust R_4 for minimum voltage to CR_1 by moving the arm all the way toward the base of Q_3. Close S_1 and the power supply should operate normally except that the input current might be a little higher than normal for no load conditions. This is due to the excessive drive caused by the control voltage being turned all the way down.

Set the input voltage at exactly 11 volts and keep it there until the adjustment is complete. Place resistors on the two outputs which will be equivalent to the desired loads after regulation is achieved. For this particular supply the values would be 32 volts divided by 1 ampere, 32 ohms, and 24 volts divided by 0.3 amperes, 80 ohms. The output voltages should be slightly above the desired regulated values at this point. Approximately 1 volt for each output above the regulated value should be ample.

Now, increase the resistance between the base and collector of Q_3 by adjusting the potentiometer substituted for R_3. When the 32 volt output starts to decrease, measure the d.c. voltage drop across the potentiometer and remove it from the circuit. Measure the resistance of the potentiometer and replace it with a fixed resistor of equal value and a wattage rating equal to E^2/R.

Adjust R_4 until the high voltage output is exactly 32 volts. You need have no fear about adjusting R_4. Nothing will be damaged if the potentiometer is moved through its entire range. Check the 24 volt output and if it is incorrect the transformer taps connected to CR_4 and CR_5 can be changed to increase or decrease the voltage. With the resistive loads still on the output increase the input voltage to 16.6 volts. The output voltages should not increase by more than 1%.

Possible Problems

Both output voltages may be too high or too low with an input voltage of 11 volts and R_4 turned all the way down. This is probably due to a slight miscalculation of the secondary turns. Add or subtract an equal number of turns at each end of *W4* until the output voltage is correct.

Output voltages may be extremely low and will not change with adjustment of R_4 or change in the wrong direction. Either or all of diodes CR_1, CR_2, and CR_3 are wired in backwards.

Output voltages may decrease normally as the arm of R_4 moves towards the negative end but begin to rise again before the arm reaches the end of its range. This is a condition that can arise with extremely light loads and is caused by the control voltage rising too far above the feedback voltage from *W1*. When this happens the control voltage itself will deliver drive current to the bases of the switching transistors and cause the output voltages to rise slightly. Usually a small bleeder current drawn from the high voltage output will correct this problem. If this does not correct the situation turns must be removed from the control winding *(W2)* until the supply behaves properly.

Supply may not start when S_1 is closed or may be slow in starting. Sometimes the starting bias for a particular supply may not be high enough to force base current to the switching transistors through the high impedance of Q_3. A high resistance (approximately 10K) connected between the base of Q_3 and the center tap of *W3* will correct the problem. This will furnish sufficient bias to start Q_3 but will have very little effect on the normal operation of the supply after it is started.

Secondary Circuit

The secondary circuit configuration is called a tapped bridge and is usually used because it allows a minimum number of turns on the secondary. Electron flow in the circuit is as follows if we assume that the top end *(S)* of *W4* is negative to start. Electrons flow from the top end of *W4* through CR_6, through the ground return and the 32 volt load, and through CR_9 to the bottom end of the winding *(F)*. For the same half cycle the current path for the 24 volt circuit is from the top of *W4* through CR_6, through the ground return and the 24 volt load, and through CR_5 to *T4B*. For the other half cycle the path of the 32 volt supply is from the bottom end of the winding through CR_7, through the ground return and the 32 volt load, and through CR_8 to the top end of the winding. For the 24 volt supply the path is from the bottom end of the winding through CR_7, through the ground return and the 24 volt load, and through CR_4 to T_{4A}.

Miscellaneous

One important characteristic of this supply has not been mentioned. This is frequency stability. The frequency of the basic multivibrator shown in fig. 1 is directly proportional to the input voltage. This is readily seen in the transformer formula:

$$f = \frac{4\,E}{A\,B_m\,N_p}$$

Where: f = frequency in kc
E = input voltage
A = cross sectional area of core in in.^{2}
B_m = saturation flux density of core in kilogauss
N_p = number of turns on each side of center tap of primary winding

[*Continued on page 104*]

A PRACTICAL PORTABLE ANTENNA SYSTEM

BY E. M. RANKIN, *W4ZUS/NØAIT

Here is a portable antenna system that can operate on the ham bands or MARS frequencies. It is compact, portable and flexible enough to be mounted or strung up almost anywhere.

With today's compact transceivers, a complete station can be carried in a fairly small ladies handbag. The biggest problem, though, is the antenna as it just doesn't lend itself to miniaturization. Many types of antennas have been tried for portable work with varying degrees of success. The more successful antennas were rather bulky and so not too portable.

For many years military communications systems have been refined and simplified to provide maximum flexibility and portability even at the cost of performance. The antenna systems used provide wide frequency ranges and ease of set-up.

The antenna system described here, for amateur use, leans heavily on the design philosophy of these military systems. The system offers maximum flexibility, portability and at least usable performance and efficiency. It covers most of the h.f. spectrum including the MARS frequencies.

The Tuner

The tuner contains an L-section network that can be set up for either a *C* or *L* input, an s.w.r. bridge, a field strength meter and a non-inductive 50 ohm dummy load resistor for matching.

Using the tuner with the s.w.r. indicator, most amateur band frequencies can be tuned to an almost perfect 1:1. Not too bad since the Navy considers anything under 3:1 acceptable.

The built in field strength meter allows you to monitor the radiation and make sure that the antenna, rather than the tuner, is taking the load.

Tuner Construction

The tuner can be built in a mini-box, cabinet or any other suitable package. It is possible to fit the components, shown in fig. 1, into a 5" × 6" × 7" container. The tapped coil shown may be replaced by a roller coil taken from a TCS or a Command set.

The layout should follow good r.f. wiring practices. Inductor L_1 should be kept as far as possible from the cabinet walls and clear of the other components. The s.w.r. bridge and field strength components should be shielded from the tuner (and each other).

Circuits and construction techniques for the s.w.r. bridge and f.s. meter are not given here. The s.w.r. bridge can be taken from any of the existing manuals and magazine articles as can the f.s. meter.

The Whip Antenna

The package includes two antennas, a whip and a long wire. The whip can be made up of mobile antenna parts similar to the Topper Mobile or possibly a 3′ lower section and a 5′ upper

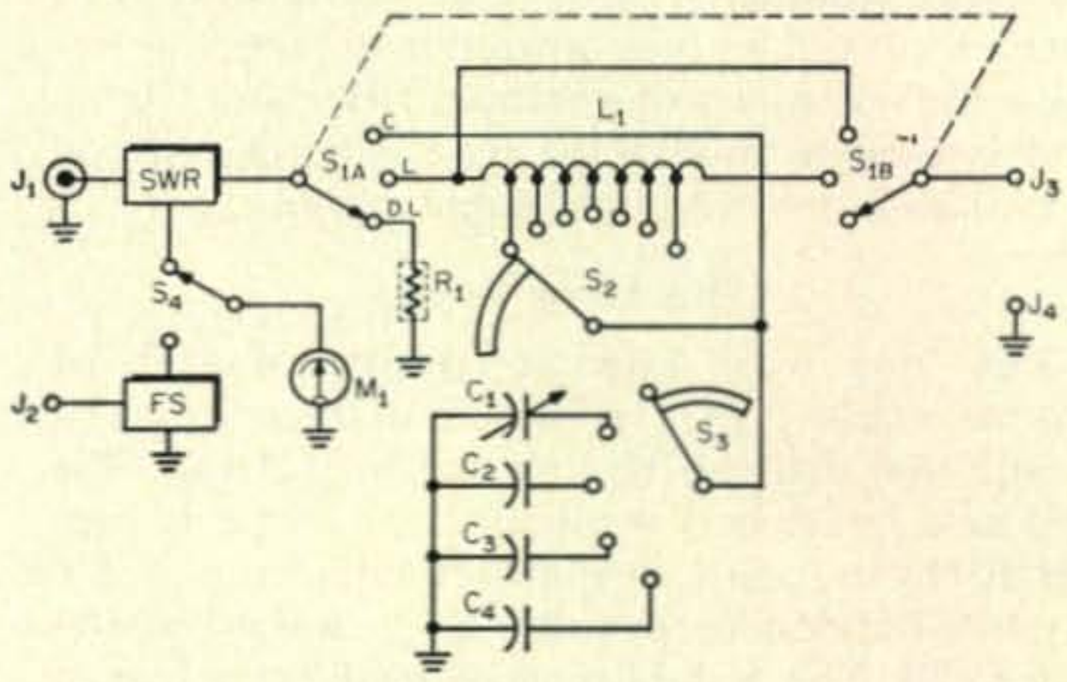


Fig. 1—Circuit of the tuner used with the two portable antennas. The circuits for the s.w.r. bridge and field strength meter may be found in any of the handbooks.

C_1—12-200 mmf variable (Johnson 200L15 or equiv.) Voltage rating should be equal to the final plate capacitor in the rig used.
C_2, C_3, C_4—200 mmf. Same voltage rating as C_1.
J_1—Coax connector, BNC type or SO-239.
J_2, J_3, J_4—Banana jacks. J_4 should be insulated with ceramic or polystyrene for high r.f. voltages.
L_1—1¾" diameter, 11 t.p.i. Air Dux #1411A indented coil stock or equiv. Tapped at 3, 5, 7, 9, 11, 13, 14 and 15 turns.
M_1—0-500 microampere meter.
R_1—50 ohm dummy load made of four 200 ohm non-inductive resistors (Spraque 10 NIT or equiv.) Good for 100 watts for 1 minute.
S_1—2 pole-3 pos. ceramic. Two deck 90 degree index type recommended.
S_2, S_3—s.p. 8 pos. shorting switch, ceramic, Centralab PSID section, P270 index or equiv.
S_4—S.p.d.t. slide or toggle switch.

*OE Div. USS F. D. Roosevelt, CVA-42, FPO N.Y. N.Y. 09501.

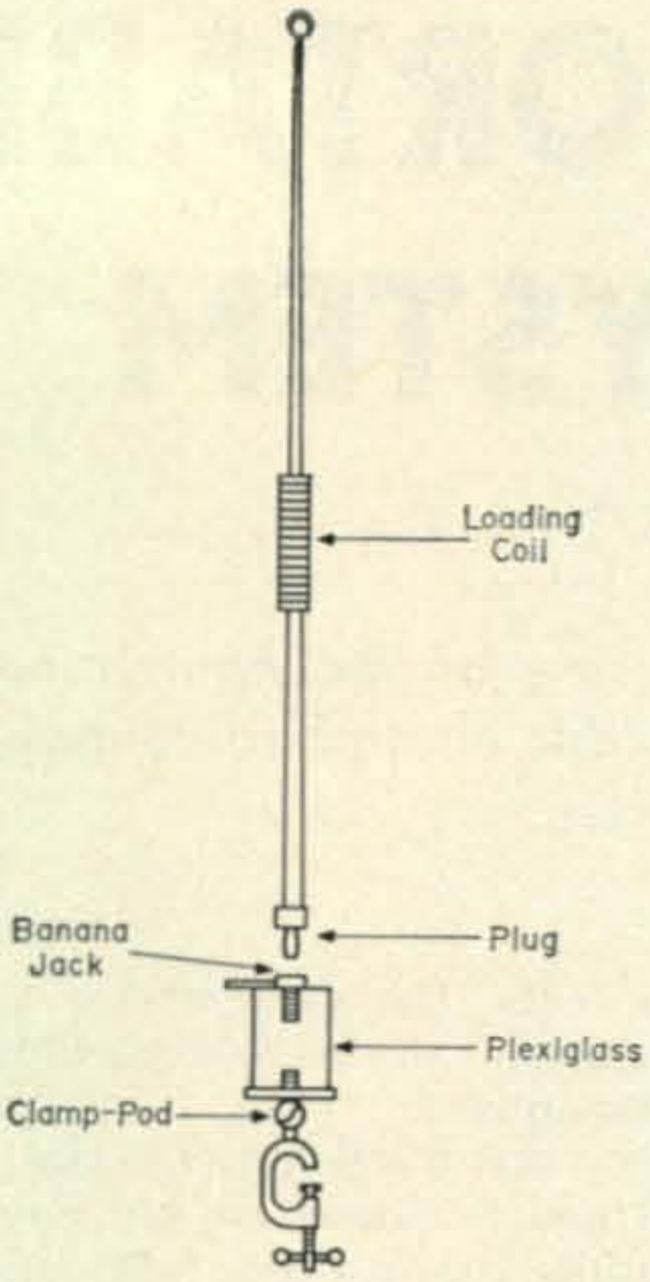


Fig. 2—Whip antenna can be made up from mobile components as described in the text.

section wtih a Master Mobile #750 loading coil. This is shown in fig. 2.

I used a surplus whip from a pack set that has ten 10" sections. A coil, 10" long by ⅝" diameter was wound on a bakelite form with #14 wire. A plexiglass base insulator is tapped to receive the antenna and a standard Herland Clamp Pod is used to mount the base. The clamp pod is available in most photo supply stores.

The Long Wire

The long wire antenna consists of 100′ of bronze cable (G.C. #70-100 dial cord) on a plastic reel that can be fastened to a clamp. The reel acts as an end insulator. The cable is supported by a small insulator made from a 20′ length of nylon cord and a 2 lb. weight at the other end. The weight may be lead but a bag of sand or shot handles better than the solid weight. A sliding insulator with cord and weight supports the close end of the antenna if necessary. The arrangement is shown in fig. 3. Weights can be thrown over existing projections and the length of the antenna adjusted for the circumstances but the longer the better.

The Ground

A ground is a very necessary part of this system. It is obtained by the use of a 2′ × ¼" brass rod sharpened at one end and with a binding post at the other. If a good ground cannot be obtained readily, a counterpoise wire (about 15 to 40 feet) can be draped across the floor. Watch that wire though; its *hot*.

Using The System

To use the whip antenna, the base clamp is mounted to a table edge, window sill or to the ground stake. Assemble the whip to the clamp

Parts List

1—Whip antenna (fig. 2)
1—Long wire antenna (fig. 3)
1—12′ length of coax with connectors to connect tuner to rig.
1—8′ braid ground strap with banana plug at one end and large alligator clip on the other end.
1—3′ jumper, insulated inner conductor from RG-58/U with banana plugs at each end.
1—3′ f.s. meter pick up wire, insulated, with banana plug at one end and alligator clip at the other end.
1—Ground rod 2′ × ¼" brass.
—Mounting clamp, photographer's type, Herland clamp-pod with swivel mount.
1—Carrying case.

and position it for the best angle, either vertical or as clear of obstructions as possible. Connect the whip to the tuner with the 3′ jumper described in the parts list.

Switch the tuner to the dummy load position and adjust the rig to the desired output. From this point on do not adjust the rig, only the tuner. Now, switch the tuner to C INPUT and adjust the *L* and *C* controls for the lowest s.w.r. and the same plate current on the rig as was obtained in the DUMMY LOAD position. If a good match cannot be made try the L position of S_1. A final check with the f.s. meter will indicate if the antenna or the tuner took the load.

It is probable that the C INPUT position will work best for the whip on all but the highest bands.

The Long Wire

To use the long wire heave the end line over the far support. Reel off as much wire as can be used; heave the sliding insulator over the close support and mount the reel clamp close to the tuner on a window sill, table edge, *etc*. Take up the slack in the antenna and connect it to the tuner with the 3′ jumper. Connect the ground and load the rig into the dummy load. Now shift to the L INPUT and tune using the same procedure as for the whip. Again, use the f.s. meter to make sure the antenna is loading.

[*Continued on page 99*]

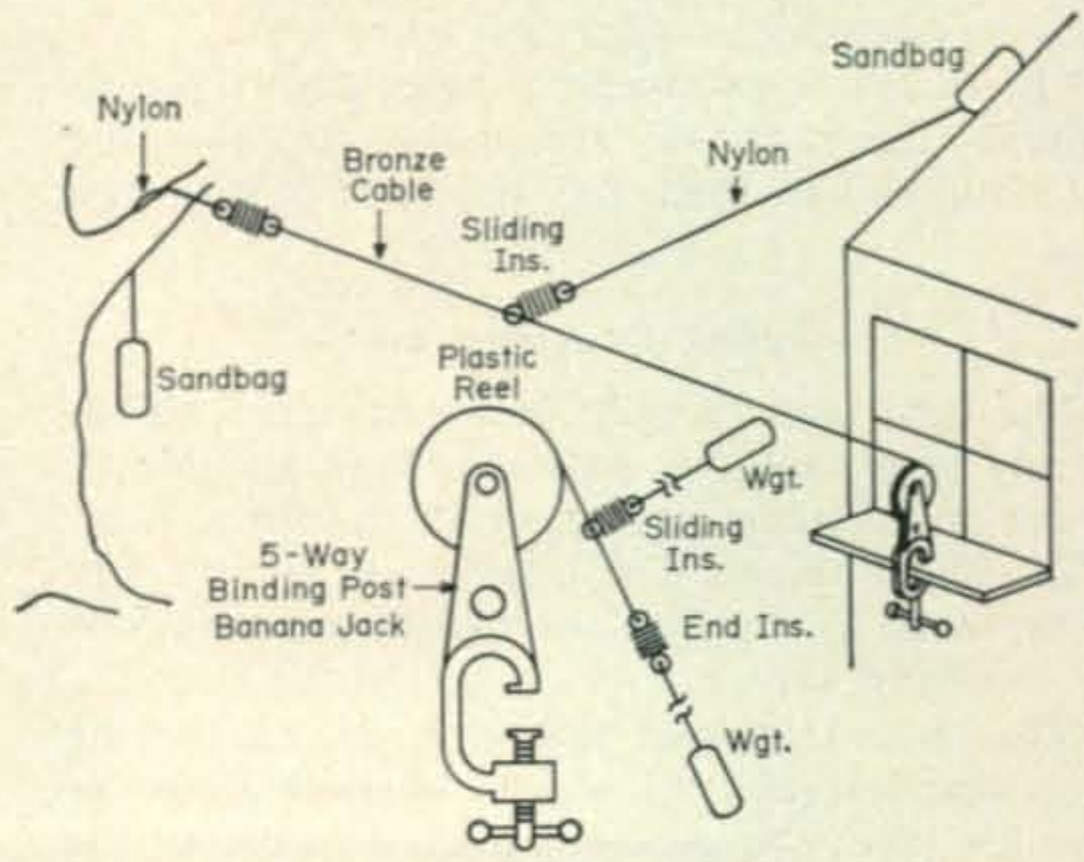


Fig. 3—Construction and typical installation for the long wire antenna.

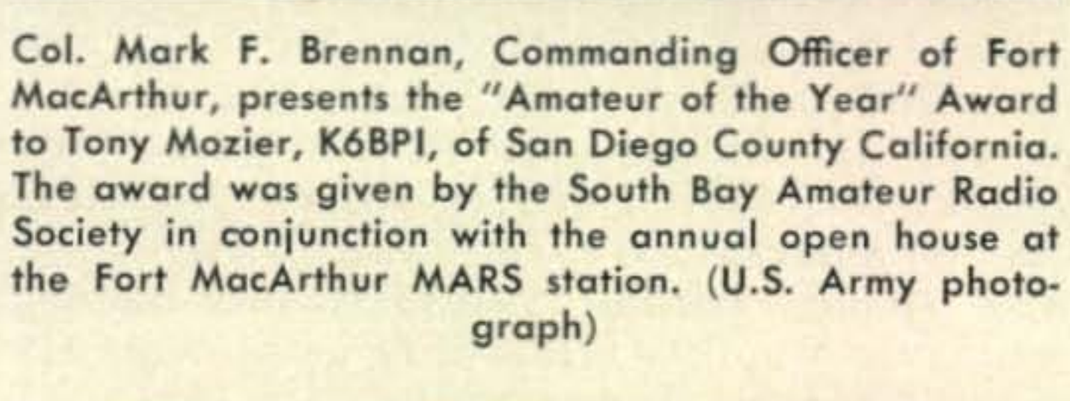
Syd Cullum, WA6NJZ, General Chairman of the ARRL S.W. Division Convention is shown with pretty Miss Sandra Watkins, Miss Orange County of 1966. Sandra will serve as hostess for the three day convention at the Disneyland Hotel, May 27, 28, 29.

This happy trio was photographed in March when they visited the club station of the IARC (4U1ITU). Seated is George Jacobs, W3ASK, standing l. to r. Bill Orr, W6SAI, and Chuck Schauers, W6QLV.

PEOPLE AND PLACES

From left to right: Bruno, HBØABS, Erik, HBØADP, and Heinz, HBØYS. The fellows are shown on their little DXpedition to the Principality of Lichtenstein from March 28th through April 3rd.

Col. Mark F. Brennan, Commanding Officer of Fort MacArthur, presents the "Amateur of the Year" Award to Tony Mozier, K6BPI, of San Diego County California. The award was given by the South Bay Amateur Radio Society in conjunction with the annual open house at the Fort MacArthur MARS station. (U.S. Army photograph)



Members of the Watervliet Arsenal Radio Club demonstrate how Armed Forces Day visitors may send messages to friends and relatives in the military via the arsenal's MARS facilities. Shown are: Richard Edwards, Charles J. Scott, and club president Henry Schmidt. (U.S. Army photograph)

DX

BY URB LE JEUNE,* W2DEC

Here and There

FL8 French Somaliland: FL8RA, Andre, 14045 at 2130 GMT. QSL via W2LJX. *(Tnx LIDXA).*

FW8 Wallis Island: FW8RC 14244 kc s.s.b. 0500-0700 GMT when conditions permit. He is the director of Telecommunications for the Island group and is using the S-line purchased from Chuck & Ted, adding the island was wrecked and the French are feeding the natives until new crops can be grown. *(Tnx WGDXC).*

HV Vatican City: WB6CIY is in the process of obtaining authorization to operate HV1CN during the latter part of June, and expects to operate from the Vatican for approximately one week. He is also attempting to obtain a 3A2 authorization and will operate from Monaco after the HV1CN operation for approximately ten days to two weeks if authorization is granted. 7, 14 and 21 mc will be used according to conditions and Gus' frequencies will be used if Gus is not using them. QSLs will be handled by K6CYG. Contributions are not required, but will be appreciated to help defray expenses. S.a.s.e. (or s.a.e. and IRCs) and GMT time and date a must. *(Tnx K6CYG).*

KC6 East Carolines: KC6BW, Hal, on 14255 at 1330 GMT. *(Tnx LIDXA).*

MP4B Bahrein: Lots of activity from here recently with MP4BFS, Dick, working up a storm at 1200 GMT on 14240 and again at 2200 GMT. QSL to Box 138, Bahrein. John, MP4BFU, also very QRV on 20 s.s.b. 14234 at 2300 GMT. QSL to Box 425 for him. MP4BFT heard at 1800 GMT on 14244 saying QSL via KØSZY. MP4BCC also on around 1300 GMT. *(Tnx LIDXA).*

SVØ Rhodes Islands: SVØWF pulled the big switch on May 21st. He will be active from HS land in August. *(Tnx W2PCJ).*

UWØ: Vera, UWØSC, is looking for N. H., Ala., Mont., N. M., N. D. and S. D. to complete her WAS. She is active daily between 14030 and 14060 kc c.w. *(Tnx W1CUX).*

VK9 Nauru Island: VK9AM, L. L. McInnes (a permanent resident) is reported active again, last reported on 21230 kc a.m. fone which is his chief mode. *(Tnx WGDXC).*

VKØ Macquarie Island: Many reports of VKØMI operation. He is not a DXer, preferring to work into VK. Active on 14150 a.m., 14050 c.w. and 7 mc c.w. Will work s.s.b. stations *(Tnx LIDXA).*

VKØ Calls for 1966: VK4SS reports via the *Fla. DX Report* that the following calls will be used for 1966: Macquarie—VKØMI, Mawson Base—VKØKM, Wilkes Barre—VKØAM. All stations will be on s.s.b. with VKØMI on a.m. and c.w. as well. QSL via the VKØ Bureau.

VP6 Barbados: Colin, VP6PJ, is active on 3550 at 0300 GMT, looking for DX contacts. *(Tnx VERON).*

VP8 Falkland Island: Dave, VP8HJ, and Austin, VP8HD, have both been very active on 14 mc c.w. *(Tnx VERON).*

VS6 Hong Kong: The following letter is from Pete, VS6FO:

"Dear Urb, Thought I'd drop you a line on the VS6 scene and enclose a picture of my rig as now. The transmitter is U. K. commercial job, the K.W. Viceroy 200 w. p.e.p. sideband and 150 w. c.w. The antennas at the moment are a 20m ground plane and dipoles for 15 and 10. The Rx is an old RCA AR-88D. I have an all band trap dipole which I hope to erect this coming winter for 80/40 meter operation, and also have materials for 10 and 15 beams, but am short of a rotator at the moment to make it worthwhile for a beam. Been getting into the east coast of the US quite well on 20 most evenings I'm on, but the path isn't open for too long and closes suddenly. I am on the council of the HK ARTS, and am Treasurer. We have just lost half of our council members, OT Maurice 6BJ, Stan 6FE and Don 6FF all returned to UK this month but 6BJ is enroute to ZD8 land from where he will be on the air later this year. Don will be G3MZV and Stan, G3HCJ. These three were, as many Ws know, keen c.w. men. This leaves a shortage of regular c.w. operation from here just now but I along with Dennis 6EN and Harry 6FK, are predominantly on c.w. I am on 20 c.w. every day that my work will allow. My total operation includes about 5% sideband. Currently active on s.s.b. are 6AJ (our club station call, ably operated by Herb, with his S line and quad), 6DS, George who will probably be returning to the UK at the end of the year, 6EK Drake OT resident and exclusively s.s.b., 6FM Bill returning to the UK in June and is our current President of the HK society, 6FS Tony who hails from ZL land ex-ZD2NWW and middle east call signs, 6BE Lyell who has, I think, the highest ham QTH in the colony; and several other calls with intermittent operation, both modes.

"I noticed a letter from Don, VS6FF, in March *CQ* pleading for QSLs from stateside. I must support his views. My US QSL returns are running at 40% up to now and by far the worst offenders are stations operated by your Services throughout the Pacific. On my last overseas stint in ZC4 land during '57/59, I ended up with a 90% QSL return from the U.S., the same from the USSR. In 18 months of this tour, even though the USSR returns are also down, they are running at 70% to this time and they all come through the bureau. Incidentally, please 5 IRCs for airmail return QSLs. I am not griping about QSLs from the U.S. alone. It is a worldwide

*Box 35, Hazlet, New Jersey 07730.

The following certificates were issued between the period from March 6th, 1966 to and including April 5th, 1966:

CW-PHONE WAZ

2149	OK2YF	Michael Ziman
2150	OK1BY	Miroslav Beran
2151	VE3AGC	Cameron W. Burrows
2152	VE3DDR	Dennis Ratcliffe
2153	K6BIA	O. Benincasa
2154	W5QIX	Robert J. Allen
2155	DJ9SB	Renata Krause
2156	JA1VX	Mitu Katori
2157	UB5KBA	Radio Club of Lvov
2158	K5INB	Dale A. Nolen
2159	W6NUU	J. F. Sabo
2160	K6ALH	Wayne A. Mills
2161	UA1ND	Peter Lisenko
2162	DJ5JH	Wolff Parmentier
2163	UC2WP	Anatol I. Prokhorov
2164	DL7DE	Wilhelm F. Siebert
2165	UA3HP	
2166	UA9FJ	Grigory Geihman

ALL PHONE WAZ

335	JA1BN	Akira Tani

TWO-WAY SSB WAZ

386	OZ8EA	Erik Andersen
387	I1TRA	Tommaso Trani
388	UW9AF	Witaly S. Miass
389	VE8RX	George T. Kondo
390	I1KDB	Giampaolo Nucciotti
391	JA4BJO	Takeharu Matsumura

CW WPX

712	OK1MX	Oldrich Mentlik
713	UA3AA	Peter Volkin
714	WA6VAT	Robert R. Suerstedt
715	UA4AZ	Anatoly I. Bzusentzov
716	UB5WK	
717	UA3KAO	Club Station of Moscow Higher Technical School
718	UA3BS	Alexander Savelev
719	UA3KHA	Radio Club of Yaroslavl
720	UL7HB	A. A. Kouaneshnikou

PHONE WPX

129	I1KDB	Giampaolo Nucciotti

SSB WPX

233	KØHUU	Don Mullen
234	K3HHY	Frank R. Grant
235	YV1LA	Janusz Grzesidwski
236	DL4BT	Dr. Karl H. Van D'Elden
237	UA9HA	Yuri A. Kropotov
238	UQ2CS	Wjacheslav M. Grozny
239	W5NXF	Norman L. Maguire
240	DL7EM	Horst Schulze
241	I2KDB	Giampaolo Nucciotti

200 TWO-WAY SSB

134	I1CSA	Antonio G. Costantino

100 TWO-WAY SSB

482	I1CSA	Antonio G. Costantino
483	W3QCM	William A. Huston
484	UA9HA	Yuri A. Kropotov
485	UAØEK	Eugeny (Jack) Belostotsky
486	UA1IG	Jury A. Belevich

trend and up to March 1st of this year I have sent out over 900 cards at that time have well under 200 in return. 122 countries worked, 56 confirmed. 18 states confirmed out of 33 worked. An annoying trend I find are the types who don't want QSLs. That's fair enough, I'll still work them. I have spoken to two ham visitors to HK who said they are not interested in QSLs. In each case they did not inform their QSL Bureau they didn't want cards nor do they when I've heard them on the air and have been asked to QSL did they reply 'sorry no QSL.' I think QSLs are an obligation of a ham operator. Maybe I'm old fashioned because I don't mind dishing out cards but I like to get them too. I've only ever claimed two certificates, WAC and WBE, I made DXCC confirmed from ZC4PN but couldn't be bothered to send off the cards. I want to make DXCC confirmed from here but won't claim the certificate. I just like to swap cards and if the fellow at the other end doesn't want to, okay, but I wish he had the guts to say so at the time.

"Well Urb, guess that's all the news and gripes for now. I enjoy your column and the whole of *CQ*, sort of like a Jackie Gleason 'American Ham Scene Magazine' though at times over the years some comments and points of view could only have been thought up by 'Crazy'. Anyway keep with it."

VU2 Andaman Islands: VU2DIA 0100-0300 GMT 14050 kc with T8 note. *(Tnx LIDXA).*

ZD9 Tristan da Cunha: Stu, W2GHK, is in the process of supplying ZD9BE with s.s.b. equipment. Alan is only active on c.w. and a.m. at present, mostly 14 mc around 1900 GMT. *(Tnx VERON).*

7X2 Algeria: 7X2MD, Driss, 14250, at 1800 GMT. QSL VE3EUU, Harry, 7X2AH, on 14217 requests QSLs via WA4STL. *(Tnx LIDXA).*

Silent Key

The DX Club of Puerto Rico informs us of the passing of Bing Crosbie, G3NMQ, CHC #424 and an ardent DXpeditioner. Bing was in England ready to pack for Sierra Leone where he was to operate as 9L1BC when he complained of severe headaches and was rushed to the hospital where he died of cerebral malaria. Although just 29 years old, Bing was already an international figure in the DX circles having signed such rare calls as MP4DAH, MP4QBG, 5A3BC and others.

QTHs and QSL Managers

CEØZI/MM	via WA5ENK
DL9YG	via WB2IEC
DU1OR	via W2CTN
ET3AC	via K8UZA
ET3GB	via K5LRE
ET3WH	via W7TDK
HR6KP	via W4MVB
HS1CW	via W1BVP
K1YPE/XV5	via W4UWC
ex-KB6EPN	Box 96, Wake Island
KC4AAA/MM	via WA5ENK
KJ5CF	via W6DPP
KS6BC/KS4	Box 1148, Miami, Fla.
KS6BH	via K6CYG
KW6EM	Box 96, Wake Island
KZ5AY	via K6CYG
LU2ZG	via LU2CN
MP4BFT	via KØSZY
OA3T	Padre Ben Meyer, Apt. 100, Huaraz, Peru
PJ5ME	via W1JYH
ST2BSS	Jim Collins, c/o American Embassy, Kharthoum, Sudan

[*Continued on page 102*]

Propagation

BY GEORGE JACOBS,* W3ASK

PROPAGATION conditions this June, especially on the 20, 15 and 10 meter bands, are expected to be somewhat better than they were last year, as a result of the rise in the sunspot cycle. The following is a brief band-by-band description of propagation conditions expected during the month.

10 Meters: Plenty of short-skip openings between distances of about 500 and 1300 miles as a result of sporadic-E propagation. Fewer DX openings are forecast as compared to the winter months, but some should be possible during the daylight hours to Central and South America and to the South Pacific area.

15 Meters: Short-skip openings should be possible during many hours between distances of approximately 400 and 1300 miles. Fewer DX openings are forecast, but some good ones should be possible every day to Central and South America; somewhat less frequently to the South Pacific area and Africa; and only occasionally to other areas of the world. DX openings should occur during the daytime hours, with conditions peaking during the late afternoon and early evening hours.

20 Meters: Excellent short-skip openings are expected around-the-clock. During the daylight hours, the skip at times may be as short as a few hundred miles. Twenty meters is also expected to continue to be the best band for world-wide DX propagation conditions. The band is forecast to open for DX shortly after sunrise, and remain open to one area of the world or another almost around-the-clock. During much of the daylight hours, DX signals may be masked by exceptionally strong short-skip signals. During the late afternoon and evening hours, however, optimum DX propagation conditions are expected to take place, with signals at very high levels.

40 Meters: Excellent short-skip openings, between distances of less than 100, to approximately 1300 miles are expected during the daylight hours. As darkness approaches, the skip is expected to lengthen considerably. After sundown, the band is expected to open for DX signals to many areas of the world. DX propagation conditions are forecast to peak around midnight, and again during the sunrise period. Seasonally higher noise levels are expected to mask signals on many days.

80 Meters: Considerably poorer propagation conditions are expected on this band than during the winter months. Seasonally higher noise levels are expected to mask signals, and the shorter hours of darkness should result in fewer DX openings. During the daylight hours, good short-skip openings should be possible out to a distance of about 250 miles. As darkness approaches, the skip should lengthen. During the hours of darkness, fairly good short-skip openings should be possible up to 2300 miles, and when static levels are low, openings should extend into some DX areas. DX propagation conditions on this band are expected to peak around midnight, and again during the pre-sunrise period.

160 Meters: During the hours of daylight few openings are expected beyond about 100 miles. As darkness approaches, the skip will begin to lengthen. By nightfall, fairly good short-skip openings should be possible out to about 1300 miles. During periods of exceptionally low static levels, short-skip openings beyond 1300 miles, and openings into some DX areas may also be possible during the hours of darkness and the sunrise period.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for June

	Forecast Rating and Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **4, 13, 19, 23**	A	A-B	B-C	C
Normal: **1, 3, 5-6, 8-10, 12, 14-15, 18, 20, 22, 24-25, 27-28, 30**	A-B	B-C	C-D	D-E
Below Normal: **2, 7, 11, 16, 21, 26, 29**	C	C-D	D	E
Disturbed: **17**	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.

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 and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propagation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 1000 watts d.s.b. into a dipole antenna a quarter-wave above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain 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—The Eastern USA chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through July 31, 1966, and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce. Boulder, Colorado

This month's *CQ* Propagation Charts contain DX predictions to all areas of the world for June *and* July. Short-skip predictions for June, for distances between 50 and 2300 miles, and from Hawaii and Alaska, appeared in last month's column. Instructions for the correct use of this month's DX Charts appear directly below the "Last Minute Forecast" at the beginning of this column.

V.h.f. Ionospheric Openings

The occurrence of sporadic-E ionization often reaches a seasonal peak during June, and this is expected to result in frequent short-skip open-

ings on 6 meters, and an occasional opening on 2 meters. Six meter short-skip openings may occur almost daily during the month, between distances of approximately 750 and 1300 miles. When intense sporadic-E ionization takes place, "two-hop" openings up to distances of about 2400 miles may also be possible, as well as single-hop openings on 2 meters, between distances of 1200 and 1400 miles.

While sporadic-E openings may occur at any time, they are more likely to take place between 9 A.M. and 1 P.M., local time, and between 5 P.M. and 9 P.M. For some tips on predicting v.h.f. sporadic-E openings see "Some Notes on Sporadic-E Propagation," appearing on page 60 of the June, 1962 issue of *CQ*.

No major meteor showers are expected during the month, and very little auroral activity is forecast for June. Check the "Last Minute Forecast" appearing at the beginning of this column, since v.h.f. auroral openings are likely to occur during periods of ionospheric storminess, or below normal conditions.

Sunspot Cycle

A monthly sunspot number of 24.5 was reported by the Zurich Observatory for March, 1966. This results in a smoothed sunspot number of 17, centered on September, 1966. The new sunspot cycle continues its very slow, but steady increase in intensity. This month's propagation forecast is based upon a predicted smoothed sunspot number of 33, centered on June, 1966.

There is usually an increase in the number of severe solar-ionospheric disturbances as the sunspot cycle increases. Two of the most severe disturbances in several years took place March 14-15 and 23-24, 1966 as large groups of sunspots crossed the center of the sun's surface. These large sunspot groups were believed responsible for showering the earth's atmosphere with an unusually large amount of ultraviolet energy, X-rays, cosmic energy and sub-atomic particles. Much of this abnormal radiation reached the D level of the ionosphere and formed a blanket of intense absorption, resulting in weak signals in the h.f. bands, with severe flutter fading. For periods during both days, disturbances existed in most areas of the world. A greater number of such storms are likely to occur as the solar cycle increases during the next few years.

73, George, W3ASK

CQ DX Propagation Charts

JUNE & JULY, 1966

Time Zone: EST (24-Hour Time)

Eastern USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	15-18 (1)	05-06 (1) 06-09 (3) 09-13 (2) 13-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	19-22 (1) 22-00 (2) 00-02 (1)	21-23 (1) 23-00 (2) 00-01 (1) 23-01 (1)†
Northern Europe & European USSR	14-17 (1)	05-07 (1) 07-09 (2) 09-15 (1) 15-19 (2) 19-21 (1)	22-00 (1)	22-00 (1)
Eastern Mediterranean & East Africa	13-16 (1)	05-06 (1) 06-07 (2) 07-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-21 (1)	20-00 (1)	21-23 (1)
West & Central Africa	14-18 (1)	04-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	21-00 (1) 00-02 (2) 02-04 (1)	00-02 (1)
South Africa	09-13 (1)	00-02 (1) 06-14 (1) 14-16 (2) 16-18 (1)	22-23 (1) 23-01 (2) 01-03 (1)	23-01 (1)
Central Asia	*Nil*	05-08 (1) 18-21 (1)	*Nil*	*Nil*
Southeast Asia	*Nil*	05-06 (1) 06-08 (2) 08-10 (1) 18-21 (1)	*Nil*	*Nil*
Far East	*Nil*	06-07 (1) 07-09 (2) 09-11 (1) 20-23 (1)	*Nil*	*Nil*
Guam & Pacific Islands	18-20 (1)* 15-18 (1) 18-20 (2) 20-21 (1)	16-22 (1) 22-00 (2) 00-06 (1) 06-09 (2) 09-11 (1)	01-02 (1) 02-05 (2) 05-06 (1)	02-05 (1) 02-04 (1)†
Australia & New Zealand	19-22 (1)	15-22 (1) 22-01 (2) 01-06 (1) 06-09 (2) 09-11 (1)	01-02 (1) 02-05 (2) 05-06 (1)	03-05 (1) 03-04 (1)†
North & Central South America	13-15 (1)* 15-17 (2)* 17-18 (1)* 07-09 (1) 09-11 (3) 11-13 (2) 13-14 (3) 14-17 (4) 17-19 (3) 19-21 (1)	06-07 (3) 07-09 (4) 09-11 (3) 11-16 (2) 16-18 (3) 18-21 (4) 21-22 (3) 22-00 (2) 00-06 (1)	19-21 (1) 21-00 (2) 00-03 (3) 03-05 (2) 05-06 (1)	22-01 (1) 01-04 (2) 04-05 (1) 01-03 (1)†
Southern Brazil, Argentina, Chile & Uruguay	14-17 (1)* 07-11 (1) 11-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	05-06 (1) 06-10 (2) 10-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-23 (2) 23-01 (1)	21-00 (1) 00-02 (2) 02-06 (1)	00-04 (1) 02-04 (1)†
McMurdo Sound, Antarctica	14-17 (1)	14-16 (1) 16-18 (2) 18-22 (1)	03-07 (1)	*Nil*

Time Zones: CST and MST (24-Hour Time)

Central USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	15-17 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1)	20-22 (1) 22-00 (2) 00-01 (1)	21-23 (1)
Northern Europe & European USSR	14-16 (1)	05-07 (1) 07-09 (2) 09-14 (1) 14-18 (2) 18-20 (1)	21-23 (1)	*Nil*

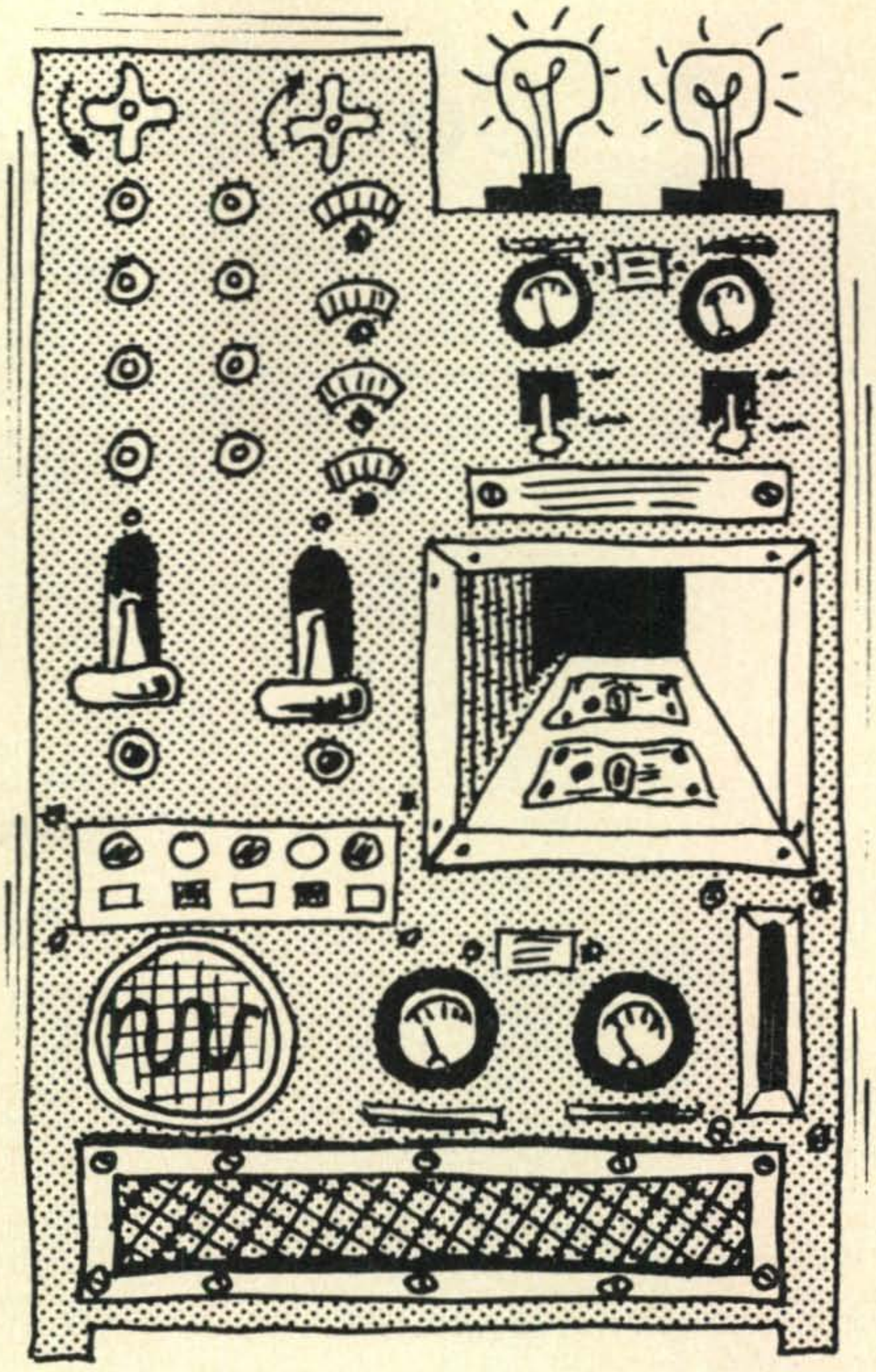
*Predicted 10 meter openings, all others in column are 15 meter openings.
†Predicted 160 meter openings, all others in column are 80 meter openings.

Eastern Mediterranean & East Africa	13-15 (1)	05-06 (1) 06-07 (2) 07-15 (1) 15-17 (2) 17-20 (1)	20-23 (1)	*Nil*
West & Central Africa	14-18 (1)	05-06 (1) 06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	21-00 (1) 00-01 (2) 01-03 (1)	00-01 (1)
South Africa	09-13 (1)	00-02 (1) 06-14 (1) 14-16 (2) 16-18 (1)	22-23 (1) 23-00 (2) 00-02 (1)	22-00 (1)
Central Asia	*Nil*	05-09 (1) 18-21 (1)	*Nil*	*Nil*
South-east Asia	*Nil*	05-06 (1) 06-09 (2) 09-11 (1) 18-20 (1) 20-22 (2) 22-23 (1)	*Nil*	*Nil*
Far East	21-23 (1)	06-07 (1) 07-10 (2) 10-20 (1) 20-22 (2) 22-00 (1)	04-06 (1)	*Nil*
Guam & Pacific Islands	18-20 (1)* 11-12 (1) 12-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	03-06 (1) 06-09 (2) 09-17 (1) 17-20 (2) 20-00 (3) 00-03 (2)	00-02 (1) 02-06 (2) 06-07 (1)	01-06 (1) 03-05 (1)†
Australia & New Zealand	15-18 (1) 18-20 (2) 20-23 (1)	03-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-19 (1) 19-21 (2) 21-23 (3) 23-02 (2)	00-02 (1) 02-05 (2) 05-07 (1)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)†
North & Central South America	12-15 (1)* 15-16 (2)* 16-18 (1)* 07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	06-07 (3) 07-09 (4) 09-11 (3) 11-16 (2) 16-18 (3) 18-20 (4) 20-22 (3) 22-00 (2) 00-06 (1)	19-21 (1) 21-23 (2) 23-02 (3) 02-04 (2) 04-05 (1)	21-23 (1) 23-02 (2) 02-04 (1) 00-02 (1)†
Southern Brazil, Argentina, Chile & Uruguay	14-17 (1)* 07-11 (1) 11-13 (2) 13-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	00-06 (1) 06-09 (2) 09-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-22 (3) 22-00 (2)	20-23 (1) 23-01 (2) 01-05 (1)	23-04 (1) 01-03 (1)†
Mc-Murdo Sound, Antarctica	13-15 (1)	12-16 (1) 16-18 (2) 18-21 (1)	03-07 (1)	*Nil*

Time Zone: PST (24-Hour Time)
WESTERN USA TO:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	*Nil*	20-22 (1) 05-06 (1) 06-08 (2) 08-13 (1) 13-16 (2) 16-18 (1)	19-23 (1)	*Nil*
Northern Europe & European USSR	*Nil*	05-07 (1) 07-09 (2) 09-17 (1) 20-22 (1)	20-22 (1)	*Nil*
Eastern Mediterranean & East Africa	*Nil*	06-12 (1) 12-15 (2) 15-17 (1) 20-22 (1)	*Nil*	*Nil*
West & Central Africa	09-11 (1)	21-23 (1) 05-06 (1) 06-08 (2) 08-13 (1)	20-23 (1)	*Nil*
South Africa	09-11 (1)	13-16 (3) 16-17 (2) 17-18 (1) 05-07 (1) 07-08 (2) 08-14 (1) 19-20 (1) 20-22 (2) 22-23 (1)	19-20 (1) 20-21 (2) 21-22 (1)	19-21 (1)
Central Asia	*Nil*	07-12 (1) 17-18 (1) 18-20 (2) 20-22 (1)	*Nil*	*Nil*
South-east Asia	20-22 (1)	06-08 (1) 08-09 (2) 09-14 (1) 19-21 (1) 21-23 (2) 23-00 (1)	02-06 (1)	*Nil*
Far East	12-14 (1) 20-22 (1)	06-07 (1) 07-09 (2) 09-19 (1) 19-21 (2) 21-23 (3) 23-00 (2) 00-02 (1)	01-02 (1) 02-05 (2) 05-07 (1)	01-04 (1)
Guam & Pacific Islands New Zealand	18-20 (1)* 09-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	04-07 (1) 07-09 (3) 09-17 (2) 17-19 (3) 19-22 (4) 22-00 (3) 00-04 (2)	23-01 (1) 01-04 (3) 04-06 (2) 06-07 (1)	23-01 (1) 01-04 (2) 04-06 (1) 02-04 (1)†
Australia	13-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	04-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-19 (1) 19-21 (2) 21-00 (3) 00-04 (2)	23-01 (1) 01-04 (2) 04-07 (1)	00-02 (1) 02-04 (2) 04-06 (1) 02-04 (1)†
North & Central South America	13-15 (1)* 15-16 (2)* 16-18 (1)* 07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	06-08 (3) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-23 (2) 23-04 (1) 04-06 (2)	19-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-04 (1)	20-22 (1) 22-00 (2) 00-03 (1) 00-02 (1)†
Southern Brazil, Argentina, Chile & Uruguay	12-14 (1)* 07-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-19 (1)	00-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-18 (4) 18-21 (3) 21-00 (2)	20-22 (1) 22-01 (2) 01-04 (1)	22-04 (1) 00-02 (1)†
Mc-Murdo Sound, Antarctica	12-16 (1)	11-16 (1) 16-18 (2) 18-20 (1)	19-21 (1) 02-07 (1)	*Nil*

HOW TO MAKE MONEY!



Use this money-making machine? A good idea, but Uncle Sam holds the patent ! ! Discouraged? Don't be . . . Try this—

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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

June	3-6	CHC/FHC/HTH Party
June	4-5	National Field Day
June	5-6	Bermuda Party
June	11-13	New York QSO Party
June	25-26	ARRL Field Day
July	2-3	Venezuela Contest
July	2-3	Alabama QSO Party
July	16-17	Colombia Contest
August	6-7	Illinois QSO Party
August	13-14	WAEDC C.W.
September	10-11	WAEDC Phone

CHC/FHC/HTH

Starts: 2300 GMT Friday, June 3
Ends: 0600 GMT Monday, June 6

Rules and procedure rather complicated but awards plentiful. Fully covered in last month's CALENDAR. Mailing deadline for your logs is July 5th and they go to: Clif Evans, K6BX, Box 385, Bonita, Calif. 92002.

National Field Day

Starts: 1700 GMT Saturday, June 4
Ends: 1700 GMT Sunday, June 5

This is really a European activity, but overseas stations are invited to work these low powered portables. There is an award to the overseas station whose log shows that he contributed the most points to the competitors. Send your report to: RSGB H.F. Contest Committee, 28 Little Russell Street, London, W.C.1, England.

Bermuda Contest

Starts: 0001 GMT Sunday, June 5
Ends: 0200 GMT Monday, June 6

Above dates are for the second week-end. Full details in last month's CALENDAR. Logs go to: Radio Society of Bermuda, Att: Contest Committee, P.O. Box 275, Hamilton, Bermuda.

New York State QSO Party

Starts: 1800 GMT Saturday, June 11
Ends: 0200 GMT Monday, June 13

The South Shore Amateur Wireless Association invites all amateurs to participate in its first New York State QSO Party.

There are no time or power restrictions, you can use both c.w. and phone and the same station can be worked once per band and mode.
EXCHANGE: QSO number, RS/RST and ARRL section or New York county.
SCORING: One point per QSO. Out of state stations multiply total QSO points by the number of N.Y. counties worked, N.Y. stations by ARRL sections and countries. (62 New York counties).
AWARDS: Certificates to the top scorer in each ARRL section, N.Y. county and country. (A minimum of 50 points required.) There is also a Novice award.
FREQUENCIES: 3565, 3900, 7065, 7250, 14,065, 14,250, 21,065, 21,350, 28,065, 29,000 kc and 50.4 and 144.5 mc. (Also check 1815 kc at 0100 GMT).

Logs must be postmarked no later than June 30 and go to: SSAWA Party, P.O. Box 465, Valley Stream, New York 11582.

ARRL Field Day

Starts: 2100 GMT Saturday, June 25
Ends: 2400 GMT Sunday, June 26

We have our own Field Day over here too and it really stirs up the pea patch. From the standpoint of participating operators this one probably tops all amateur competition (except our own WW DX contest, of course!). The June issue of *QST* will give the details.

Alabama QSO Party

Starts: 2100 GMT Saturday, July 2
Ends: 0300 GMT Monday, July 4

The Huntsville Amateur Radio Club has organized this party so interested amateurs can earn credits for the WAS and USA-CA awards.

Operate any 24 hours out of the 30 hour period. The same station may be worked once per band and mode. Stations running under 150 watts at all times multiply their score by 1.25.
EXCHANGE: QSO number, report and ARRL section, county for Alabama stations.
SCORING: *Alabama stations:* 1 point per contact, multiplied by ARRL sections and countries worked. *Outside stations:* 3 points per Alabama station, multiplied by the number of Alabama counties worked (and the power multiplier if applicable.) (67 Alabama counties).
AWARDS: Certificate to the highest scorer in each ARRL section and foreign country. (Minimum of 100 points necessary.) In addition a Trophy to the overall winner. Also a Trophy to the highest Alabama station and 2nd, 3rd and 4th place certificates.
FREQUENCIES: 3577, 3965, 7040, 7230, 14,040, 14,290, 21,040, 21,390, 28,600, 50,550, 144,400 and the Novice bands.

Mailing deadline is August 1st and your entries go to: Hunstville Amateur Radio Club, c/o Richard Rodkin, WA4TID, 4030 Medford Dr. SE, Huntsville, Alabama 35802.

*14 Sherwood Road, Stamford, Conn. 06905.

Venezuelan Contest

Starts: 0000 GMT Saturday, July 2
Ends: 2400 GMT Sunday, July 3

The Radio Club Venezolano invites all amateurs to participate in their annual contest to commemorate the 155th Anniversary of the Independence of Venezuela.

BANDS: This is a phone *only* contest. Use all bands 10 thru 80, a.m. and s.s.b.

CATEGORIES: Single operator, all bands and single band; Multi-operator, all bands, both single and multi-transmitter.

SERIAL NO: The RS report plus a 3 figure contact number starting with 001.

VALID CONTACTS: *Stations in the Americas:* With YV, other American countries and the rest of the world. *Stations in other continents:* With YV and other American countries only.

SCORING: One point for each contact, 2 points for each YV contact. (Except on 40 meters)

MULTIPLIER: A multiplier of 1 for each country, YV call area and USA call area.

FINAL SCORE: For a single band, total points multiplied by the sum of the multiplier. All band, total points multiplied by the sum of the multiplier from all bands.

LOGS: Date/time in GMT, station worked, number sent, received, multiplier (only first time contacted) and points. Use separate log for each band. Also include a separate summary sheet with your score computed and your name and address in BLOCK LETTERS.

AWARDS: A certificate to each station with the following number of contacts. *Americas:* With 20 YV's and 10 different countries. *Other Continents:* With 5 YV's and 5 other American countries (s.w.l.'s with 50 different confirmed contacts). There are also 8 Trophies for the highest scorer in each category, both for the YV's and foreign stations. And a silver medal to each continental winner. Finally a special trophy to the station contacting the most countries.

I would like to personally add that the certificate is by far the most beautiful one I have ever seen, and I have acquired quite a collection. It is worth your time and effort to qualify for this award. You will note that you do not have to be a winner to be eligible.

It is requested that a remittance of $1.00 or its equivalent in IRC's be included with your log if you are eligible for an award. Entries must be in postmarked no later than September 15th. They go to: Radio Club Venezolano, Independence Contest, P.O. Box 2285, Caracas, Venezuela.

Colombia Contest

Starts: 0000 GMT Saturday, July 16
Ends: 2359 GMT Sunday, July 17

This contest is held yearly to celebrate the dat of Independence of Colombia. Colombia stations will work as many DX stations as possible, other countries will contact HK stations as well as other DX.

SERIAL NO.: The conventional 5 and 6 figures. RS/RST report plus a progressive 3 digit contact number starting with 001.

SCORING: *Stations on the American continents:* 3 points for each HK contact, 1 point for non-HK. *Stations on other continents:* 5 points for each HK contact, 1 point for non-HK.

MULTIPLIER: Sum of HK districts on all bands plus number of different countries worked.

FINAL SCORE: Sum of QSO points multiplied by sum of HK districts from all bands, plus different countries worked.

CATEGORIES: Single operator and multi-operator, but not multi-transmitter.

AWARDS: Certificates for the top scorer in each country and each continent. There is also a silver cup to the overall winner. The HKs have many awards for their own winners.

You are expected to submit detailed log showing both QSO points and multiplier. Also include a summary sheet wtih the score worked out and your name and address in BLOCK LETTERS.

Logs must be in the hands of the committee before September 30th. They go to: L.C.R.A., Colombia Independence Contest, Box 584, Bogota, Colombia, S.A.

Editor's Note

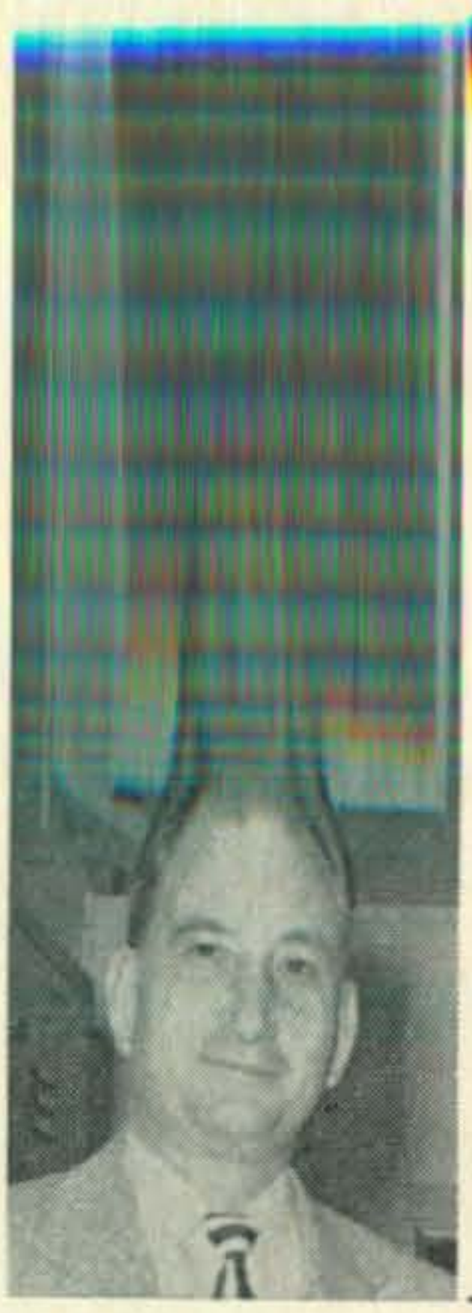
No time or space for any of my comments this month. However just a reminder, don't forget to send in your log for the recent WW SSB Contest. We had an excellent weekend with fine conditions on the higher frequency bands. Some stations were heard with QSO totals in the four figures. Have a relaxing summer.

73, for now, Frank, W1WY

New Amateur Product

Superex Electronics Corp. Headphones

SUPEREX Electronics Corp., 4 Radford Place, Yonkers, N.Y. announces the introduction of a new communications headphone, Model CO-S. The headphone is extremely sensitive and lightweight. A fully adjustable covered headband, foam filled, washable, replaceable ear cushions and dynamic elements are used. Specifications are as follows: impedance, 4 to 16 ohms, response, 100 to 10,000 c.p.s., termination, standard phone plug with seven feet of cable. Net price is $13.95. For further information either write direct or circle 74 on page 110.



HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

PHONE-PATCHES and patching have received a great deal of attention in amateur radio literature during the last 15 years. Few well equipped ham stations are without their phone-patches, yet we continue to receive letters on the subject month after month. So in this column we thought we would cover the subject in summary form and present information of interest to both the novice and advanced ham.

Why Phone-Patches?

To begin with, we all know that a phone-patch is used to connect the station telephone alternately to our receiver and transmitter so that a party on another telephone calling us can converse with still another party thousands of miles away located at another station or telephone.

In the U.S. phone-patches are *tolerated* because they are generally used wisely and well. However, in most foreign countries because the telephone companies are operated by and are under the control of the government, ham phone patches are forbidden. Nevertheless some overseas hams do use phone patches on occasion.

One of the main reasons that the phone-patching via ham stations has not been made the matter of a penalty or official sanction is because it is always used for non-commercial purposes. It really does not take revenue away from the telephone companies, but on the contrary, increases it. As long as the ham does not cause a mal-functioning of a telephone circuit or disturb the installed equipment mechanically and electrically, most telephone companies could care less how their circuits are used by the average ham.

As a morale builder of our Servicemen overseas, the phone-patch has really proven its worth. I remember a personal experience very well. When stationed in Korea I received a message via a U.S. ham station in Japan of a relative's near critical illness. This message saved me two days, for I did not receive the official Red Cross message until 2½ days later. My message had been relayed to Japan via phone-patch.

If used properly, the phone-patch can contribute to the ham's public service function, but if the unofficial privilege is abused, then the bad

tions.

Types of Patches

Telephone companies do not like the idea of *direct* connection to their telephones but they will say little or nothing if an *inductive* pickup is used.

The inductive pickup is nothing more than either a flat coil placed under the telephone or a round coil attached to the phone near its induction coil by means of an induction cup. Both types work very well.

The inductive pickup can be used with nearly any kind of phone-patch as long as it provides additional amplification either through a tube or transistor type amplifier. However, with today's modern transceivers, sufficient gain is available to obviate the need for a separate amplifier.

I have mentioned the pickup *first* because I wish to emphasize the point that I do not advocate direct telephone connection with phone-patches.

A phone-patch can be simple or very sophisticated. It can contain nothing but a few capacitors, resistors and transformers or it can contain these as well as amplifiers, elaborate switching circuitry, vu meter, filters, etc.

Fig. 1 shows the most simple phone patch. Note that no switches are used. Connection can be made to the telephone directly or through an inductive pickup. If insufficient gain is encountered using the pickup, then a transistorized amplifier (such as those sold by Lafayette) may be used and a switch installed for both sending and receiving. With this phone-patch, the operator will of course be forced to carefully adjust his receiver and transmitter gain controls during the contact.

Fig. 2 illustrates the circuit for the very popular Heathkit hybrid phone patch, model HD-19. This fine patch has separate receiver and transmitter gain controls and a vu meter. Though not classified as a highly sophisticated unit it works and works well. It would be very easy to install a small transistorized amplifier in the unit so that it can be used with an inductive type pickup.

The best phone-patch that I have ever used was described in the December 1958, *CQ* (reprints from the *CQ* Editor, $1.00) in the article "The Patchmaster" by W6GDO. This is a patch that is without compromise. Modern tubes such as the 12AT7 can be used instead of the 6SL7's used in the original model. The mike amplifier can use any of the new miniature pentode tubes. But other than these substitutions, the patch is "the most."

A patch that can be built for $2.98 (still!) is described in the October 1958 issue of *CQ* (reprint also $1.00). The article, "The 'Macy's Special' Patch" by W6QID is a very simple but effective unit similar to the one in fig. 1 but includes switching and a gain control.

Installation and Troubleshooting

Phone patches can be temperamental things!

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

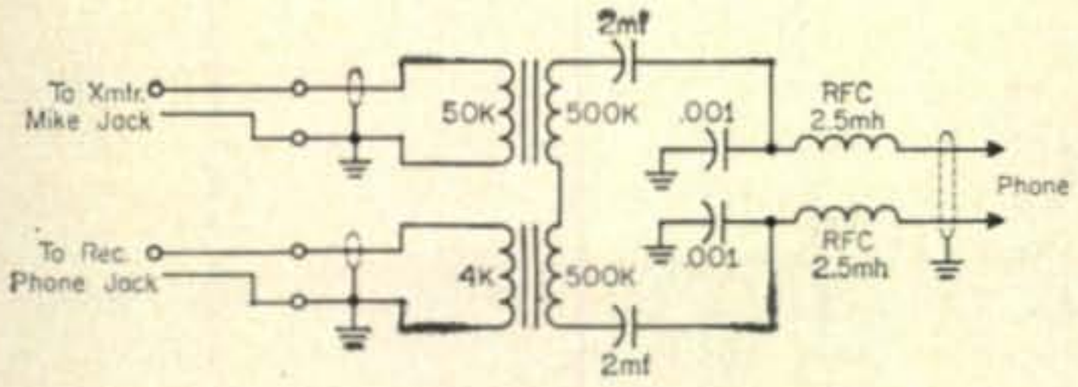


Fig. 1—A simple phone-patch that uses no switching. The phone itself provides monitoring. Transformers, capacitors and chokes should be installed in a metal case, and the case grounded.

But if installed properly will work day in and day out without trouble.

Feedback seems to be the biggest problem encountered by hams using phone-patches. One ham in desperation wrote to us and said he had tried everything but that he still had feedback. His patch was a commercial unit, quite expensive, and he could not understand why it would not operate properly. We suggested that he reduce the length of all wires from and to the patch, make sure these are shielded, and install a *separate* ground for the patch. We also told him that he should tie two .001 mmf ceramic capacitors in series across the line (their center-top grounded). Our suggestions were taken and his trouble cleared up. But sometimes the problem is not so easy of solution.

One must remember that r.f. can be rectified and fed into the telephone circuit (and/or patch) in a number of ways. Ground loops can exist to cause feedback. A ground loop can be created by multiple grounds having different impedances, so when a good *common* ground does not seem to work, the loop pattern can sometimes be "broken" by installing another good ground.

Good quality from a phone-patch depends of course on how well the unit is matched to the phone line or the inductive pickup unit. Many hams seem to think that a lot of gain is necessary to make a patch work well and they have a tendency to overdrive their transmitters, thus poor voice quality results.

Proper shielding of *all* wires cannot be overemphasized. A good common ground is essential. Long ground connecting wires are not good. It is better to have a short poor ground than a long good one in some cases.

If a patch uses a tube amplifier that has a lot of gain there is always the possibility that r.f. from the transmitter can enter the unit and rectification take place at the input grids. This can be alleviated by installing 75k to 100k resistors in series with the grids and by-pass these to ground with something like .001 mmf ceramic capacitors.

When your patch does not contain r.f. chokes in series with its output connections (to the phone line), install them. These units can be 2½ mh or so. Ahead of the units install the series connected .001 mmf ceramics whose center tap is grounded, as shown in fig. 1.

Using the Patch

Some hams really do not know how to use patches correctly. The *good* operator never allows the voice of a telephone operator or a ringing signal to go out over the air—*never*. The smooth operator uses his phone-patch in such a way that it would be difficult to determine whether or not a patch is being used. He never says, "fellows how about keeping the channel clear, I'm phone-patching" or some such other nonsensical chatter.

A good operator *never* allows his conversation with the telephone party on his end to go out over the air. Instructions on how to use the patch are given over the telephone *off* the air. The phone-patch should *never* be operated with a transceiver in v.o.x. position—the operator *must* do the switching.

Overseas stations operated by U.S. Servicemen should never be used to call, "CQ stateside for phone-patch traffic to Podunk." The less said on this subject the better, but those concerned should take heed.

Lastly, ham stations having phone-patches should not "act" like commercial radio relay centers . . . the reason here is obvious. Proper voice operating procedures are mandatory, and this "go" business after a transmission is not proper and sounds like h . . .—excuse my French.

Questions

U.K. Licensing Procedure—"I am planning on going to England to school next year. Can you tell me what I must do to obtain a ham license there?"

Yes. Write to Radio Services Department, Ra-

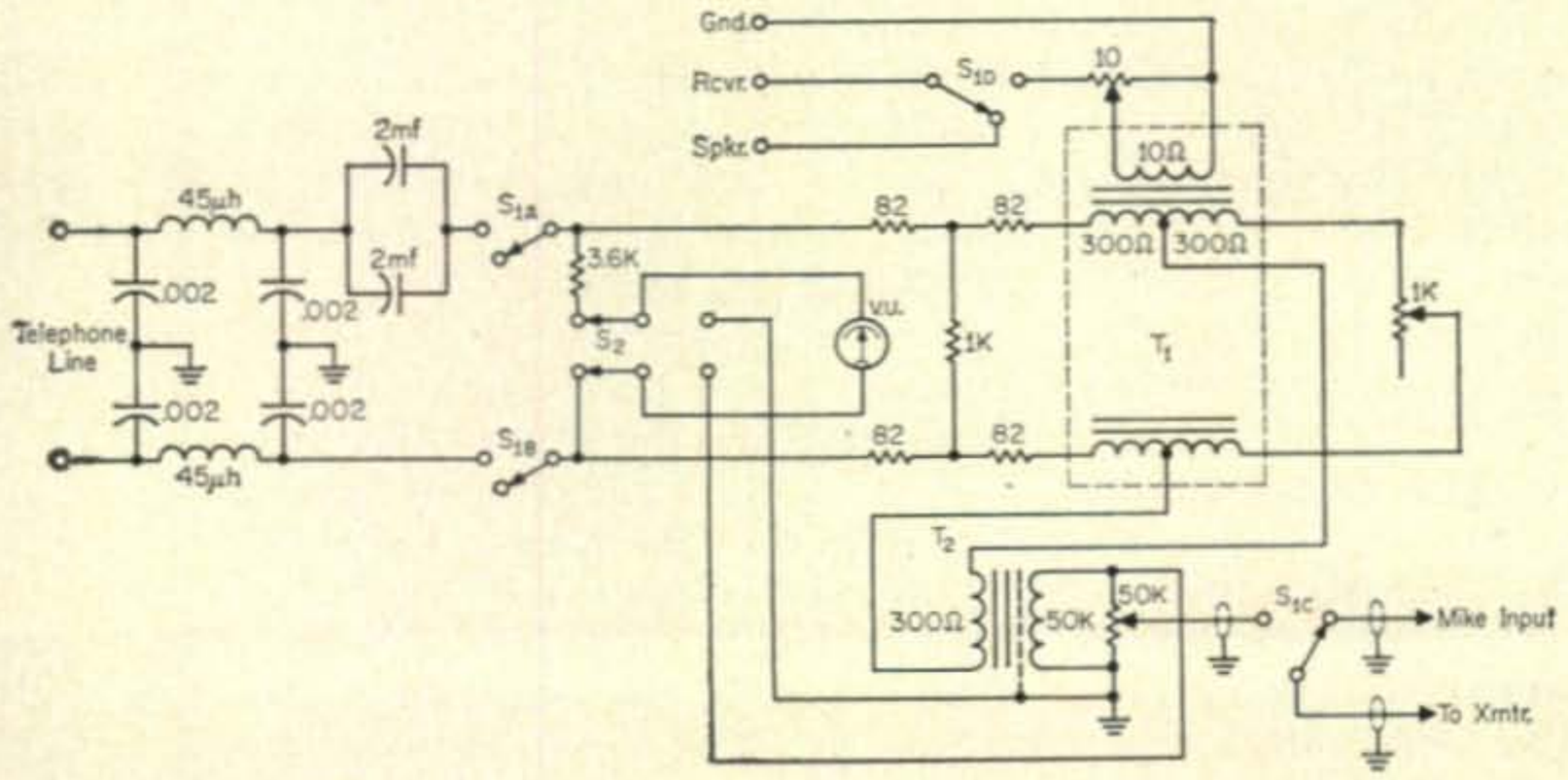


Fig. 2—Basic circuit of the Heathkit hybrid phone-patch (HD-19).

dio Branch (Amateur Licensing Section) Hqrs. G.P.O. St. Martins-le-Grand, London, E.C.1 England for application forms. Fill these out with the required information and return them to the same address. If you are a British ham and want to operate in the U.S. write the Federal Communications Commission, Washington, D.C. 20554 for form 610-A. Negotiations are still going on with a number of countries for reciprocal operations. Let us hope all are successful.

Choosing a Scope—"I am in the market for a new oscilloscope. What factors should I consider in purchasing one? I am interested in a professional type scope that I can use in my own lab for serious work and for ham operations."

First of all remember that scopes can be purchased from $49.95 to $4995.00 or more. Only general information can be given you on the subject of choosing a scope in this column because of space limitations. The first consideration of most engineers of course is bandwidth and speed. Pick the scope that best suits your *upper* frequency requirements. Then input sensitivity should be considered. This means that you will choose a scope whose vertical amplifier will amplify (for full scale deflection) the smallest voltage that you will work with. Next, you can consider rise time. The product of rise time and bandwidth should be around 0.36. Pulse shape is another important thing to look for. Remember that there is no perfect pulse as such. One scope may show a pulse one way and another a different way. Sweep accuracy is important. Choose the scope that has an accurately calibrated sweep. Input impedances vary for different scopes. Choose the scope (in your price range) that gives you the *highest* input impedance available. Triggering circuitry is important but remember that the state-of-the-art does not yet permit triggers to match the maximum bandwidth and sweep-speed of the best scopes. This is so because of the extremely high frequencies now encountered. Check linearity of the horizontal and vertical amplifiers and the difference in phase-shift between them. What you must do is to compare the specifications (required) against those available. Good luck.

Telephone Information—"Where can I obtain information (including a schematic) for a dial telephone and an explanation of how a telephone operates?"

See the June 1959 *CQ* page 56 for an article "Small Talk on the Landline." This article (reprints from the *CQ* Editor, $1.00) gives full information on the telephone.

Collins 32V On Six Meters—"I own a Collins 32V and I would like to place this fine transmitter on 6 meters. Can you refer me to some information for doing this?"

Yes. April 1958 *CQ*. Reprints $1.00 for the article that covers this.

SB-10 and BC-610 for s.s.b.—"Can you refer me to an article describing the use of the SB-10 s.s.b. exciter and that old work-horse the BC-610 transmitter? If not, what must be done to make this combination work?"

I cannot refer you to any articles on the combination. However, the SB-10 can be made to work with the BC-610, but only if crystals are used for frequency control. The v.f.o. in the BC-610 exciter is not stable enough. You would have to linearize the final (250TH's) which could be driven with a linearized 807. If you can provide the drive (outside of the SB-10), then see the article in the October 1959 *CQ* for using 250TH's in grounded grid.

Galaxy Remote v.f.o. on RTTY—"Where can I obtain information on using my Galaxy V on RTTY?"

Write Galaxy Electronics' Owen Meyerson for the service bulletin No. 6-1. This will tell you.

Galaxy Linear Amplifier 2000+ Operational Hints—For a lot of good operational hints on the Galaxy Linear Amplifier 2000+ write Galaxy for the bulletin mentioned above, it has them as well as the RTTY info.

SR-150 Hum—"I own an SR-150 transceiver and have had no trouble at all with it, but I notice that when I turn the r.f. gain control all the way off and turn the a.f. control all the way on without a station signal coming through that there seems to be some power line hum. What gives?"

No doubt a poor ground connection, loose connecting cable or a bad capacitor in the filter power supply; but the latter I doubt.

Heath Hybrid Patch—"I recently bought a Heath hybrid phone patch second-hand without an instruction book. Tell me, how is it that when I adjust the null then place a call that the null is off?"

First, get yourself an instruction book for the unit from Heath ($1.00). Next turn to page 16. You will read that you should always adjust the null by placing a call, for the impedance of the "dead" phone is different from the impedance after the call is placed, i.e., with the party on the other end connected.

Millen 90901 CR Scope—"I have a Millen 90901 1" cathode ray scope. What I would like to know is, can I obtain the 600 to 950 volts d.c. required for its operation from the buffer stage (785 volts) of my transmitter without loading it down?"

Yes. The voltage required can be obtained from the buffer and there would hardly be any loading for only 3.2 ma are required.

H, KHz and MHz—"Most radio-electronics magazines are using H, KHz and MHz for cycles, kilocycles and megacycles respectively. How come *CQ* is so far behind? Also, how about pico instead of micro-micro?"

This is a decision of the Editor. However, either cycles or hertz can be and are used. We'll conform when the Editor tells us to. We use pf and micro-microfarad interchangeably now.

Eimac 5CX1500A Linear Tube—"I still build all of my own equipment and have now embarked on a project to make myself 'a linear of linears.' I only wish to use one tube in the final and I

[*Continued on page 102*]

SPACE COMMUNICATIONS

BY GEORGE JACOBS, W3ASK

As of April 15, 1966, no fewer than 59 satellites were in orbit transmitting radio signals back to earth on approximately 110 different h.f. and v.h.f. frequencies. Many of the signals in the h.f. range can be heard well on relatively inexpensive short-wave receivers, while the v.h.f. signals can often be received with relatively simple frequency converters. TABLE I contains those frequencies in which orbiting satellites were transmitting as of April 15, 1966. Many of these satellites are expected to continue to transmit radio signals throughout 1966.

Not included in TABLE I are the frequencies of the Orbiting Astrophysical Observatory, OAO-1, launched by the U.S. on April 8, and several of the recently launched Russian COSMOS satellites. The OAO-1 satellite is transmitting telemetry data on command, on 136.260 mc. A tracking beacon transmits continuously on 136.44 mc.

In addition to the frequencies shown in Table I for the French satellite D1A (149.7 and 399.92 mc) the satellite also transmits command beacon and telemetry data on 136.98 and 252 mc.

The satellites which should be heard with the least difficulty are those which transmit a continuous c.w. signal. These signals, which are often used as tracking beacons, can usually be identified by their steady tone when the receiver's beat frequency oscillator (b.f.o.) is on the ON position. Telemetry signals are often somewhat more difficult to receive, since in most cases telemetry data is transmitted for only brief periods upon command from the ground. Telemetry signals usually consist of two or more musical tones being transmitted at the same time, or in the

[*Continued on page 109*]

Table I—List Of Freq. On Which Satellites Can Be Heard (As Of April 15, 1966)

Freq. (Mc)	*Satellite Name and Country*	*Date Launched*	*Period* (Minutes)	*Inclination* (Degrees)	*Remarks*
1.5	EXPLORER 20—USA	25 Aug. 1964	104	80	Ionospheric sounder, on command
2.0	"	"	"	"	"
2.850	"	"	"	"	"
3.720	"	"	"	"	"
5.470	"	"	"	"	"
7.220	"	"	"	"	"
19.430	ELECTRON 2—USSR	30 Jan. 1964	1356	59	Command telemetry and c.w. beacon
19.540	"	"	"	"	"
19.775	COSMOS 63—USSR	15 Mar. 1965	104	56	"
19.800	COSMOS 71-75—USSR	16 Jul. 1965	96	56	"
20.000	EXPLORER 27—USA	29 Apr. 1965	108	41	Command trans., c.w. tone mod.
20.005	ELECTRON 1—USSR	30 Jan. 1964	169	61	Command telemetry and c.w. beacon
20.005	EXPLORER 22—USA	10 Oct. 1964	105	80	Command trans., c.w. tone mod.
20.035	COSMOS 55—USSR	21 Feb. 1965	105	56	Command telemetry and c.w. beacon
20.084	COSMOS 61—USSR	15 Mar. 1965	105	56	"
20.084	COSMOS 71-75—USSR	16 Jul. 1965	95.3	56	"
30.008	ELECTRON 1—USSR	30 Jan. 1964	169	61	"
40.000	EXPLORER 27—USA	29 Apr. 1965	108	41	Command trans., c.w. tone mod.
40.010	EXPLORER 22—USA	10 Oct. 1964	105	80	"
41.000	EXPLORER 27—USA	29 Apr. 1965	108	41	"
41.010	EXPLORER 22—USA	10 Oct. 1964	105	80	"
54.000	TRANSIT 4A—USA	29 Jun. 1961	104	67	"
89.100	COSMOS 71-75—USSR	16 Jul. 1965	96	56	Command telemetry and c.w. beacon
90.023	COSMOS 44—USSR	29 Aug. 1964	100	65	"
90.158	COSMOS 56—USSR	21 Feb. 1965	104	56	"
90.225	ELECTRON 2—USSR	30 Jan. 1964	1356	59	"
90.378	COSMOS 71-75—USSR	16 Jul. 1965	96	56	"
136.019	ECHO 2—USA	25 Jan. 1964	108	81.5	Continuous c.w. and telemetry
136.078	ALOUETTE—USA/CAN	29 Sep. 1962	105.5	80.5	Command telemetry
136.078	EXPLORER 23—USA	6 Nov. 1964	99	52	"
136.080	ALOUETTE 2—USA/CAN	29 Nov. 1965	121	79.8	Command transmission
136.125	EXPORER 28—USA	29 May 1965	8559	33.8	Continuous c.w. and telemetry
136.140	RELAY 1—USA	13 Dec. 1962	185	47.5	Command telemetry
136.142	RELAY 2—USA	21 Jan. 1964	195	46.3	"
136.147	EXPLORER 21—USA	4 Oct. 1964	2080	34	Continuous c.w. and telemetry
136.170	ECHO 2—USA	25 Jan. 1964	108	81.5	Continuous c.w. and telemetry
136.171	EXPLORER 22—USA	10 Oct. 1964	105	80	Command telemetry and c.w. beacon
136.200	OGO 1—USA	5 Sep. 1964	3842	40.7	Command telemetry and c.w. beacon
136.200	OGO 2—USA	14 Oct. 1965	104	87.4	Command telemetry and c.w. beacon
136.230	ESSA-1—USA	3 Feb. 1966	100	97.9	Command trans. and c.w. beacon
136.231	TIROS 8—USA	21 Dec. 1963	99.4	59	Command telemetry and c.w. beacon
136.232	TIROS 10—USA	2 Jul. 1965	101	99	"
136.233	TIROS 7—USA	19 Jun. 1963	97.4	58	"
136.234	TIROS 9—USA	22 Jan. 1965	119	96.4	"
136.273	EXPLORER 26—USA	21 Dec. 1964	452	20	Continuous c.w. and telemetry
136.292	EXPLORER 25—USA	21 Nov. 1964	116	81.4	Cont. c.w. and command telemetry
136.326	EXPLORER 20—USA	25 Aug. 1964	104	80	Command telemetry and c.w. beacon

Table I—List Of Frequencies On Which Satellites Can Be Heard (cont.)

Freq. (Mc)	*Satellite Name and Country*	*Date Launched*	*Period* (Minutes)	*Inclination* (Degrees)	*Remarks*
136.350	FR-1 FRANCE/USA	6 Dec. 1965	100	76	Command transmission
136.350	EXPLORER 20—USA	25 Aug. 1964	104	80	Command telemetry and c.w. beacon
136.380	EXPLORER 31—USA	29 Nov. 1965	121	79.8	Cont. telemetry and c.w. beacon
136.405	ARIEL 1—USA/UK	26 Apr. 1962	100	54	Cont. c.w. and command telemetry
136.410	PEGASUS 1—USA	16 Feb. 1965	97	32	Command telemetry and c.w. beacon
136.410	PEGASUS 2—USA	25 May 1965	97	32	Command telemetry and c.w. beacon
136.410	PEGASUS 3—USA	30 Jul. 1965	1437	29	"
136.440	EARLY BIRD—USA	6 Apr. 1965	95	0.13	Cont. c.w. and command telemetry
136.467	SYNCOM 2—USA	26 Jul. 1963	1435	31.2	Command transmission
136.470	SYNCOM 3—USA	19 Aug. 1964	1435	0.72	Command telemetry and c.w. beacon
136.500	ESSA 2—USA	28 Feb. 1966	113.5	101	Automatic picture transmission
136.530	EXPLORER 30—USA	19 Nov. 1965	101	59.7	Cont. telemetry and c.w. beacon
136.557	ARIEL 2—USA/UK	27 Mar. 1964	99	52	Cont. c.w. and command telemetry
136.590	PEGASUS 3—USA	30 Jul. 1965	95	29	Command transmission
136.590	ALOUETTE 2—USA/CAN	29 Nov. 1965	121	79.8	Command transmission
136.591	ALOUETTE—USA/CAN	29 Sep. 1962	105.5	80.5	Command transmission
136.620	RELAY 2—USA	21 Jan. 1964	195	46.3	Cont. c.w. and command telemetry
136.621	RELAY 1—USA	13 Dec. 1962	185	47.5	Cont. c.w. and command telemetry
136.650	1964-83C—USA	13 Dec. 1964	106	90	Continuous c.w. beacon
136.653	1963-38C—USA	28 Sep. 1963	107	90	Command telemetry and c.w. beacon
136.680	EXPLORER 20—USA	25 Aug. 1965	104	80	Command telemetry and c.w. beacon
136.709	EXPLORER 24—USA	21 Nov. 1964	115.5	81.4	Continuous c.w. beacon
136.713	OSO 2—USA	3 Feb. 1965	96.5	33	Continuous c.w. and telemetry
136.740	EXPLORER 27—USA	29 Apr. 1965	108	41	Command telemetry and c.w. beacon
136.766	GRAVITY GRADIENT 3—USA	9 Mar. 1965	103.5	70	Continuous c.w. beacon and telemetry
136.768	1965-58C—USA	20 Jul. 1965	2595	36.9	"
136.770	ESSA-2—USA	28 Feb. 1966	113.5	101	Command transmission
136.800	SOLAR RAD—USA	9 Mar. 1965	103.5	70	Cont. c.w. and command telemetry
136.800	FR 1—FRANCE/USA	6 Oct. 1965	100	76	Command transmission
136.805	EGRS 1—USA	11 Jan. 1964	103.4	70	Cont. c.w. beacon and telemetry
136.830	EXPLORER 29—USA	6 Nov. 1965	120	59.4	Command telemetry and c.w. beacon
136.840	EGRS 3—USA	9 Mar. 1965	103.5	70	Cont. c.w. beacon and telemetry
136.840	EGRS 5—USA	10 Aug. 1965	122	69.2	Cont. telemetry and c.w. beacon
136.860	EXPLORER 25—USA	21 Nov. 1964	116	81.4	Command telemetry
136.861	EXPLORER 23—USA	6 Nov. 1964	99	52	Command telemetry and c.w. beacon
136.886	SOLAR RAD—USA	11 Jan. 1964	103.5	70	Continuous c.w. and telemetry
136.889	PEGASUS 2—USA	25 May 1965	97	31.8	Continuous c.w. beacon
136.890	PEGASUS 1—USA	16 Feb. 1965	97	31.8	Continuous c.w. beacon
136.890	ALOUETTE 2—USA/CAN	29 Nov. 1965	121	79.8	Cont. telemetry and c.w. beacon
136.918	TIROS 9—USA	22 Jan. 1965	119	96.4	Command transmission
136.920	ESSA 1—USA	3 Feb. 1966	100	97.9	Cont. telemetry and c.w. beacon
136.924	TIROS 7—USA	19 Jun. 1963	97.4	58	Command transmission
136.924	TIROS 8—USA	21 Dec. 1963	99.4	58.5	Command transmission
136.924	TIROS 10—USA	2 Jul. 1965	101	98.6	Command transmission
136.980	SYNCOM 2—USA	26 Jul. 1963	1435	31.2	Command transmission
136.980	SYNCOM 3—USA	19 Aug. 1964	1435	0.72	Command telemetry and c.w. beacon
136.980	EARLY BIRD—USA	6 Apr. 1965	1437	0.13	Command c.w. beacon and telemetry
149.7	DIA—FRANCE	17 Feb. 1966	118.7	34.1	Telemetry and c.w. signal
150	TRANSIT 4 A—USA	29 Jun. 1961	104	67	Command tone-modulated c.w.
150	1963-22A—USA	16 Jun. 1963	100	90	Command tone-mod. c.w. & telemetry
150	1963-49B—USA	5 Dec. 1963	107	90	"
150	1964-26A—USA	4 May 1964	103	90.5	"
150	1964-83D—USA	13 Dec. 1964	106	90	"
162	ANNA 1B—USA	31 Oct. 1962	108	50	Command tone-modulated c.w.
162	1963-38C—USA	28 Sep. 1963	107	90	Command tone-mod. c.w. & telemetry
162	EXPLORER 22—USA	10 Oct. 1964	105	80	Command tone-modulated c.w.
162	1964-83C—USA	13 Dec. 1964	106	90	Command tone-mod. c.w. & telemetry
162	EXPLORER 27—USA	29 Apr. 1965	108	41.2	Command tone-modulated c.w.
162	EXPLORER 29—USA	6 Nov. 1965	120	59.4	Command telemetry and c.w. beacon
324	1964-83C—USA	13 Dec. 1964	106	90	Command transmission
324	TRANSIT 4A—USA	29 Jun. 1961	104	67	Command tone-modulated c.w.
324	1963-38C—USA	28 Sep. 1963	107	90	Command transmission
324	EXPLORER 22—USA	10 Oct. 1964	105	80	Command tone-modulated c.w.
324	EXPLORER 27—USA	29 Apr. 1965	108	41.2	"
324	EXPLORER 29—USA	6 Nov. 1965	120	59.4	Command transmission
360	EXPLORER 27—USA	29 Apr. 1965	108	41.2	Command transmission
360.090	EXPLORER 22—USA	10 Oct. 1964	105	80	Command tone-modulated c.w.
399.920	DIA—FRANCE	17 Feb. 1966	118.7	34.1	Telemetry and c.w. signal
400	TRANSIT 4A—USA	29 Jun. 1961	104	67	Command tone-modulated c.w.
400	1963-22A—USA	16 Jun. 1963	100	90	Command c.w. beacon and telemetry
400	1963-49B—USA	5 Dec. 1963	107	90	Command tone-mod. c.w. & telemetry
400	1964-26A—USA	4 May 1964	103	90.5	Command tone-modulated c.w.
400	1964-83D—USA	13 Dec. 1964	106	90	Command transmission
400.250	OGO 1—USA	5 Sep. 1964	3842	40.7	Command c.w. beacon and telemetry
400.250	OGO 2—USA	14 Oct. 1965	104	87.4	Command transmission
400.850	OGO 1—USA	5 Sep. 1964	3842	40.7	Command c.w. beacon and telemetry
400.850	OGO 2—USA	14 Oct. 1965	104	87.4	Command transmission
972	EXPLORER 29—USA	6 Nov. 1965	120	59.4	Command transmission

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

THE "Story of The Month" is about Art, WØMCX, but first this information on awards issued. Stephen, K3LXN earned a USA-CA-2000 award; Walt, WA2HGL received a USA-CA-1000 award and Clyde, KØJPJ won a USA-CA-1000 award and a USA-CA-500 award. Other USA-CA-500 mixed awards went to Fred, W5ODJ; James, WAØJIH and Robert, VE3IR. Dennis, W1DYE received a USA-CA-500 award endorsed All A-1; John, W5OYG received one endorsed All 75 & All A3A. Two of the "fair sex" earned USA-CA-500 awards: Irene, WA9EZP had hers endorsed All 7 mc & All A-1; Margaret, WA9HLW had hers endorsed All A-1. Jean, YO8CF received #1 award to YO land and his USA-CA-500 award was endorsed All 14 mc & All A-1 and I had the pleasure of telling him over the air that his award was on the way.

Arthur A. Jablonsky, WØMCX
Winner of #2 USA-3079 County Award

Arthur got started in ham radio in 1921 when he purchased his first issue of *QST*, but never got a license until Feb. 1940. In 1941 he passed the "Advanced" or Class "A", and also received a Commercial "First Telephone" and "Second Telegraph" license (still has them). Last year he passed the "Amateur Extra."

Art worked in the Engineering Dept. of a public utility for 16 years, then to CBS radio (KMOX) for a short time. He started with Raytheon Mfg. Co. in 1943 as a field engineer, working on radar, and ended up in R.I., N.Y., Hawaii, Enewitok, Ulithi, Guam, Saipan, Tinian, etc. and then finally in Seattle and Portland. Art left Raytheon in 1946 and then traveled with the Texas Refinery Corp. in the State of Illinois for 10 years. He then took a *temporary* job at KXOK (St. Louis) in 1957 and he is still there, his work is now supervisor of the transmitter.

Arthur built his first transmitter in 1933 (TP-TG with a pair of 210s) and bought a home made receiver from W9AGB (he still has it). Unfortunately just about the time Arthur was going to take the exam W9AGB died, and as a result Art lost contact with any active ham. The XYL of W9AGB gave Arthur a bunch of *QST*s and other radio magazines that started him collecting all back issues. He was able to complete the collection when he acquired *QST* for May 1916 in 1956. So his collection of *QST* is complete from Dec. 1915 and a complete collection of *CQ* from the first issue in Jan. 1945 to date.

After 20 years of operating, Arthur was sure he had the needed 500 counties confirmed when *CQ* announced the USA-CA Award Program in July 1961. He had only 465 different counties from his fixed station operation, but with the mobile cards he was able to go well over the 500 mark and received USA-CA-500 award #1-C. After much searching of the bands his total went over the 1000 mark and he received USA-CA-1000 in June 1963. In December of that year he stumbled on a bunch operating on 40 meters hunting counties, and he quickly went to 1500, 2000 and 2500 in 1964. In June 1965 he went to 3000 and in November 1965 the last county was worked and the QSL quickly obtained and then #2 ALL COUNTY AWARD.

Arthur put his first mobile rig in his 1941 Chevy and has had a rig in his cars ever since (except for the war years). When he traded for a new car, May (XYL) always knew that the car would not get out on the road until the mobile rig was installed and working.

May got her ticket in 1953 after the children were married and gone from home. She worked a lot of DX with the old kw a.m. rig, but has

*103 Whittman St., Rochelle Park, N.J. 07662.

USA-CA HONOR ROLL

2000
K3LXN 27

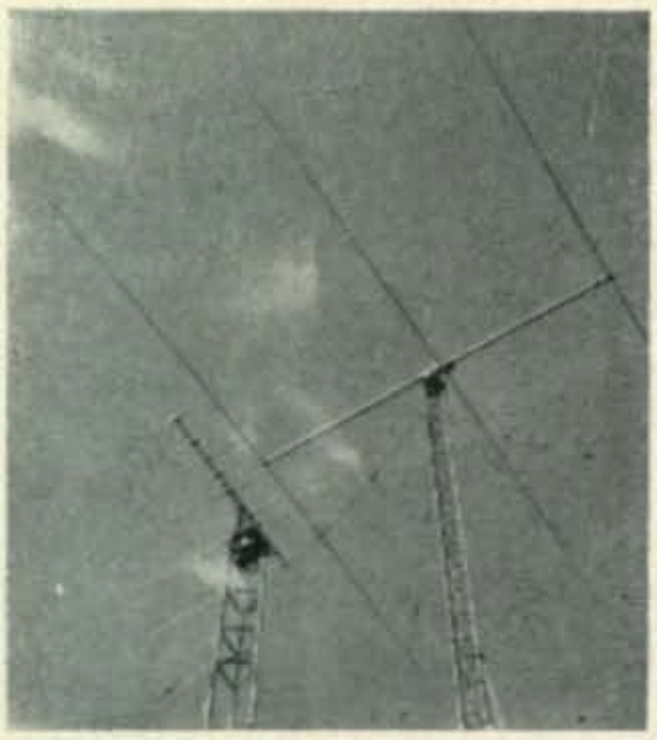
1000
WA2HGL 96
KØJPJ 97

500
VE3IR 557
W5ODJ 558
WA9HLW 559
WA9EZP 560
W1DYE 561
YO8CF 562
W5OYG 563
WAØJIH 564
KØJPJ 565

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

K9EAB	3079	WØKZZ	2580
WØMCX	3079	WØVFE	2410
K8CIR	3067	W8UPH	2368
W9ICF	3050	W9CMC	2368
WØJWD	2977	K3LXN	2331
K5SGJ	2961	WØGYM	2231
K5SGK	2960	K8VSL	2180
K4VOF	2944	W5NXF	2080
WA9AJF	2900	WA5AEB	2062
K8IWI	2780	W2JWK	2050
VE3-9301	2679	K9UTI	2000
K8KOM	2649	W5EHY	2000
WA8EZW	2000		

The shack at WØMCX.



The antennas at WØMCX.

never taken to s.s.b. Art was sorry to see the old kw go when he decided a.m. was out in 1957.

They have three children, one boy and two girls, and now 10 grandchildren, but no hams in the lot of them. The eldest grandchild (13) recently showed some interest, so some books were obtained to help increase her interest.

May has 180 countries confirmed on phone and Arthur has a total of 291 phone/c.w. but Arthur insists he has not worked a new country in over two years since he has been so fired up over USA-CA.

The kw rig was built in 1946 after getting back home from Raytheon, it used a pair of 304-TH tubes modulated by 810s. It was sold in 1957 and a Collins line was obtained. Now in use is an updated Collins S line with the Henry 2K linear.

As this is being written, Arthur and May are leaving on a world trip. Stops will include Amsterdam, Frankfort, Zurich, Athens, Beirut, Jerusalem, Teheran, Bombay, New Delhi, Taj Mahal, Bangkok, Hong Kong, Manila, Tokyo, Nikko, Hawaii, San Francisco, Dallas and back to St. Louis. Bon voyage! This story would not be complete without this incident—Arthur's brother in Teheran had no knowledge of Arthur's county hunting until a fellow worker showed him the photograph of Arthur on page 78 of November *CQ*, it sure is a small world.

Rare Counties

For some rare Arizona counties, see **Arizona Calling** in the May column. *Jefferson County,* Washington will be activated by the ARCS of Kitsap County as they again hold their Field Day from the top of Mt. Walker as W7RGL/7. Operation will be on c.w. & s.s.b. 80 thru 15, plus 6 a.m. Callbook QTH is fine for QSLs.

John, W9OIJ/WB2LZF and Fred, K2RUR, through the assistance of Stu Meyer, W2GHK of Hammarlund plan trips to the following rare counties: Hamilton during the June N.Y. QSO Party; Morgan during the July W. Va. QSO Party; Salem or Cumberland during the N. J. QSO Party in August; Sullivan or Fulton during the Sept. Penna. Party; and Meigs county during the December Ohio QSO Party. The best way to get a QSL for these QSOs is to send s.a.s.e. or s.a.e. and IRC to Stu Meyer, W2GHK, Box 7388, Newark, N. J. 07107.

Awards

Essex County Merit Award: Sponsored by the Belleville Amateur Radio Club (W2JUU) is issued for confirmed contacts with communities in Essex County, N.J. Class C for 5 communities—One seal; Class B for 10 communities—Two seals; and Class A for 15 communities—Two seals plus Gold Seal with ribbon. QSLs must be on hand, no time limit, any band or mode and endorsements when requested. Seals sent no charge. Applicant may apply for Class C and request higher seals when he qualifies by sending list of additional communities and a s.a.s.e. Send GCR and 50¢ to Thomas Cecire, WB2DDQ, 73 Mawal Drive, Cedar Grove, N.J. 07009. Communities in Essex County are: Belleville, Bloomfield, Caldwell Boro., Cedar Grove, East Orange, Essex Fells, Fairfield (formerly Caldwell Township), Glen Ridge, Irvington, Livingston, Maplewood, Millburn (Short Hills), Montclair (Upper Montclair), Newark, North Caldwell, Nutley, Orange, Roseland, South Orange, Verona, West Caldwell, West Orange.

San Fernando Valley Radio Club Award: Issued for working members of SFVRC of California. The certificate is awarded in three (3) categories, (1) stations in the Los Angeles section must work ten (10) club members with endorsements for each additional ten members worked; (2) stations in the rest of California and the Continental U.S. must work five members with endorsements for each additional five; and (3) all others, including Alaska and Hawaii, must work three members, with endorsements for each additional three. All contacts must be after January 1, 1962. Send log information only, no QSLs, to W6SD Awards Chairman, P. O. Box 3151, Van Nuys, California 91405. Send s.a.s.e. for membership list. No charge for certificate.

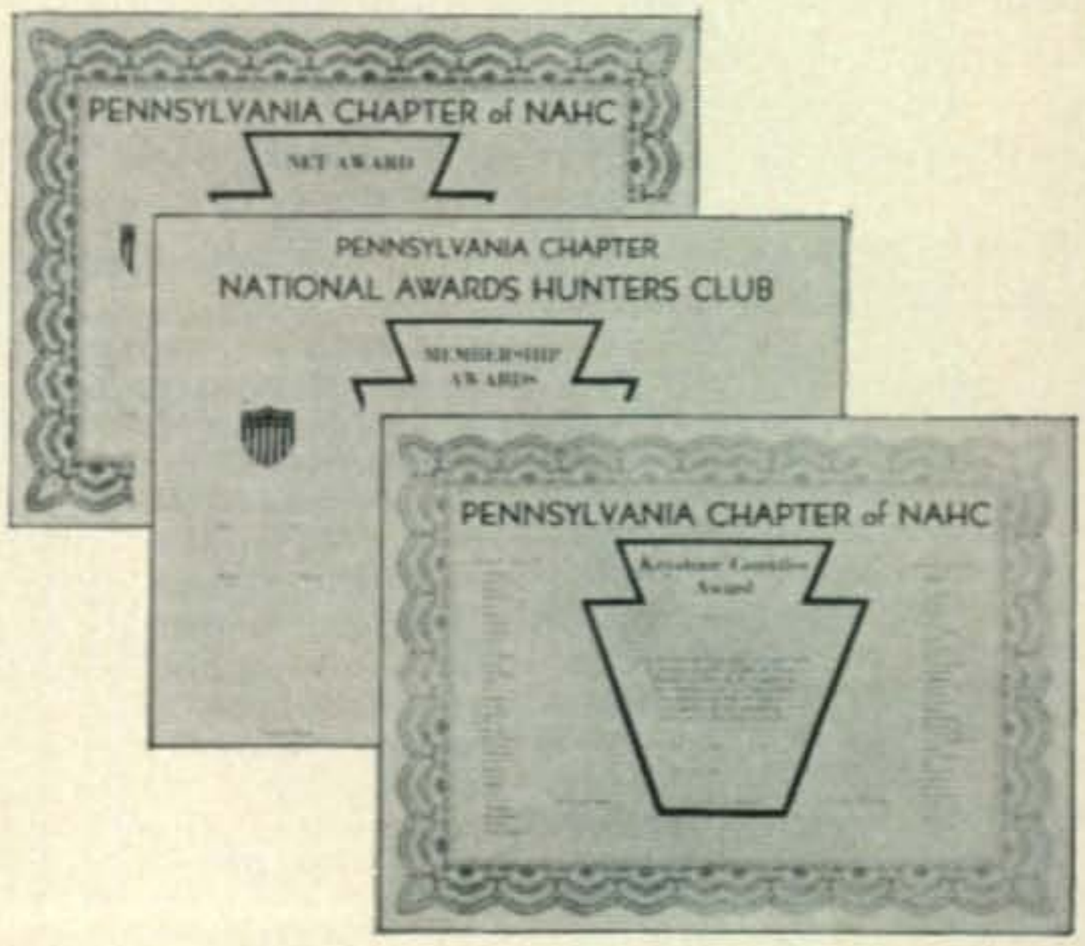
The Pennsylvania Chapter Of The NAHC Awards Program:

The Penna. Chapter of the National Award Hunters Club have started their Awards Program with three nice awards. They are also issuing an interesting newsletter. (For information on this chapter, send s.a.s.e. (please) to Zeno (Ike) Spenkle, K3MPN, 428 Race St., Sunbury, Pennsylvania).

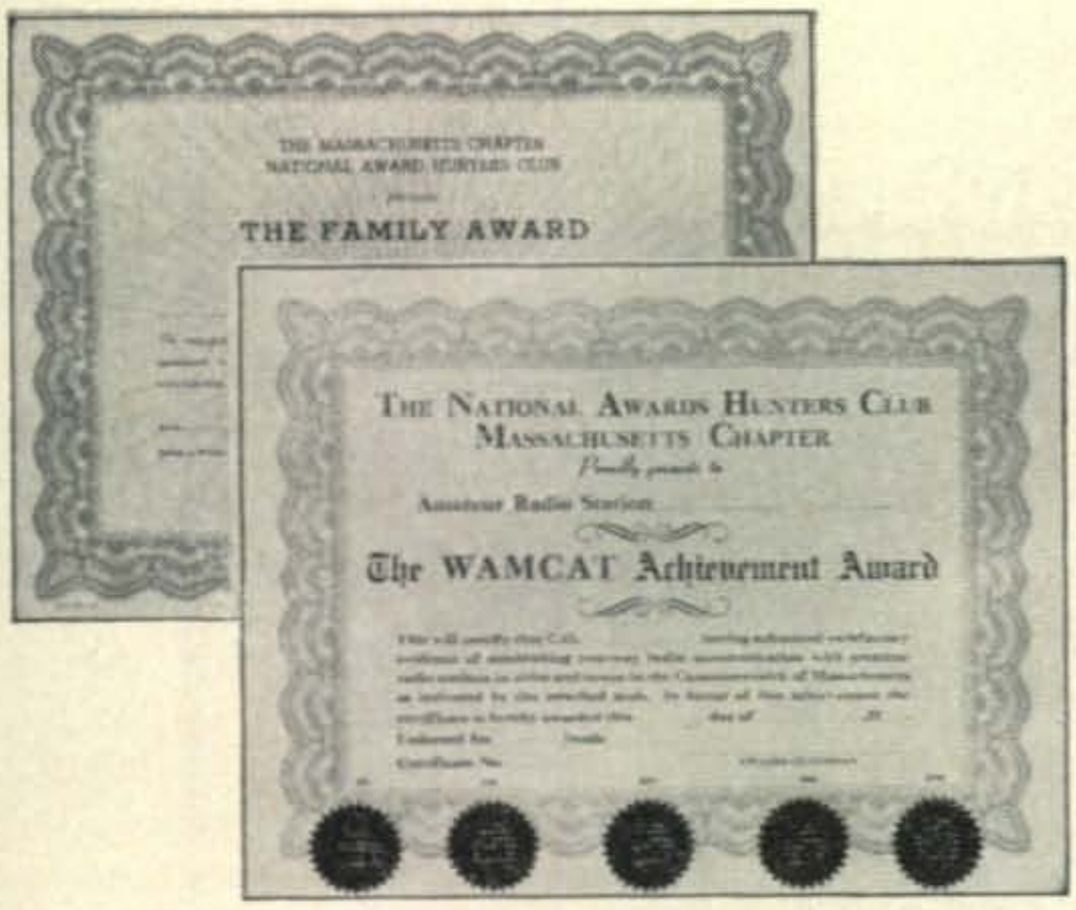
#1. **Net Award:** issued for signing into the NAHC Penna. Chapter Net on Sunday 09:00 A.M. on 50.400 mc. Ten sign-in's for award with seal, twenty-five for second seal, fifty for third seal. List dates of sign-in's on QSL card and send with 25¢ in stamps to W3LXN, Awards Chairman.

#2. **Work NAHC Penna. Chapter Members Award:** issued in three steps, for working ten points—twenty five points—and fifty points. All Charter and Founder members worth two points, all other members worth one point. GCR list and one dollar to W3LXN.

#3. **Keystone Counties Award:** issued in two steps, for working all Eastern Counties or all Western Counties—one seal; and for working all 67 Counties—two seals. AOMB/M all one Mode and Band/or mixed.



Keystone Counties/Worked Members/Net Awards of Penna. Chapter of NAHC.



The WAMCAT Award/The Family Award of Mass. Chapter of NAHC.

The application must be signed by two amateurs who have checked all QSL cards listed on the application, or QSL cards with return postage will be accepted. Send application and Counties list and one dollar to, W3LXN, Awards Chairman, Paul O. Mitch, RFD 2, Milton, Pennsylvania.

The Massachusetts Chapter Of NAHC Awards Program:

The WAMCAT Achievement Award: issued for working the 351 Cities and Towns in Mass. The award is issued in 5 classes with band mode endorsements as follows:

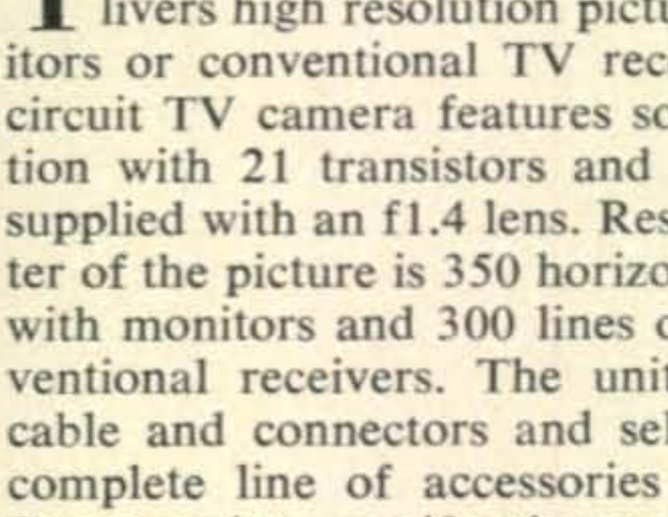
Class D-50 cities/towns in 5 counties.
Class C-100 cities/towns in 8 counties.
Class B-200 cities/towns in 11 counties.
Class A-300 cities/towns in 14 counties.
Class AA-351 cities/towns in 14 counties.

No date or time limit on contacts, but QSLs must be on hand. Portables count but **not** mobiles. Mobile installations with long wire antenna, portable beams or attached to a driven ground rod are considered portable since they can not get underway while transmitting. Submit application with GCR list showing station and date for each town worked, arranged in alphabetical order of towns. It is suggested that form L-1 titled "Cities & Towns of Massachusetts" be used as both check list and GCR list. This can be obtained free of charge from The Sec'y of the Commonwealth, Public Documents Division, State House, Boston, Mass. 02133. Fee for basic class D award is $1.00. Seals for higher class, 10¢. Award will be endorsed for band and mode. If application is made for a second band or mode, fee is 25¢ as a second certificate will be issued, no charge for higher class seals at time of original application.

The Family Award: issued in 3 classes: Class C for 10 pairs; Class B for 20 pairs and Class A for 30 pairs. Issued for working pairs of amateur radio operators of a family any place in the world and they do not have to be members of NAHC. No date or time limit but QSLs must be on hand. Fee for basic award is $1.00. Seals for higher class 10¢. Award will be endorsed for band and mode. If application for a second band or mode is made, fee will be 25¢ as a 2nd certificate will be issued. For each of these Mass. Chapter Awards—send GCR list and fee to Custodian, Steve Rich, WA1DFL, 31 Arlington Ave., Revere, Massachusetts.

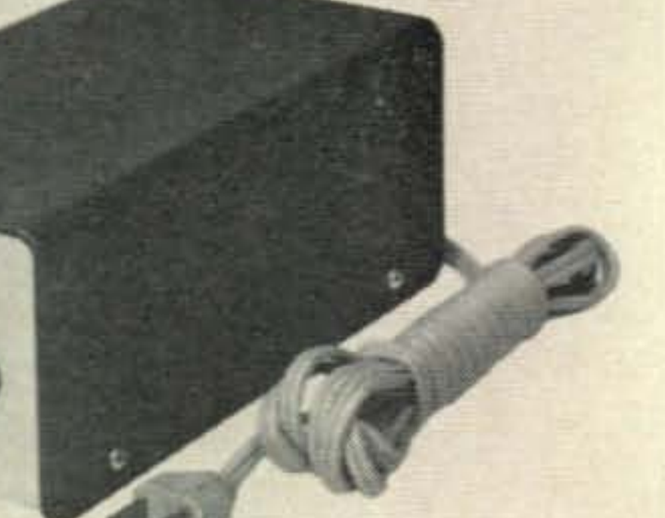
Sorry that space did not permit printing some of the many nice letters received but we love them and will try to get some in next month, so please keep them rolling in. By the time you read this we will be having fine weather in USA and there will be many many more mobiles in operation so keep your ears open on the County Hunter Nets for those new counties. How was your month?

73, Ed., W2GT



Essex County Merit Award.

The San Fernando Valley Radio Club Award.



New Amateur Product

Squires-Sanders TV Camera

THE Squires-Sanders model SS-310 camera delivers high resolution pictures on video monitors or conventional TV receivers. The closed circuit TV camera features solid state construction with 21 transistors and 14 diodes, and is supplied with an f1.4 lens. Resolution at the center of the picture is 350 horizontal lines or better with monitors and 300 lines or better with conventional receivers. The unit is supplied with cable and connectors and sells for $289.95. A complete line of accessories is also available. For complete specifications write to R. Marder, Squires-Sanders, Martinsville Road, Millington, New Jersey, or circle 71 on page 110.

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

An editorial in a professional electronics publication recently pointed out that it wasn't necessary to re-invent the Schmitt trigger every time such a circuit was needed, but the electronics engineer should make more use of other engineers' past efforts because, with a little research of past publications, a significant savings in time and effort can be realized. This also applies very well to the amateur RTTYer who does most of his own development and construction of terminal gear. (By choice as well as by necessity—very little is available over the counter.)

While the RTTYer can find much basic information as well as construction details in the *New RTTY Handbook* ($3.95 postpaid, from *CQ*), he should be able to look up specific information in back issues of not just *CQ* but *RTTY* also. (*RTTY* is the excellent monthly bulletin, almost a magazine, put out by the RTTY Society of Southern California, Inc., and which may be subscribed to for $3.60 per year via W6AEE, 372 Warren Way, Arcadia, California 91006.)

For example, the February '66 issue of *RTTY* contains the complete memo from Frank White W3PYW concerning the distribution of commercial surplus teleprinters from Western Union to MARS, to authorized teleprinter societies and amateur radio clubs, and to individual amateurs. To receive detailed information, send a self-addressed and stamped envelope to: Frank C. White (Co-ordinator—WUSP), 2706 Harmon Road, Silver Spring, Maryland 20902.

The WU 2B Printer

While page printers such as the Teletype Models 15, 26, and 28, are admittedly more desirable, the Teletype Model 14 strip printer and the similar Western Union 2B, the latter now in abundant supply, can serve two useful purposes: 1.) The low-cost strip printer can be a valuable training device. A little less complicated than the page printer, its low cost and availability make it attractive to the newcomer. If this unit can be made to work properly there naturally will be less reluctance to dig into the innards of the more complex and expensive page printer. 2.) The strip printer can serve quite well as a second machine in the RTTY station, permitting monitoring of a v.h.f. autostart channel while the page printer is in use on the h.f. bands.

As we said, the 14 and the 2B are very similar, and many of the parts are interchangeable. The principle difference is that the 14 uses tape ⅜" wide while the 2B uses tape 5/16" wide. Many 2B machines have fractions instead of punctuation marks for upper case on some characters. Some also have the bell but no bell function. No end-of-line indicator is supplied with the 2B, which is a problem; page printers are usually on the other end.

The March '66 issue of *RTTY* contains some very useful comments on the 2B by W8BBB. Of particular interest is the solution to the problem of radiated motor noise when the 2B is equipped with a d.c. motor. Also described is an ingenious electric end-of-line indicator.

One of the minor but vexing problems with the 2B is the 5/16" width tape—it is not too available. Of course you can buy a carton of 60 rolls for $15, as W3PYW notes. A simpler solution is to change the tape feed mechanism to one from a Model 14 strip printer which handles the more common ⅜" tape. (We did this to ours.) Such tape mechanisms, and synchronous a.c. motors, are available at a reasonable price from Felic Esteban W2ZKV, 8424 57th Avenue, Elmhurst 73, New York.

Figure 1 shows a simplified diagram of the electrical connections to the 2B. The terminal block is underneath the base. The 2B is usually supplied with a black cord and/or plug (similar to a PL-55) for the receive circuit to the se-

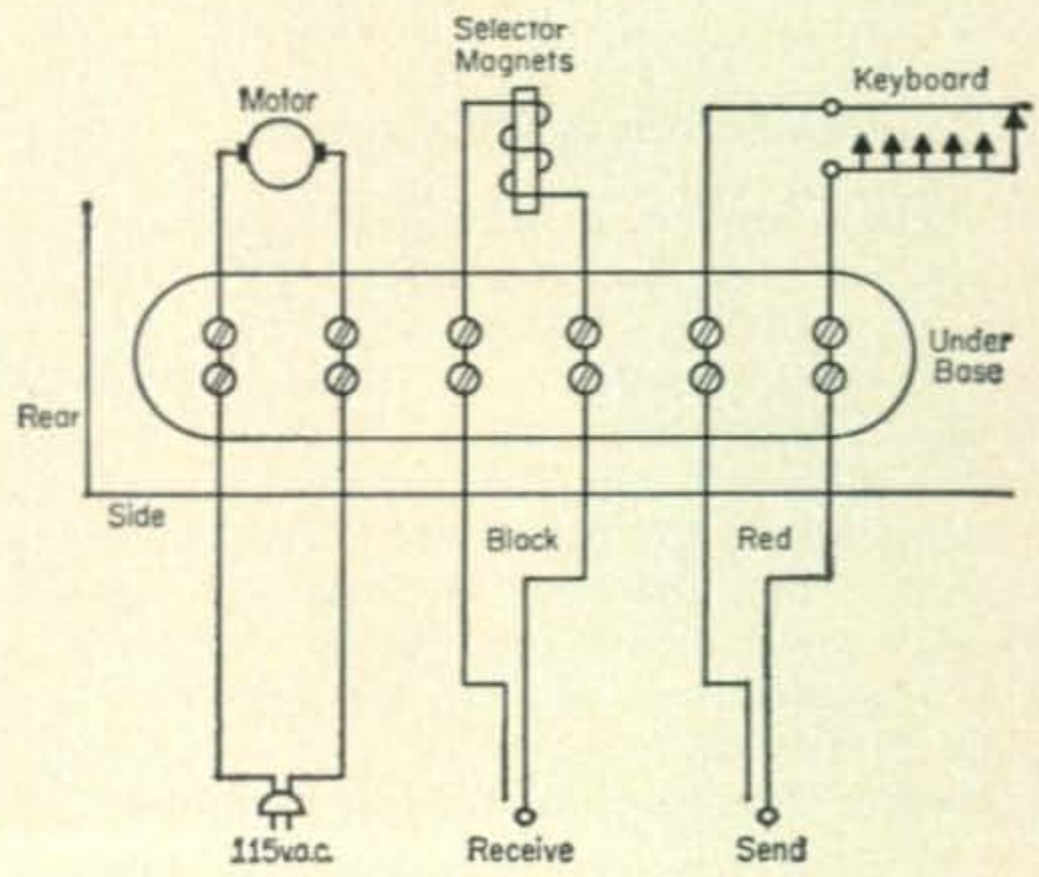


Fig. 1—Simplified diagram of the electrical connections to the Western Union Model 2B Strip Printer.

*431 Woodbury Road, Huntington, N. Y. 11743.

lector magnets, and a red cord and/or plug for the send or keyboard circuit. The motor circuit most likely has the customary black cord and a.c. plug. Note: *There is no fuse in the motor circuit.* It is strongly suggested that the motor circuit be fused. (If you build the autostart system as described in the January, February, and the March 1965 RTTY Columns, fusing is provided.)

The selector magnets may be wired in series for 20 (or 30) ma line current, or in parallel for 60 ma, by means of leads which come out to a 3-terminal barrier strip mounted up near the selector magnet mechanism. Figure 2 shows the arrangements of the leads for either series or parallel connection. The 5.1K-ohm resistor is normally provided. Its purpose is to dampen the back e.m.f. when the magnet circuit is opened.

On the Bauds

K1OYB of Portland, Maine, is building the W2JAV transistorized terminal gear. (RTTY Column, February, March, April, 1962) K1OYJ of Barre, Vermont, uses a Swan 350 into a Warrior at 650 watts, and with an SGC-1A TU and a Model 19, on 80, 20, and 15. K1RGD at the Westover Air Force Base, Mass., uses tape on 80.

W2BVE of Maywood, N. J., handles printers and adjustments. K2DQC of Shirley, L. I., is looking for a Model 14 TD at a reasonable price. W2LNP of Brookville, L. I., uses narrow shift on 80. W2ACE, CAP Communications Officer at Mitchel Field, L. I., has obtained a Northern Radio Model 152 Converter. (*See January 1965 RTTY for conversion to 850 cycle shift.*)

W3WXB of Timonium, Maryland, advises VE7UC/Ø *(March '66 "On the Bauds")* that he is using the AN/FRR-37 which is the dual diversity version of the triple diversity AN/FRR-24. *(Contact W3WXB at 302 Deep Dale Drive, Timonium, Md.)* K3DWQ of Latrobe, Pa., got a WU 2B strip printer but is missing parts in the tape mechanism. *(An anyone nearby help Bob?)* W3ADO, the U. S. Naval Academy Radio Club station at Annapolis, Md., is on 80 with 200 watts.

WA4GHK of Palm Bay, Florida, works 80. W5IFH of Pasadena, Texas, has developed a regime for transmitting math via RTTY using the Fortran computer language.

W6UUS, the Convair (Austronautics) Amateur Radio Club has installed RTTY at the

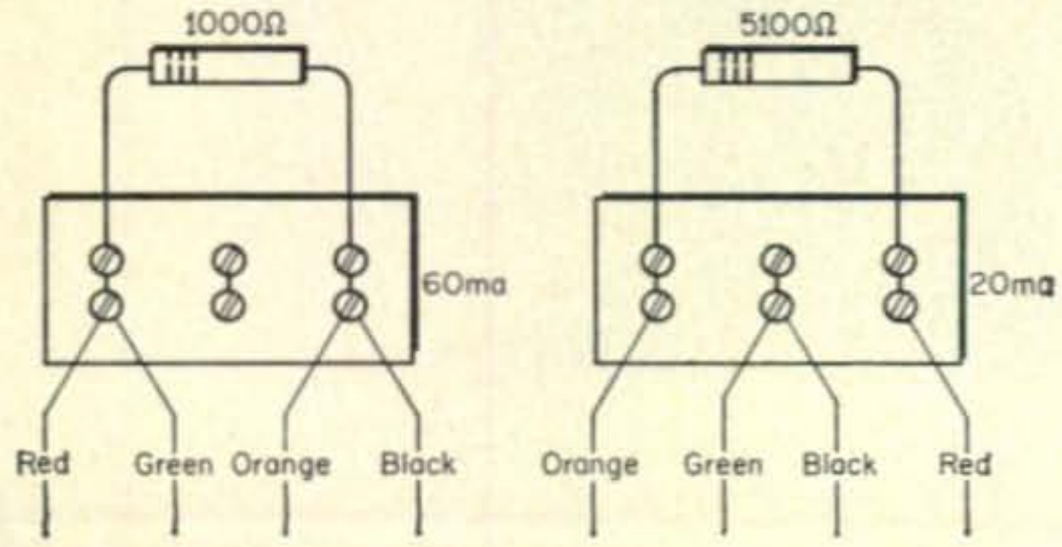
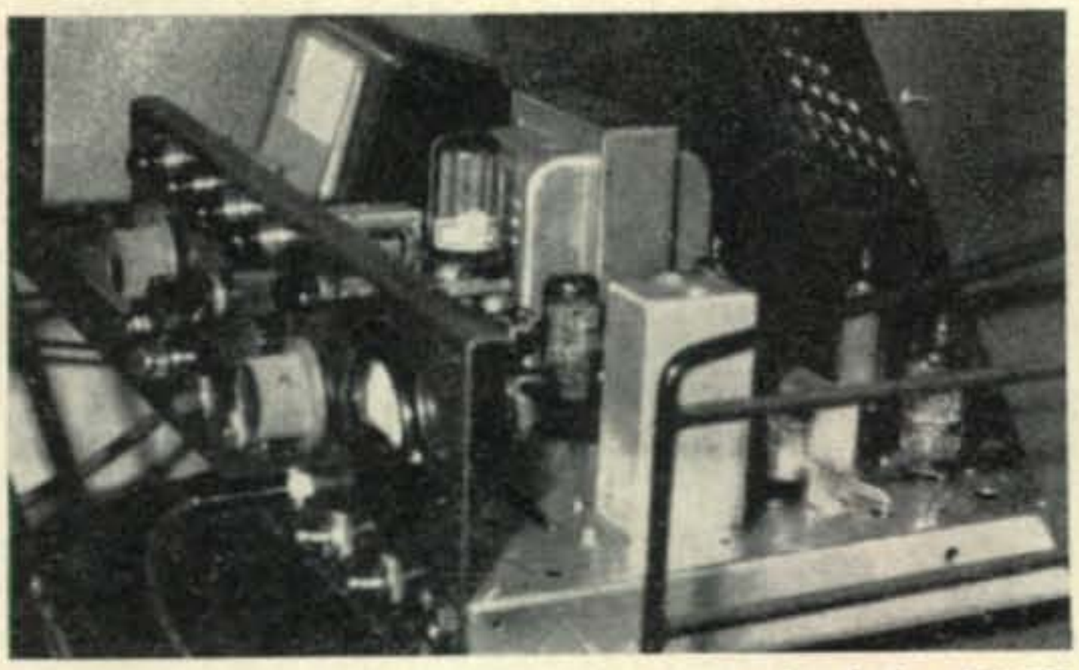


Fig. 2—WU Model 2B selector magnet connections for series and parallel operation.



W2JAV Terminal Unit, Italian-Style, as built by I1LCF from the New RTTY Handbook.

Kearny Mesa location in San Deigo, California. Now in use on 80, 20, and 2, are a Model 15 and a Model 14 TD, with a transistorized TU and a.f.s.k. oscillator. W6SAW of San Carlos, Calif., has a Model 26 that *doesn't* down-shift on space and wants to know how to fix it. *(Maybe W6AEE can help, Herb.)* K7HJO of Scottsdale, Arizona, President of the Arizona Amateur Radio Society advises that their club station will soon be on RTTY. W7ARS of Tucson, Arizona, handles traffic from Antarctica with tape and narrow shift on 20 in spite of "termite" QRM.

K8JYL of Blauchester, Ohio, is building the W2JTP transistorized tuning fork standard. K8CPZ of Rochester, Mich., would like to see an article on getting started on RTTY. K8MAM of Detroit, Mich., is on 80 with a Drake T4X. WA8QVI of Genoa, Ohio, is also on 80.

K9PCQ of Chicago, Ill., is looking for info on the AN/FGC-7A. *(Try Propagation Products Co., Box 242, Jacksonville 1, Florida.)* W9FRU of Decatur, Indiana, strongly objects to the listing of 7040 as the RTTY frequency on 40. *(Bob, the history of this was given in detail in the* RTTY *Column in May 1963.)* W9WKN of Griffith, Indiana, works 80. WØLDO of St. Louis, Mo., is on 80, too. WØNYU of Omaha, Nebraska, sends ARRL bulletins on 80 Monday nights.

KC4USV is on 7127 kc Mondays through Fridays each week to handle traffic on RTTY for the U. S.

W9UE

In the March '66 RTTY Column we mentioned that Ben Woodruf W9UE could tell you where to get those very scarce Kleinschmidt teleprinter parts. It was with great sadness that we learned later that Ben had passed away about 8 months before that item appeared. W9UE was an old-time RTTYer in the Chicago area. He loved both c.w. and RTTY. Some years back he made up cabinet kits for the W9TO electronic keyer. He also was famous for his "Auto-Mate 26" attachment kit to provide automatic carriage return and line feed for the Model 26 machine. Ben provided these kits as a service to hams, not to make money, but because he realized that he had the mechanical facilities that the usual ham lacked.

Ben Woodruf was born in Arkansas, and was buried near his place of birth. We shall miss him.

73, Byron, W2JTP

YL

LOUISA B. SANDO,* W5RZJ

CONGRATULATIONS to these YLs who received certificates of appreciation "in recognition of outstanding service to the U.S. Navy" for their work during "Operation Goodwill" this past winter: K2TXP, Clara Hoffman, and WA2GPT, Beatrice Dietz. Both Clara and Bea worked daily in Operation Goodwill. This is a service originated by "Uncle Dave," W2APF, that provides and airmails without charge recorded tapes from family or friends to men and women in any of the military services and to those serving in any government branch throughout the world. Operation Goodwill is sponsored by the Troy, N.Y. *Times-Union* and the Fort Orange Radio Corp. of Albany as a public service, and this year was manned by nearly 100 volunteers from the Army, Air Force, Navy and Coast Guard, Red Cross and by amateur radio operators.

This year, its 6th, the service was kicked off with a parade on Dec. 1 with all the military branches participating. Following the parade volunteers began accepting messages for holiday distribution by airmail and via ham radio around the world. Messages from families and friends were delivered anywhere—from the South Pole to the North Pole, from submarines to aircraft. Substation offices of Operation Goodwill were opened in Tokyo, the Panama Canal Zone and Paris, and manned full time by ham operators. MARS stations and others helped handle the large number of holiday messages.

In all cases a radiogram was sent to each serviceman or woman advising him or her that a recording from a loved one had been airmailed to the person, and including Season's Greetings, and signed "Operation Goodwill."

K2TXP in Troy was the initial recipient of each message. Clara then relayed them to WA2GPT, Bea. This year both Clara and Bea sorted the radiograms for various directions—APOs, bases in areas such as Okinawa, Alaska, Hawaii and Germany. WA2GPT then relayed them by the most direct means—APO San Francisco and Far East directly to California; Guantanamo and states directly to them, etc.

Radiograms to military QTHs are not easy. Name, serial number and military designations, etc. are often longer than the message itself and each must be carefully repeated phonetically as one wrong digit and the chap would never receive the radiogram. Run a few hundred of these daily for three and four weeks and it's work!

When Operation Goodwill closed its 1965 season at 5 P.M. Christmas Eve, it had sent out 6,489 messages and handled 3,264 addresses for Pen Pals in Viet Nam, for a total of 9,753 communications via mail, tape and amateur radio. (The Pen Pal program got under way in mid-December and it was anticipated some 22,000 letters would be flowing between Troy area residents taking part in the program and servicemen in Viet Nam.)

As stated by "Uncle Dave," chairman of Operation Goodwill, and owner of Fort Orange Radio Corp., the purpose of the service is "good will" and to bring home a little closer to American servicemen who spend their year-end holidays away from home, family and friends, and to let the GIs in Viet Nam know the full support the folks at home have for their efforts.

Our thanks to Clara, Bea and to Camille, WB2PYI (ex-W3TSC), for furnishing the information on this fine public service work—"Operation Goodwill."

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Jim Hoffman, W2JEB (left), and Clara, K2TXP (calls in photo should be reversed) are active in the Eye-Bank Net, in Civil Defense, emergency work and traffic handling. Clara also received a certificate for her daily work in Operation Goodwill (see text).

Goldie Hoover, K9AXS, receives athe 100th WAS/YL certificate awarded byy YLRL from her OM, W9VEY, who is secretary of the Montgomery County Radio Club. Goldie is custodian of the Prairie State Mother-Daughter Award. Photo courtesy W9GME.

Martha Edwards, W6QYL (left), YLRL president for 1965, received from Gladys Eastman, W6DXI, YLRL president in 1960, a scroll of appreciation from YLRL. The scroll was executed by W2JZX, Vi, and was presented to Martha at the 1966 YL-OM Valentine Dinner of the Los Angeles YLRC. (Photo by W6CEE, Vada.)

K2TXP

Operation Goodwill is only a part of Clara's, K2TXP, public service work. Both Clara and her OM Jim, W2JEB, belong to the Eye-Bank Net and check into this daily (nearest eye bank is in Schenectady). According to an article in *The Sidewinder* (Odessa, Tex.), (courtesy W5ZPD) there have been over 1000 human eyes shipped from one part of the country to another for corneal transplants through efforts of the Eye-Bank Net since this network was established in December, 1962. Clara mentions two other YLs on the East Coast who are active in the Eye-Bank Net: WA2JEE, Ruth, at Cedar Cove, N. J., and WA3ATQ, Harriet, at Philadelphia.

The Hoffmans handle a lot of traffic all year round, especially from military bases. They also are active in the Civil Defense Net, the Red Cross Communications System, and are johnny-on-the-spot during ice storms or other emergencies.

Jim became seriously interested in radio during WW II when he attended radio and radar school. Clara became interested when Jim went to work at Behr-Manning on the 3rd shift, worked most of the night and slept most of the day, so she started playing around with his gear and soon was studying for her license. The Hoffmans have two boys, 17-year old Jim, Jr. and 11-year old Joe, the younger of whom is very interested in radio.

WAS/YL

It is interesting to note that one of the harder to obtain awards is still WAS/YL. No. 1 was awarded to W2QHH in Oct. 1949. Now, nearly 17 years later, only 103 additional WAS/YL certificates have been issued. Grace Ryden, W9GME, custodian of the award for the last ten years, brings us up to date on the requirements: Contact with a licensed YL in each of the 50 States. Hawaii and Alaska QSL cards must be dated after Aug. 21, 1959. District of Columbia may be substituted for Maryland. Send the 50 QSLs and list, alphabetical by states, showing date, call, band and emission, to W9GME at 2054 N. Lincoln Ave., Chicago, Ill. 60614. Include sufficient postage for return of QSLs via first class mail.

Prairie State Mother-Daughter Award

The Montgomery County (Ill.) AREC is sponsoring an award for working four mother-daughter ham teams in three states. Each member of the team does not have to be in the same state, just so three states are involved in the 8 contacts. DX stations may qualify with 3 teams (6 contacts) in 2 states. Send a list of log data, showing all contacts, signed by an officer of your radio club or two other licensed amateurs to verify the information, together with $1, to Goldie Hoover, K9AXS, 401 East Wood St., Hillsboro, Ill.

Martha and Noel Edwards, W6QYL-W6RDQ, with their two jr. ops, have gone to Washington, D.C. where they will be for a time before going overseas on a foreign assignment. Nothing definite yet as to where it will be, but they are hoping to get on the air as DX again.

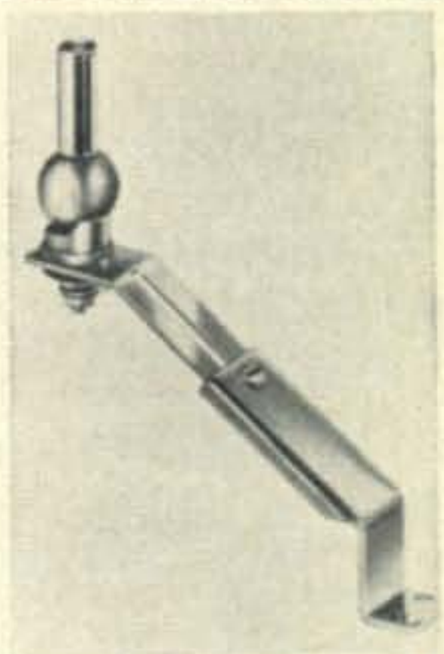
With the Clubs

Current officers of the New York City YLRL: Pres., W2OWL, Ruth; V.P., K2IGA, Ruth; secy, ex-W2PZA, Jean; treas., W2EEO, Madeline.

Effective April 1 these YLs took office for the Loaded Clothes Line YL Net: Pres., W7GGV, Helen; V.P., KØEPE, Marte; secy, K7WVT, Phyllis; treas., WØWZN, Annabelle; P/C, KØGAS, Connie.

33, Louisa, W5RZJ

New Amateur Products

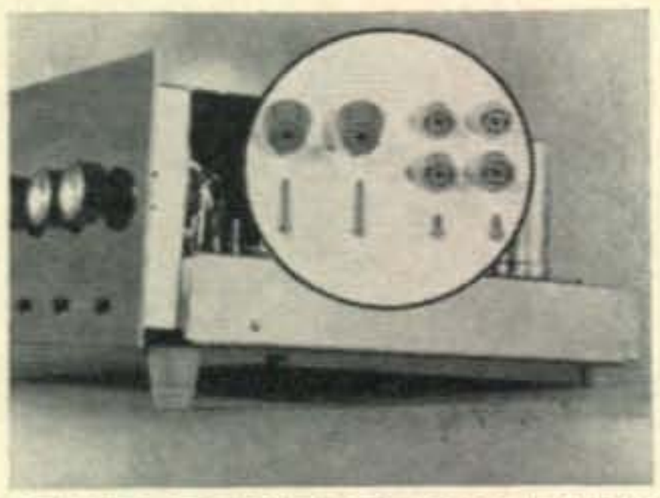


New-Tronics

NEW-TRONICS announces the TGM-1 trunk groove antenna mount. It is fully adjustable. The mount sells for $3.95. For full information, write to James Taylor, New-Tronics Corp., 3455 Vega Ave., Cleveland, Ohio 44113, or circle 65 on page 110.

Budwig Cabinet Mtg. Feet

BUDWIG MFG. CO., P.O. Box 97, Ramona, Calif., now sells a set of packaged cabinet mounting feet. The set sells for $.89. For more details either write direct, or circle 66 on page 110.



SURPLUS sidelights

BY GORDON ELIOT WHITE*

ONE of the most popular receivers among amateurs over the years has been the Hammarlund Super Pro, a rugged design that was widely used by the Signal Corps during WWII and the Korean War, and even today is seen occasionally in military service. Thousands of Super Pros have been sold as both commercial models and through surplus over the last twenty years, and it is a rare amateur who has not owned one at one time or another.

The supply of this old friend is dwindling now, but they can still be found in most electronic surplus outlets. Columbia Electronics, 4365 West Pico Blvd., Los Angeles, has advertised them recently in the $90.00 to $100.00 range. I have seen them in New York, Boston, and Washington in recent months from $40.00 to $90.00.

In a higher price range is the much newer SP-600-JX which is beginning to appear again. Jack Silverman of Gadgeteers Surplus Electronics, 5300 Vine Street, Cincinnati, Ohio, has a good supply on hand at about $350.00.

Other dealers carrying the SP-600 include Rex Radio, 759 10th Avenue, New York 10019; Selectronics Inc., S. Napa Street, Philadelphia, and Columbia.

There were six different models of the Super Pro, as far as I can discover, with the differences almost entirely in their frequency coverage. The military used four different sets which are most commonly found now. Depending upon model, these covered from 100 kc to 40 mc.

Military nomenclature	Civilian model	Frequency coverage
BC-779-A	SP-210-LX	100-400 kc, 2.5-20 mc
BC-779-B	SP-200-LX	100-400 kc, 2.5-20 mc
BC-794-A	SP-210-SX	1250 kc-40 mc
BC-794-B	SP-200-SX	1250 kc-40 mc
BC-1004-B	SP-210-X	540 kc-20 mc
BC-1004-C, D	SP-200-X	540 kc-20 mc
R-129/U	none	300 kc-10 mc

The variations between A, B, C and D models were generally inconsequential, with changes chiefly in the internal construction of parts such as coils and transformers. The BC-1004-D did not contain the S-meter common to the other versions.

Three different power supplies were built to provide filament, bias and B+ voltages. Of these the RA-74 could be operated from any a.c. line providing between 90 and 260 volts at anywhere from 25 to 60 cycles. Changes were made by shifting taps on the input side of the transformer.

The RA-84 runs from a 105-125 volt 60 cycle line and the RA-94 is designed to be used on either 115 or 230 volts, 60 cycles.

A fabricated cable is usually supplied with which to connect the receiver and power supply, but in some cases the cable is missing, or no power supply can be found. The drawing below indicates the proper power connections to the receiver:

In building a power supply for the Super Pro you can vary these inputs to some degree, particularly the + 385 volt d.c. and + 270 volt d.c. points. I have found that the receiver works very well with these two lines tied together and fed with 250 volts B+. The lower voltage degrades the audio power to a degree, but only where a great deal of speaker volume is required.

You have to provide the negative d.c. bias however, within 10 or 15 volts for proper operation. The + 140 volt input is the screen voltage, and should be near that value, although it may be lowered somewhat with reduced B+.

The Super Pro may be operated from batteries, using a 6 volt storage battery for the filaments, a 45 volt dry cell for the bias line, and five 45 volt cells for the B+, which in this case would be 225 volts. The d.c. voltage to pin 5 would be taken from the same 225 volt point and the screen voltage to pin 4 would be + 90 d.c. taken from the plus side of the two cells nearest ground.

If you want to provide voltage regulation, it should be in the supply to pin 5 (nominal 270 volts) as that circuit is the oscillator plate line.

A Super Pro in fair shape can be a very solid receiver. It has good bandspread (set to 100 for accurate calibration on the main dial) and fair stability. If you set the receiver on a solid bench and keep the room temperature relatively constant, drift will be reasonable. Probably this slight stability problem is the worst feature of the Super Pro, but it can be licked, particularly with regulation of the h.f. oscillator line.

I have found that the stability of the b.f.o. was much worse than the h.f. oscillator in Super Pro's I have had, partly because the wiring in many sets was pulled loose in order to apply anti-fungus varnish and never put back into place, thus it wanders around pretty freely. I suggest you try to clean up the b.f.o. as a first step, particularly for c.w. or RTTY work.

The i.f. in all military Super Pros was 465 kc, a slightly bastard frequency for use with pan-adaptors, i.f. type RTTY converters, etc., but

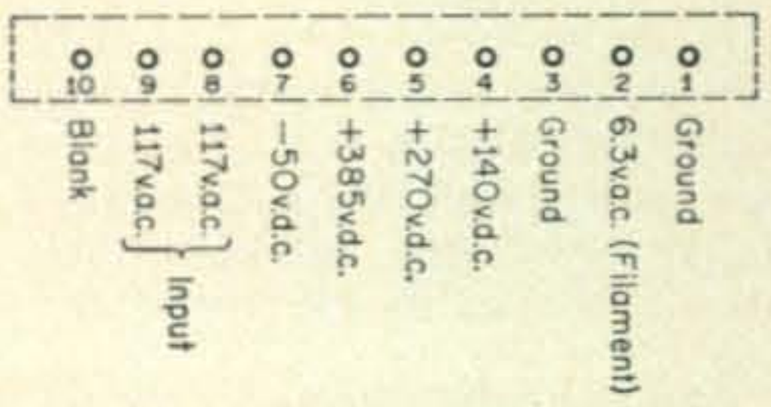


Fig. 1—Rear terminal set-up for the Super Pro receiver.

*5716 North King's Highway, Alexandria, Virginia 22303.

you can usually realign the accessory by 10 kc. Don't try to shift the receiver; the crystal filter is set at 465 kc and there it must stay!

Incidentally, in aligning the i.f. be careful of the trimmers—Several of them are hot. I have gotten my quota of B+ jolts from carelessness with trim adjustments on these sets.

Be cautious about the main tuning drive, as it can be broken loose by tuning too far. Parts are of course impossible to find, and replacing the dial hub is a tedious job if you have to machine the new one yourself. Take care with heat around the plastic dials, as they warp easily.

You might want to lubricate the various drives in the front panel, as they have quite a bit of friction, but don't over-oil the set as too much lubricant collects dust which causes other troubles.

In addition to its own nomenclature, the Super Pro was used in the SCR-244-A and -B, the SCR-704 and the AN/FRR-4 sets.

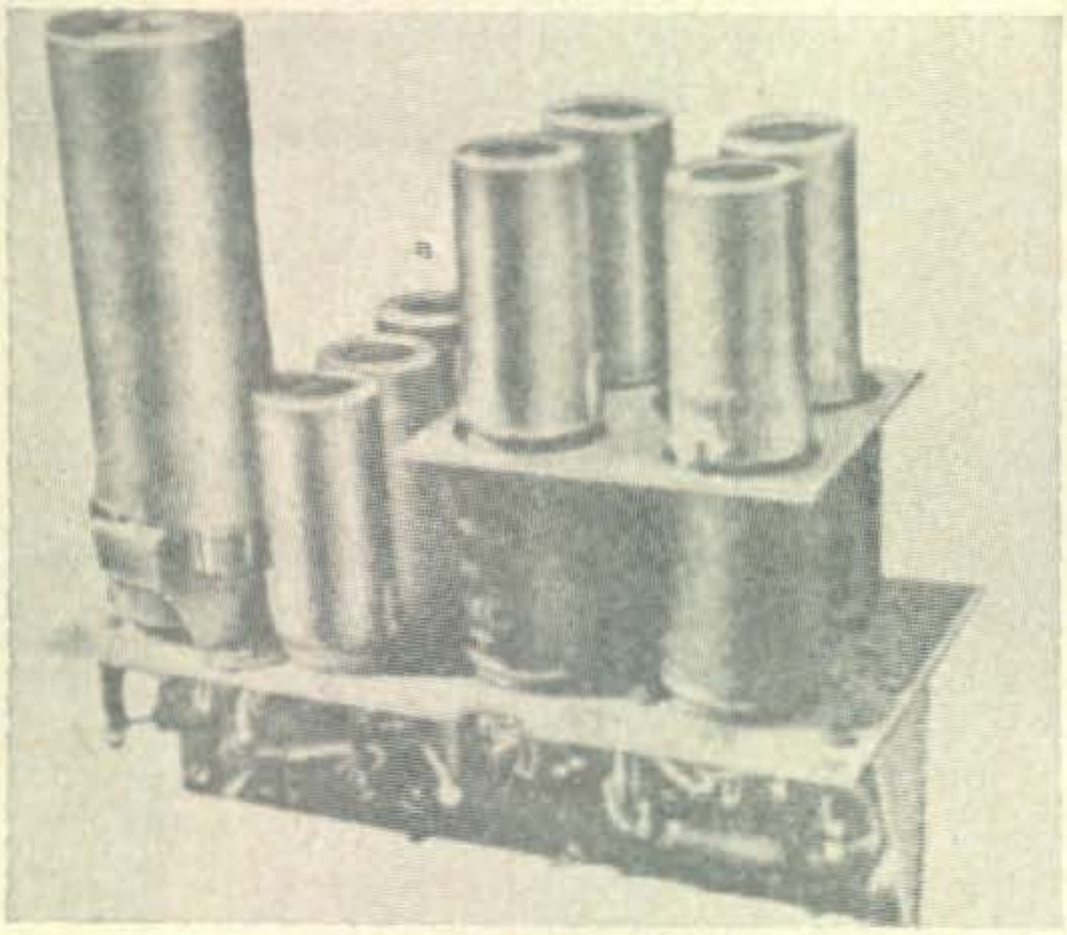
The book on the military versions is TM 11-866.

I may have made the Super Pro sound bad, but it is really a fine, relatively inexpensive receiver. Most of the problems I have mentioned are due to age, and in a well-treated set they will not be found.

The SP-600 is a much more modern receiver, built in the 1950's, for commercial and military use. It has better stability and selectivity, and if in decent condition is one of the classic general coverage receivers ever built. It covers 500 kc to 54 mc. (There is a very-low-frequency version but it is relatively rare.)

Tuning Forks

One nice item to have around the shack or lab is a really stable, accurate, audio source. Few of the kit-type audio generators meet those specifications, particularly when you are trying to build or test narrow filters such as might be used in an RTTY converter. I have found the re-set accuracy of even some pretty fair military



This tuning-fork unit in a sealed can can be used to provide 400 or 1000 cycle tones, or altered for other precise frequencies in the audio range.

units to be less than reliable, and it is certainly a bother to have to calibrate your audio source with WWV again and again.

For many years electronically-driven tuning forks have been one of the best types of audio generators. General Radio built some fine model 723 forks for years. Temperature-compensated, they vary by only a fraction of a cycle in normal room conditions, but they do cost a good deal, often well over a hundred dollars.

I found a pair of G.R. 723's in a junk yard years ago for next to nothing, and have used them very happily ever since, but that was a rare find.

The R. E. Goodheart Company, Box 1220, Beverly Hills, California, has now sent me a sample of a very nice little fork that will equal the larger General Radio unit at a fraction of even the usual surplus cost.

These are hermetically sealed assemblies that were apparently used in aircraft instruments. At a location which doesn't change its altitude the sealed feature is hardly necessary. They are temperature-compensated.

Goodheart lists forks tuned to 400, and 1,000 cycles. Calibration, in aircraft use, is said to be accurate to .02% over a wide temperature range. Used in normal conditions the stability would be much better.

The charm of these tuning forks is their adaptability to different frequencies. Goodheart will supply circuit information on binary counters that will count down to subharmonics of the fork frequency, or you could buy Walkirt plug-in dividers from Goodheart that will count down to one cycle a year. For small reductions in frequency it is possible to add solder to the fork tips, or to wrap the tips with wire weights.

I shifted the frequency of one of Goodheart's 400 cycle forks up to 425 cycles for RTTY work (mark and space tones are multiples of 425 cycles) by drilling the fork tines with a hand drill. It is possible to file metal off the tips, but you can usually be more accurate in removing the same amount of metal from both sides if you use a drill. If you unbalance the fork too badly it will not oscillate.

If you do have trouble with the fork failing to start after you have altered it, try tapping it. This will give you enough oscillation to allow you to re-balance the fork by removing metal from the heavy side or by adding solder to the light side.

If you want to lower the frequency without using solder or wire weights, try filing out a small amount of metal from the center of the fork. Be careful—you can't put it back!

Finally, I want to suggest another surplus goodie for the RTTY gang. Western Union is removing several hundred switching consoles from service around the country. These units, installed for the Government, each contained four #14 typing reperforators, four transmitter-distributors, and four tape winders plus other

assorted relays, blowers, etc. Few of these are getting into amateur hands because Western Union wants to get rid of the entire installation, not just the innards, so most of them are going to scrap yards.

The reperf and TD units are geared for 65 words per minute, so would have to be adjusted down to 60 w.p.m. for amateur use anyway, but the tape winders are very nice items. They fit into slide-out bases and are equipped with standard two-prong a.c. plugs and cords. They accept ordinary 11/16 inch perforator tape, and have microswitch contacts to stop the motor on tight-tape.

They would be just the ticket to handle the pile of tape most RTTY'ers collect in a couple of hours of operating. Both Western Union and the Bell Systems use tape storage reels which can hold the tape after it is wound. Western Electric and A.T. & T. frown upon their scrap being scrounged—they want it sold as scrap, period. Western Union however seems to have no interest once it is sold, so it might be possible to ask them where they sell their scrap in your locality, then do a little looking in the junk yard. You might even find the Phone Company's dumping ground as well.

I have seen these tape winders listed by two dealers. On the West Coast Elliott Buchanan, 1067 Mandana Blvd., Oakland, California, carries them, and in the East, Sasco Electronics, 1009 King Street, Alexandria, Virginia, has them. ■

Portable Antennas [*from page 74*]

Generally speaking, the greater the antenna length and height the greater the efficiency. Also, the less *L* and *C* used in the tuner the higher the efficiency. In general the *L* input will give the best loading but some frequencies may require a *C* input.

Results

You will notice an absence glowing 40 over S9 reports because these antennas represent the minimum as far as performance goes. This system has been used under varying conditions for well over a year now and has performed well.

For example I operated the whip inside my kitchen for several hours during a hurricane and was able to maintain contact with a county CD net on 75 meters. Another time, during a hurricane this past year, the long wire was used from the Air Station at Glynco, Ga., to maintain contact with the Georgia CD net and with 6th ND

MARS net for a couple of days. The wire was about ten feet off the rain soaked ground. Just recently I operated from the Naval Hospital in Jacksonville, Fla. and was able to meet state traffic nets.

I believe that if you try this system on several bands you will find that the advantages do outweigh the disadvantages. Particularly the ability to grab up a small package and go anywhere and set up a station at any time. See you portable 3 layers under the big signals from most anywhere. ■

Hinged Tower Base [*from page 69*]

crete. With the bolts in place and everything together, trim the concrete surface until the plate is perfectly horizontal.

Tower Raising

The tower base is mounted to the hinge, as shown in the photos, and the entire tower is assembled on the ground. (Because of a yard full of trees, the beam was not attached until the tower was raised, but this can be done if room is available.) Rotator cable and transmission line is installed, and guy wires are attached. Guy anchors are placed in the ground, at three points about 120 degrees apart.

If a block and tackle is to be used, the tie point should be directly in line with the tower, to avoid undue strain on the hinge. Four or five willing assistants should be on hand. Two men on the block and tackle, and two or three walking up the tower from underneath is ideal. The type of block and tackle that has a locking brake is much preferred.

When the tower is at a 45 degree angle, two men from underneath should be transferred to the side guy wires, to keep the tower from swinging to the sides. Extremely light pressure should be used on the guys, as the hinge and the block and tackle will keep the tower very nicely in line. When the tower is nearly upright, the rear guy wire is loosely attached to its anchor to control the tower and keep it from swinging too far. All guys are then permanently attached, and the hinge plate is securely bolted down.

If a place to tie a block and tackle is not available, a couple of additional strong backs under the tower will suffice. Once the tower is partially raised, a few men on each of the side guys can pull it the rest of the way up.

The writer used two sets of guys on a 60 foot steel tower, supporting a full size three-element 20 meter beam. The installation has withstood severe wind and ice conditions, and shows distinct signs of being around for quite a while longer. ■

Rtty A-Z [*from page 67*]

one revolution, which causes the printing of that character or the operation of that function.

Any character or function may be selected while the printing of the previous selection is taking place.

The operations of the selector unit, locking

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See Page 103 May issue for ANTENNA Roundup II.

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cam and locking lever and mainshaft clutch throw-out lever should be thoroughly studied by the reader. These operations should be followed by viewing the parts in the associated figures, visualizing each operation. Continued reference to the sequence chart (fig. 139) should also be made while making these observations.

This month's installment should have left little doubt in the readers mind the important role the selector mechanism plays in the operation of a teletypewriter. Associated with the selector mechanism are related mechanisms that complete the story on the operation of the teletypewriter. It was only possible to touch on a few of these related mechanisms in this part. Some of these related mechanisms are: Type Bar Carriage Printing Mechanism; Locking Function Lever; Spacing and Function Bail. These and other functions will be covered in next month's installment.

[To be continued]

DX [*from page 77*]

ex-SVØWF	(Rhodes) via W2PCJ
VP8HD	via G3PEK
VP8HO	via K6GMA
VP8HJ	via W2CTN
VQ8TC	via W4IBD
WA4QKY/KG6I	via K6UJW
WB6LZP/MM	via WA5ENK
XV5AA	via W4UWC
XW8AX	via W6KTE
XW8AZ	via W6KTE
XW8BD	via K1BFX
XW8BM	via K8DBP
YA1KC	via W9YFS
ZD7IP	via K2HVN
ZD8CR	via K3FLS
ZD8RD	via WØMLY
ZF1RD	via K8LSG
ZF1XX	via VE2BR
1M4A	via W4ECI
5W1AX	via KS6BT
ex-5X5IU	R. Roberts, Berlin 42, Tempelhoferdamm 88, W. Germany
7Q7BN	Box 51, Blantyre, Malawi
9L1TL	via G3USF
9M6AP	via G3TXE
9M6NQ	Box 399, Jesselton, North Borneo
9U5DP	via W2SNM

Ham Clinic [*from page 86*]

am only thinking about 1000 watts or so. What is your current recommendation for a tube for the purpose I have in mind? I am only interested in s.s.b. operation, AB_1."

I would recommend the Eimac 5CX1500A. It is a pentode and provides unusual linearity for s.s.b. operation. The p.e.p. output for this tube with a d.c. plate voltage of 4000 volts, 500 volts on the screen, is around 1785 watts. The third order products are a —35 db at the indicated power. It would be pretty hard to do better. Good luck.

Thirty

Summertime is visiting time and we hope that we shall see some of you in our travels. We love to contact fellow hams no matter where we are. Again we thank all of you who have written to us and have let us know that you like the column —a little encouragement goes a long way. For this month then, 73 and 75, Chuck, W6QLV.

Phone Results [*from page 51*]

conditions FB and the electrical storm didn't start until 10 minutes after the contest ended."

Some of the boys are finding the full 48 hour period a bit gruelling and have gone to single band operation. Quote CX3BH, "It becomes a matter of human resistance as well as operating skill." But he hopes we never tire of log checking. That also gets a bit frustrating Horacio, especially those logs with unchecked duplicates, errors in their contact and country/zone credits and no summary sheet with the required information. Sorry to say some had to be disqualified.

While some found it tiring, HR2GK finds contest operating relaxing after putting in a 16 hour day as Director of Communications. When do you sleep, Gus?

Contest operating is probably best described by Wing. Comm. W. D. Reed, VS9AWR in his first contest. "A most stimulating week-end. Interesting, tiring, stimulating, tiring. Seldom in the field of human conflict has so much talking been done by so many to so few."

It was good to hear the YL's, pretty Marlu, XE1HHH a winner this year. Monique of the FG7XL team; all the gang on 20 went QRX so that she could raise a KL7 for a new multiplier. Molly, ZE1JE who keeps improving her score and just missed the Top Ten this year. Carola, a member of the famous OH5SM team. Alicia KP4CL, Lily 9Q5YL, Paula EA2CQ, Susi DJ2YL, Eva DJ3YL and many more.

We reconsidered our ruling of dividing Australia into Zones for award purposes. With practically all the active stations located in Zone 30 it did not seem a fair allocation. Therefore we went back to awards by call areas. We hope the boys down-under will show their approval by creating more activity.

However we still feel that the awards by Zones for Canada should be retained since the activity does not justify awards by districts.

Its always nice to receive an award but JA1JAN expressed it best. Kunito said, "I think the important thing with contest games is not winning, but taking part."

You will note that Stu Meyer W2GHK, is now a Trophy donor. We thank Barry Briskman, for his support the past years but K2IEG has given up any active participation.

It was a big one this year, 908 logs from 109 different countries were received, a 22 per cent increase over the last one. The tremendous activity, however, warranted an even greater return.

We are issuing over 300 certificates, but there are areas, even in the United States, that have not taken advantage of the many available awards.

The boys are still busy finishing up the last of the C.W. section. This year's Committee, Andy Bodony, WB2CKS, Fred Capossela, W2IWC, Ben Lazarus, W2JB, Andy Malashuk, W1GYE and yours truly. Maybe you can thank the boys when you work them on the air.

73, for now, Frank W1WY

Connectors [*from page 43*]

questions:

1. Are your rigs protected with adequately-rated connectors?
2. Are you using connectors, designed to carry audio, for r.f. purposes?
3. Can the connectors on your cables stand common abuses such as being stepped on or being assembled under Field Day conditions, without damage or shorting?
4. Can the connectors on your rigs and cables stand normal unmating and mating abuse?
5. Are you hedging on the use of a weather-proof connector at the risk of a blown final at worst, or high s.w.r. at best?
6. Have you hesitated spending an extra dollar or two for proper connectors to protect a kilo-dollar rig?

If the answers to any of these questions indicate any doubt, it's common sense to install connectors with ratings documented for your particular application.

D.C. to D.C. Converters [*from page 72*]

Obviously the only variable on the right side of the equation for a completed transformer is E. Referring back to the explanation of circuit operation you will note that all input voltage in excess of 11 volts will be dropped across the switching transistors. This means that the *effective* input voltage to the transformer will be 11 volts even though the input battery voltage may exceed this. Therefore, the frequency of oscillation will remain essentially constant for any input voltage of 11 volts or more. This is a simple and inexpensive method of obtaining frequency stability when this feature is desirable.

Figure 3 shows how the output voltages change with input voltage for both no load and full load conditions. The no load condition does not mean that the output current is zero. The output has a bleeder current equal to about 10% of the normal full load. This is necessary for the proper operation of the regulator. If it is necessary to have a condition where the load is completely removed during normal operation a fixed bleeder equal to 10% of full load should be added.

You will note that the no load curve is about the same distance above the full load curve at all points. This difference in no load and full load output voltages is due to voltage drop across the d.c. resistance of the secondary circuit. Since the voltage drop across the diodes is essentially constant the change here is due to the d.c. resistance of $W4$, L_1, and L_2. This emphasizes the importance of minimizing the resistance in the circuit between any regulator and its load. ■

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SELLING Swan 400 with model 420 V.F.O. and model 117-C power supply. One year old. Perfect shape. $400.00 Deliver free within 100 miles. Leonard R. Wilmot, 6905 Flint Avenue, Lubbock, Texas 79413

COLLINS KW-1 Deluxe 1000 watt phone/cw transmitter $1200.00. Cost $3850.00. Want Collins 312B-4 or 312-B-5 station control. George Norton W4EEE, Georgia University Station, Athens, Georgia 30601.

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Please remember that our closing date is the 10th of the 2nd preceding month, and remittance must accompany all ads.

For further information, check number 45, on page 110

For further information, check number 48, on page 110

Expandable Linear [*from page 30*]

However, just because the amplifier works properly in the c.w. mode, is no indication that it is really "linear." A multiple tone test, such as the simple two-tone test, is the only safe way to check an amplifier. One approach is to start with the microphone gain on the exciter as low as possible and checking with a local amateur who has a panoramic adapter on his receiver and knows how to use it. Advance the microphone gain in small increments until splattering is just indicated. Then back down on the gain to leave a safety margin.

Another useful indication in the c.w. mode is to load the amplifier fully and then decrease the drive while noting that the plate and grid currents both drop off at the same rate until standby plate current level is reached.

With exciters in the 50 to 100 watt output class, the above procedures usually work without difficulty. With exciters of greater output, an attenuating pad may be necessary between the exciter and the amplifier in order that the exciter output circuit can be properly resonated without overdriving the amplifier[1]. A simpler and cheaper solution, which should be investigated first, is to reduce the screen or plate voltage on the exciter output or driver stage in order to reduce the output to the desired level.

Conclusion

Perhaps a little more effort is required to construct an amplifier of this sort. However, if any one component changes in the near future which will allow linears with better efficiency or cleaner operation, it is likely to be improved tubes. At least with this linear it should be possible to try them with a minimum of rebuilding. ■

[1]Glanzer, K., "T Pads for R.F. Circuits," *CQ*, July 1964, p. 31.

Space [*from page 88*]

case of the Russian Cosmos satellites, of a series of dots and dashes of different length.

Inclination and period data are included in the listing as a further aid in identifying satellites from which signals can be received. The inclination is the angle that the satellite's orbit makes with the equator. If a directional antenna is being used to receive satellite signals, the inclination data can be used for determining the direction from which the satellite's signal should be heard first. The satellite's period is the time it takes, in minutes, for the satellite to complete an orbit. By timing reception on successive orbits, it is often possible to identify the satellite.

73, George, W3ASK

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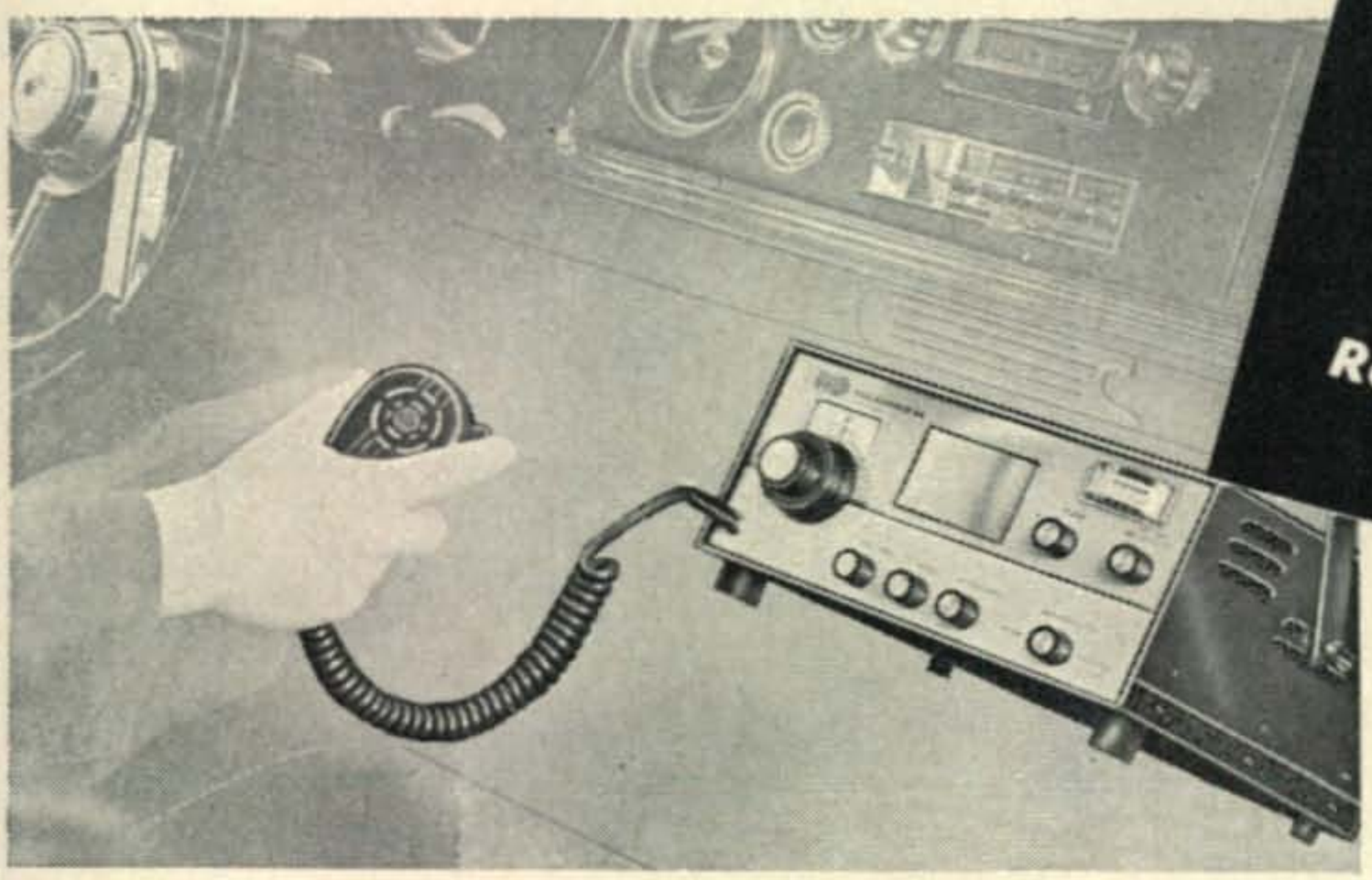

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We Furnish Everything but the Car!

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ORDER ZZM078.

$299.95
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Look at these features!

• 300 Watts PEP/SSB • Rugged Reliable Printed Circuitry • 2 Kc Dial Calibration • Dual Speed Vernier VFO Tuning • EZ One-Knob Tune-Up—"Just Peak Output" • Built-In Speaker—Gimbel Bracket • Combination "S" Meter and Output Meter • McCoy 4-Crystal Lattice Filter.

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☐ Check or Money Order enclosed ☐ Charge it to my account
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☐ Quote me on Attached Letter
☐ FREE WRL 1966 Catalog

Name_____ Call_____

Address_____

City_____ State_____ Zip_____

For further information, check number 33, on page 110

Are Amateurs Always Amateurs? No...They're Professionals Also!!

A recent survey indicates that 41.4% of all radio amateurs are professionally employed as engineers or technicians within the electronics and/or communications industry. If you're reading this message, it's almost an even-money bet that you fit in the above mentioned 41.4%.

And it's almost as certain that your company has a need for additional engineering or technician personnel. There's no more effective or less expensive way to reach prospective technical personnel than by advertising through CQ, The Radio Amateur's Journal. Ad rates in CQ are a mere fraction of those of "professional" engineering magazines, but readership is far more intense.

Remember, more than 40,000 engineers and technicians read CQ every month; that's as many or more than the entire mailing list of most "professional" engineering magazines. Why not show this message to your company's personnel director? Have him drop a note to our advertising department for a rate card. He'll be glad he did!

Aboard the 83 foot yacht *Compromise...*

Compromise . . . One of the largest welded luminum hull cruisers ever built in the U. S. . . powered by twin diesels that develop 525 IP each . . . with three double staterooms plus uarters for the crew of four.

Shown below at the custom amateur instal- ation in the main salon is owner Peter chweitzer, W2MDQ. His choice of equip- nent is National, of course.

Whether intended for use aboard one of the largest and most luxurious yachts in the country or for use in home or auto installations, for over half a century National gear has been the choice of critical amateurs demanding maximum performance and craftsmanship. If, like W2MDQ, you can be satisfied with only the best, then your equipment selection must also be National.

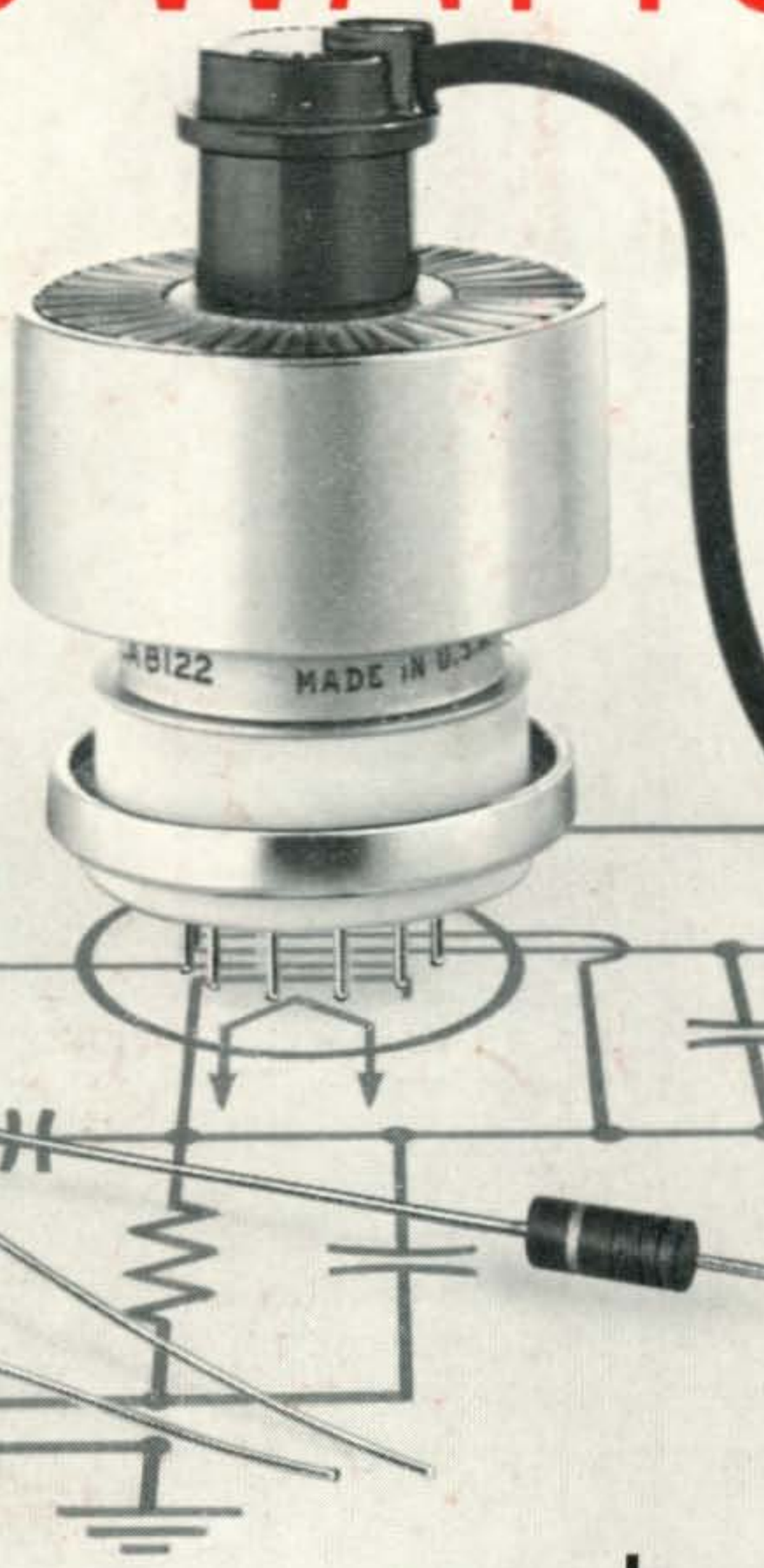
The amateur installation aboard *Compromise* includes the NCL-2000 2 KW linear amplifier ($685), the solid-state HRO-500 5KC-30MC general coverage receiver ($1560), the NCX-5 SSB transceiver with one-KC digital dial ($685), the VX-501 VFO console ($249.95), and the NCX-A AC supply/speaker console ($110).

National, of course.

NATIONAL RADIO COMPANY, INC., *37 Washington St., Melrose, Mass. 02176*

For further information check number 25 on page 110

300 WATTS—*OUT!*



...any band, 160 to 1¼

The RCA-8122 has power and reliability that's *hard to beat*—more than 50% greater dissipation capability than older tubes of comparable size. Used in the latest commercial equipment, or in your own project, the RCA-8122 can deliver power and efficiency with as little as 5 watts drive.

This low-cost forced-air-cooled beam power tube is designed with the builder in mind. . . . Use it with coaxial, strip-line, or conventional lumped tank circuit construction. Get broad-band neutralization on upper frequencies with only a series-tuned capacitor in one cathode lead. Ceramic-and-metal construction and special electrode configuration eliminate mechanically-caused noise and provide extreme sturdiness even at high operating temperatures.

Whether you're planning to buy or build, make sure you take advantage of the latest advances in tube technology with the RCA-8122—made by the people who gave you the 6146. On the amateur bands, it's years ahead!

- Full ratings up to 500 MHz (CCS)
- 380 Watts PEP out at 30 MHz
- 300 Watts CW out at 470 MHz
- Heater 13.5± 10%, 1.3A
- Approximate 5 Watts drive for 300 Watts out CCS

"Product Guide for RCA Power Tubes" (PWR-506A) gives you tabulated data of technical information on specific tube types. Ask your RCA Industrial Tube Distributor for a copy.

AVAILABLE THROUGH YOUR AUTHORIZED RCA INDUSTRIAL TUBE DISTRIBUTOR

The Most Trusted Name in Electronics

For further information check number 7 on page 110