CQ

December 1964
50¢

holiday GREETINGS

The Radio Amateur's Journal

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For further information, check number 1, on page 106

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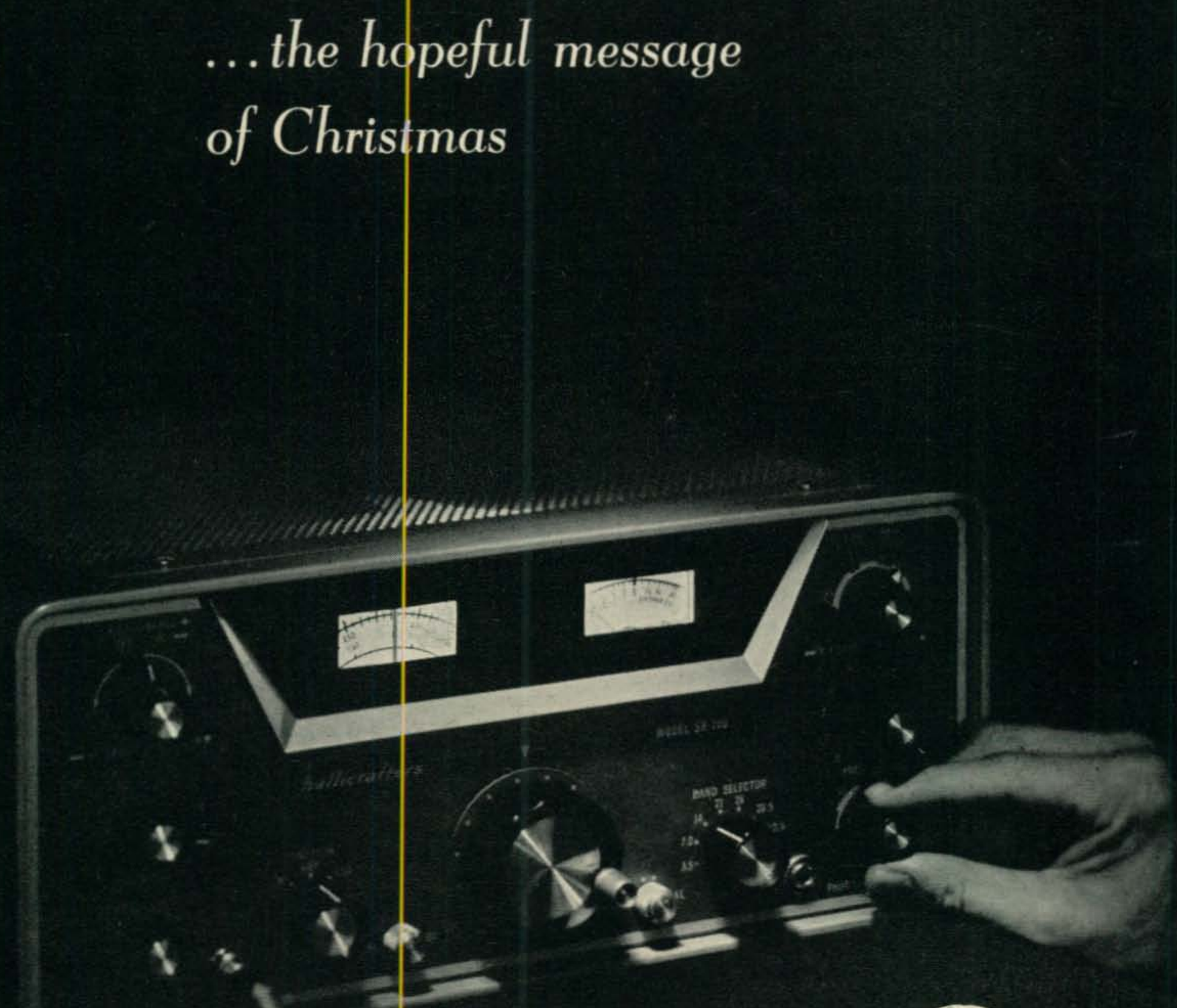
than communication of
the greatest of all ideas
... the hopeful message
of Christmas



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DECEMBER 1964 VOL. 20, No. 12

CQ The Radio Amateur's Journal

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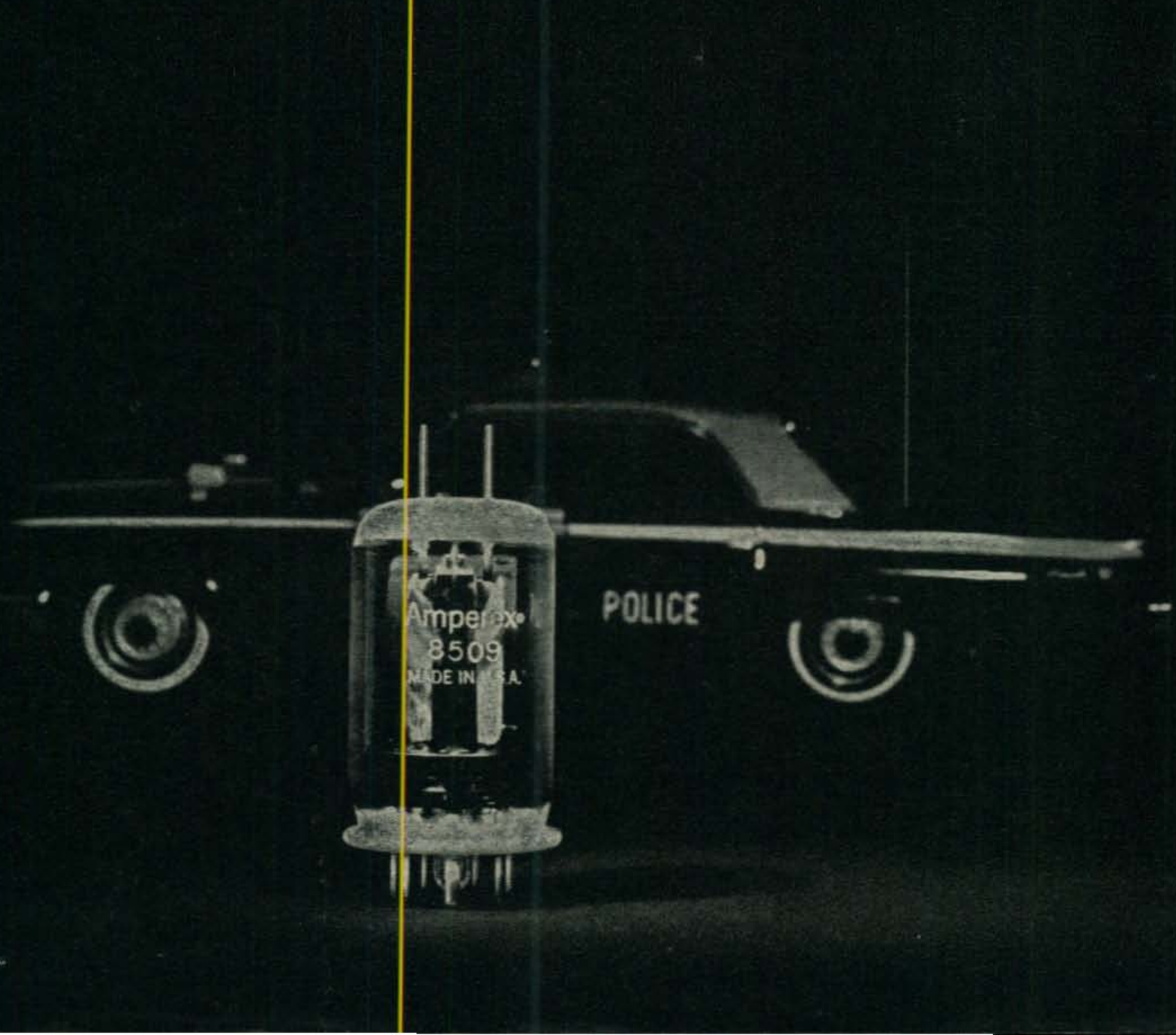
...and for Mobile UHF Communications Equipment with greater power in a smaller package, there's the new Amperex 8509, instant-heating version of the renowned 5894



Take the Amperex 5894, a twin tetrode widely recognized by communications equipment designers and end-product users alike for its overall superiority. Take the Amperex instant-heating Harp Cathode, the same Harp Cathode that is now proving its exceptional qualities in the rapidly growing Amperex family of instant heating communication tubes. Put the two together and the advantages to designers of transistorized communications equipment—whether its back-pack or land safety—are unbeatable.

Like the famous 5894, the new 8509 is designed for use as an RF power amplifier, oscillator, modulator and frequency multiplier. It features high-gain, unfailing uniformity and extreme reliability.

Unlike the 5894, however, and thanks to its Harp Cathode, the 8509 has an operational warm-up time of only 0.5 second thus insuring an ideal marriage with transistorized circuitry, and the reduction of battery power supply-size without sacrificing either power output or equipment efficiency.

Under Typical Class C Telegraphy ICAS operation as a Push-Pull RF Power Amplifier, the 8509 will deliver a Power Output of 96 watts at 250 mc. At reduced ratings the tube may be operated up to 500 mc.

For complete data on the new 8509 and other Amperex instant-heating communication tubes for mobile applications, write: Amperex Electronic Corporation, Tube Division, Hicksville, Long Island, New York 11802.

Amperex®

IN CANADA: PHILIPS ELECTRON DEVICES LTD., TORONTO 17, ONTARIO

For further information, check number 5, on page 106

ZERO BIAS

As promised last month, the new custodian of *CQ*'s USA-CA Program and editor of the USA-CA Column will be announced this month. We're very proud to welcome Ed Hopper, W2GT, to the *CQ* staff as USA-CA Custodian. Ed, of Rochelle Park, New Jersey has already begun the task of establishing new lines of communications with certificate hunters throughout the world.

W2GT is no stranger to the "Wonderful World of Wallpaper," he's been at it for at least 30 of his 42 years as an amateur! But just having an interest in certificates doesn't necessarily qualify a man for the job of USA-CA Custodian. Ed's qualifications as an amateur go a bit deeper than that, as you'll see later. The most appealing thing about him is that he's one heck of a nice guy who loves his ham radio and intends to work *for* it.

We asked Ed for a brief biographical sketch of himself to serve as an introduction to *CQ*'s readers. He told us how he got off to a rocky start in amateur radio in February 1922 after narrowly missing the mark six months earlier when his pen went dry during the exam and in the excitement he broke the point of his pencil too! And in his youthful innocence he blissfully peppered 2OM (no W's in those days) with calls on his spark coil, not realizing that 2OM was busily chasing DX. Back came 2OM with a curt "QRT." A quick check of his Q-signal list sent 2GT off sulking into a dark corner! Yet only three years later 2GT was to be one of the operators at 2OM when the station won the first "Hoover Cup" donated by the late Herbert Hoover, Sr.

In the pre-war DXCC listing, Ed was on the top of the heap with 152 countries, but unfortunately his current 310 in the post-war DXCC doesn't even get him on the Honor Roll! Among his proudest accomplishments are WAZ, WPX, WAS, DXCC (phone and c.w.) and 2XSSB (#385). His name appears on the membership rolls of ARRL, RSGB, North Jersey DX Association, West Gulf DX Club, FOC (#560), QCWA (#1550), Old Timers Club, RCC, A-1 Operators Club, and Royal Order of the Wouff Hong.

So that's Ed Hopper. We hope that he will receive the kind of cooperation that dozens upon dozens of County Hunters and certificate chasers have promised. Ed's first column will appear in January *CQ*—sorry fellows but printer's schedules prohibited an earlier start. Material has already begun to flow in Ed's direction, so if you've got any relevant news, don't delay—get it in the mail!

Miscellaneous

Just when things were beginning to roll nicely here at *CQ*, along comes the proverbial fly in the ointment. *CQ*'s enormous reader growth rate (1.6% per month, averaged over the last 3 months) has caught our subscription department off guard. Circulation Manager Hal Weisner has been suffering incalculable agonies over the past few weeks by having to turn away orders for the big November issue of *CQ*! Sorry —we're fresh out! The rapid growth, combined with a slightly short print run have put us a few thousand copies in the hole. Of course, our subscribers all received their copies—such are the benefits of a subscription—but a lot of latecomers have been disappointed.

And speaking of November *CQ*, a few words about the cover(s). Actually, two slightly different covers went out. Originally it was intended to use a "duo-tone" of W3BK's 4 element 20 meter quad on the cover. A duo-tone is produced by printing the same photo in two colors—red and black in this case. The result was the lovely autumn sky effect that most subscribers noticed. The only trouble was that you couldn't read what was appearing in the issue! A stop-presses order went out, and so did the red in the photo, producing the monotone photo that most newsstand buyers received. So if you've got a red November *CQ*, hang on to it. It's liable to become a collectors item in years to come! Our thanks to the *Seaford* (Del.) *Leader* for the fine photo.

That little package on this month's cover is another W6BLZ item destined to become a classic. Hot on the heels of his two band c.w. transceiver last month, Ed now introduces the "ARC-Port" that has caused such a buzz on the west coast. See page 26.

Last on the agenda for the year, we'd like to offer our deepest thanks to the readers who have taken a few moments to say that they approve of the job we're doing. That's *our* Christmas present!

On behalf of all the folks here at *CQ*—Bill, W2AEF; Marcia; Al, K2EEK; Dick, WA2LRO; Hal, WA2OBR; Jack, WA2FPE; and myself, I'd like to wish you all a Very Merry Christmas,

73, Dick, K2MGA

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- Accessory Cases

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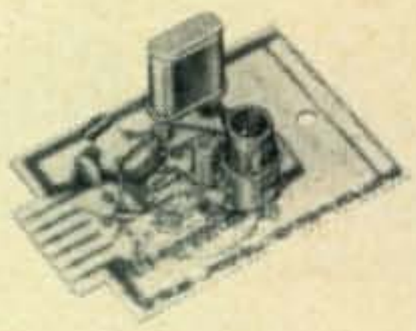
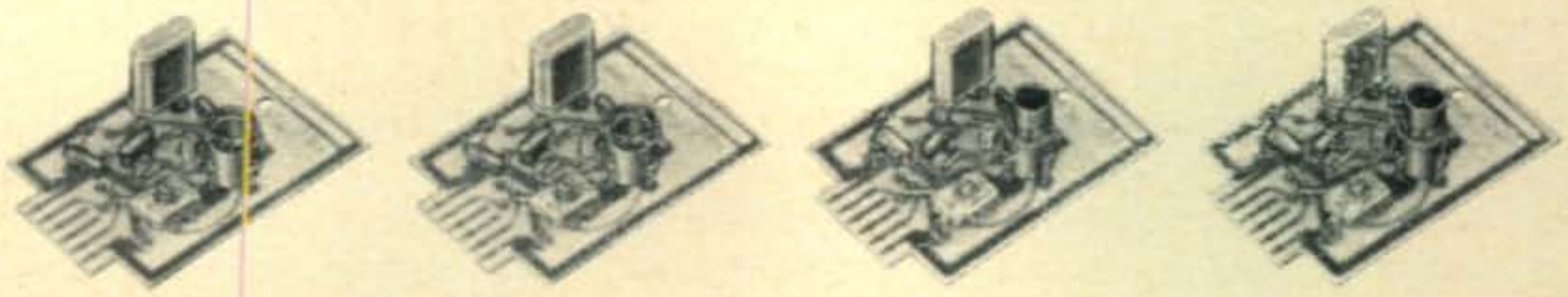
OSCILLATOR TYPE	OSCILLATOR RANGE	CRYSTAL TYPE	TEMPERATURE TOL. —40°F to 150°F	OSCILLATOR (LESS CRYSTAL) PRICE
OT-24	20-40 mc	CY-7T	±.0035%	$ 9.10
OT-46	40-60 mc	CY-7T	±.0035%	9.10
OT-61	60-100 mc	CY-7T	±.0035%	15.00
OT-140	100-140 mc	CY-7T	±.0035%	15.00
OT-160	110-160 mc	CY-7T	±.0035%	15.00

CRYSTAL FREQUENCY	CRYSTAL PRICE
20-60 mc	$ 6.90
60-100 mc	12.00
101-140 mc	15.00
141-160 mc	18.00



Order direct from International Crystal Mfg. Co.



LOW FREQUENCY (70 kc -- 20,000 kc)

Four transistor oscillators covering 70 kc - 20,000 kc. Trimmer capacitor for zeroing crystal. When oscillator is ordered with crystal the standard will be ±.0025%. Oscillator output is 1 volt (min) across 470 ohms. Power requirement: 9 vdc @ 10 ma. max.

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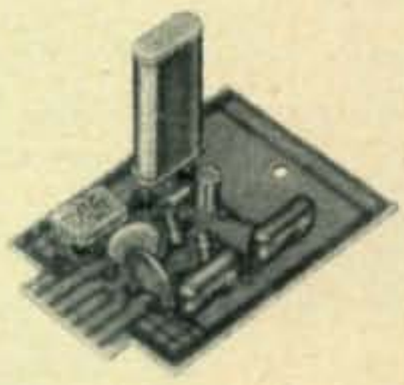
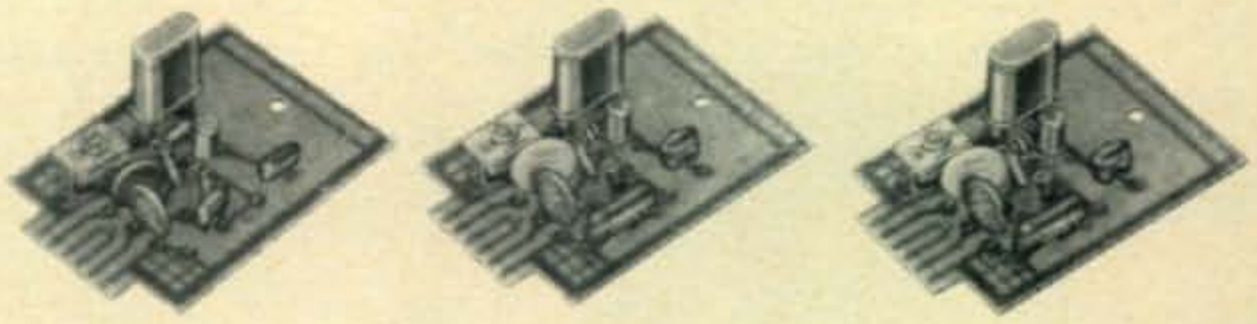
OT-1	70-200 kc	CY-13T	±.015%	$7.00
OT-2	200-5,000 kc	CY-6T	200-600kc ±.01% 600-5,000kc ±.0035%	7.00 7.00
OT-3	2,000-12,000 kc	CY-6T	±.0035%	7.00
OT-4	10,000-20,000 kc	CY-6T	±.0035%	7.00

CRYSTAL FREQUENCY	CRYSTAL PRICE
70-99 kc	$22.50
100-200 kc	15.00
200-499 kc	12.50
500-849 kc	22.50
850-999 kc	15.00
1,000-1,499 kc	9.80
1,500-2,999 kc	6.90
3,000-10,999 kc	4.90
11,000-20,000 kc	6.90





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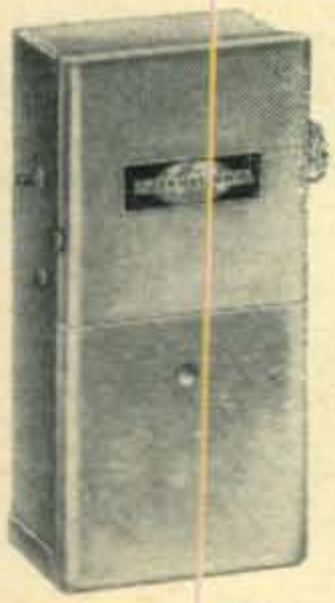
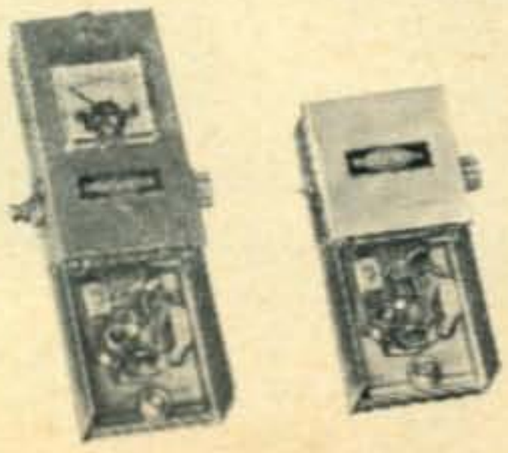
Small portable cases for use with the OT series of plug-in oscillators. Prices do not include oscillators. (When oscillator and crystal are ordered with FOT-10 case a 77° F tolerance of ±.001% may be obtained at $2.00 extra per oscillator/crystal unit. When oscillator/crystal units are ordered with FOT-20 case, a single unit can be supplied with temperature calibration over a range of 40° F to 120° F. Correction to ±.0005%. Add $25.00 to the price of FOT-20 and oscillator/crystal unit.)

FOT-20



FOT-10



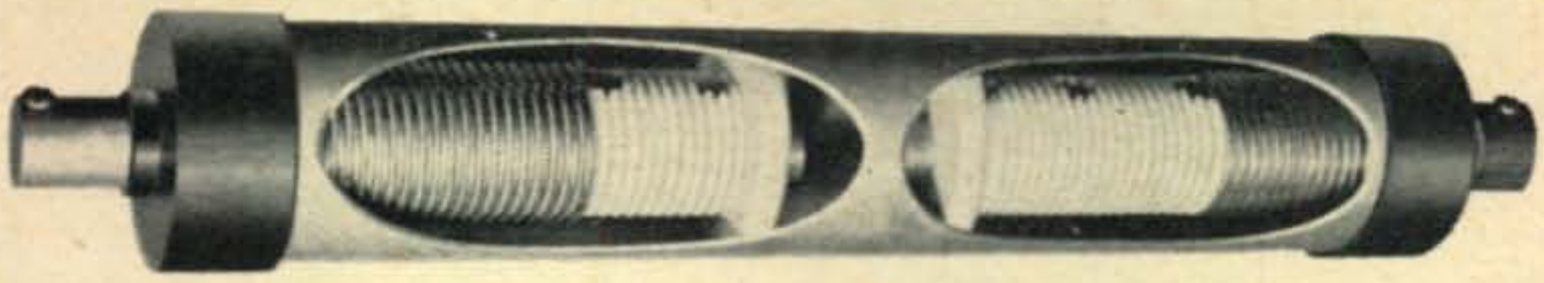
FOT-20 For high accuracy calibration requirements. Includes battery and output jack, output meter circuit and battery check, as well as thermistor temperature measuring circuit. **$87.50**

FOT-10 Basic case with battery and output jack for general wider tolerance applications. **$14.50**

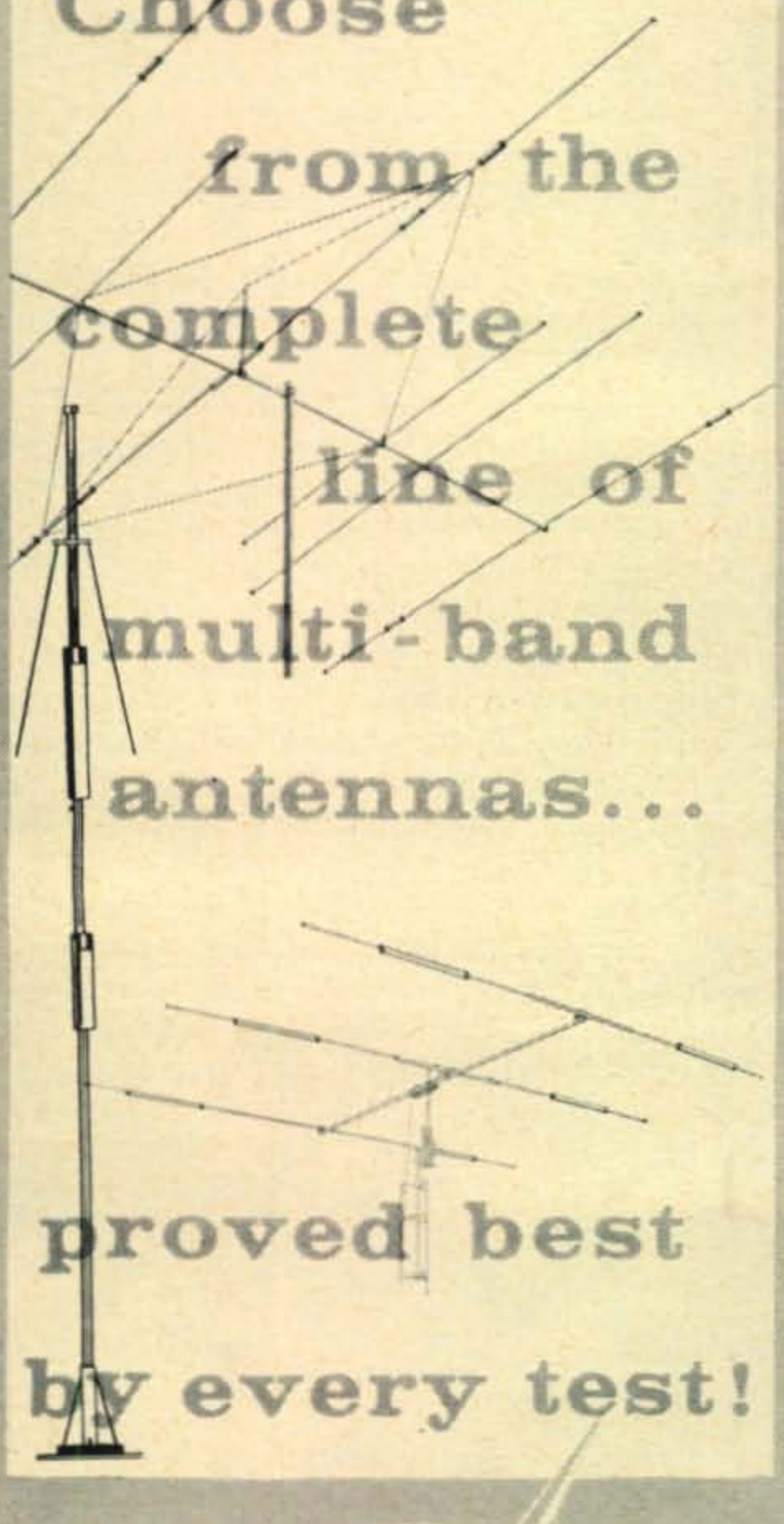
MT-1 Oscillator board mounting kit. **$4.95**

For further information, check number 8, on page 106

HERE'S THE ORIGINAL!



None Better HAS EVER BEEN Made!



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For further information, check number 9, on page 106

How Did You Spend *Your* Weekend?

THREE hams recently played a dramatic role in a sixty-hour race against death. The three men supplied a vital communications link between a doctor in New York and one in Columbia, South America. The efforts were all directed to save the life of John Riley, an American plantation owner who was stricken with a severe case of bleeding ulcers. Mr. Riley was not responding to treatment and when his condition grew worse Mrs. Riley contacted Jim Porta, HK2VN, in Santa Marta, Columbia. While Mrs. Riley was on the phone with Jim, Jim was trying to contact anyone who could reach a Dr. Baird in New York. Dr. Baird was Mr. Riley's regular doctor and had recently operated on him for this condition and had his medical records.

Jim contacted Scotty Crichton, HI4XAB, in the Dominican Republic, who in turn contacted Bill Zeisler, W2DLP, in New Jersey. Bill contacted Dr. Baird on the landline, and the vigil began. Orders from Dr. Baird were relayed through Bill, Scotty, Jim and Mrs. Riley to the doctor attending Mr. Riley. The Doctor in turn would send information on the patient's condition back the same way. For sixty hours this vigil was kept up while Mr. Riley's life hung in a precarious balance until he could be flown to New York. Once in New York, Mr. Riley was admitted to Flower Fifth Avenue Hospital and under Dr. Baird's treatment began to slowly recover.

Bill, who took care of all the arrangements on this end, now provides Mr. Riley an opportunity to speak with Mrs. Riley *via* phone-patch. All this took place around the weekend of September 12, 1964 . . . How did you spend that weekend?

—*K2FFI*

Bill Zeisler, W2DLP, shaking hands with Mr. Riley while Mr. Riley's nurse looks on. *(Photo courtesy of the Newark News).*

← For further information, check number 10, on page 106

Attention XYL's!

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For further information, check number 11, on page 106

LETTERS TO THE EDITOR

The USA-CA Column

Editor, *CQ*:

I was glad to see that you stuck by your guns in the matter of useful reading material This close editing can only result in more useful information in *CQ*. Too many write only to fill up space with no regard to whether it contains any useful information or not. Keep up the good work.

Ken Judge Glanzer, K7GCO
202 South 124th Street
Seattle, Washington

Editor, *CQ*:

Re: November ZERO BIAS and loss of editor, Clif Evans. I am sure that you did the right thing, he seems to have become another Wayne Green, and that is 'nuff said.

Dr. Louis E. Persons, W4PJG
P.O. Box 1647
Fort Myers, Florida 33902

Editor, *CQ*:

The first time the October USA-CA column was missed was after reading November's Zero Bias.

Brian H. Alsop, WA2KSD/2
Box 425, Clement Dormatory
Rensselaer Polytechnic Inst.
Troy, New York 12181

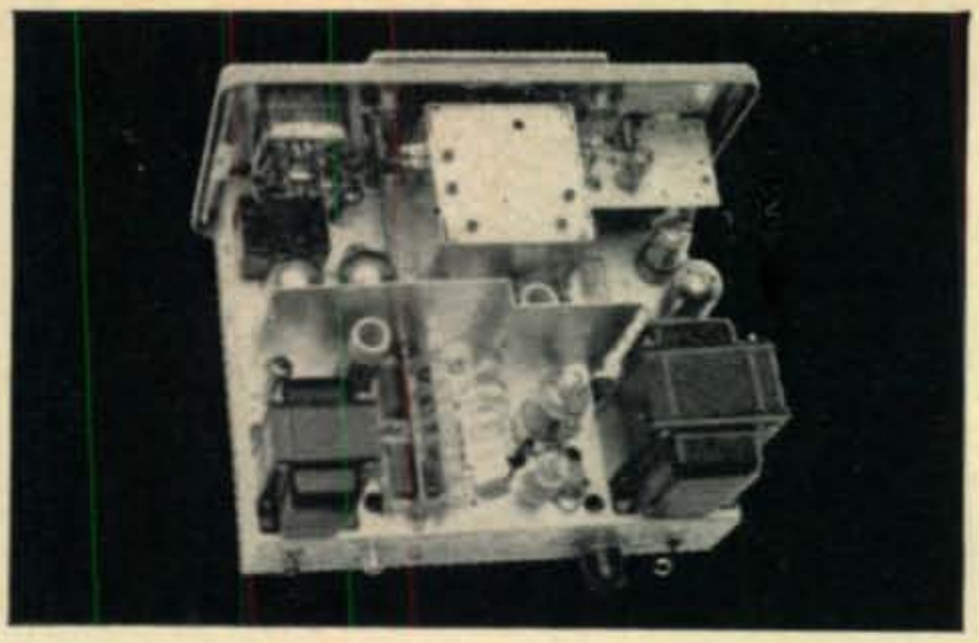
The three letters above represent only a tiny sampling of the response to the changes in *CQ*'s USA-CA program. We are very happy to report that although the news was greeted at first with skepticism by many County Hunters, correspondence with them has brought unanimous favorable support. It seems that most fellows were most concerned with what would happen to the award program and award news coverage, rather than who managed the USA-CA column. Just goes to prove again that USA-CA has earned an honored position in the world of amateur radio. We're proud of it! —*K2MGA*

Lasers

Dear Dick,

The response to my recent article on Lasers has been better than anything I could anticipate. In addition to the mail received through *CQ*, a rather heavy volume was also addressed to me at Radio Free Europe. Although highly gratifying, it has left me in a somewhat embarassing position, for it will be almost impossible for me to answer every letter personally.

First, I want to express my thanks for the many kind words about the article. There is little that gives an author greater satisfaction, particularly when it comes from a competent, qualified group such as we have in the amateur community.



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

Cat. No. 240-162-1..."Ranger II" Kit ... **Net $249.50**
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FEATURES

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

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

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WASECA, MINNESOTA, U.S.A.

For further information, check number 13, on page 106

Many readers wanted to know about building their own laser. By coincidence, the September 1964 edition of *Scientific American* carries, in its Amateur Scientist section, an article entitled: "How a Persevering Amateur Can Build a Gas Laser in the Home." Should the magazine be unavailable, reprints of this fine do-it-yourself article can be obtained for 20¢ from W. H. Freeman and Company, 660 Market Street, San Francisco, California.

Those interested in injection lasers can obtain information from Korad Corporation, 2520 Colorado Avenue, Santa Monica 6, California.

A number of letters requested additional information about lasers. I have just completed a book on Masers and Lasers which will be published by John Rider, 116 West 14 Street, New York City, early in 1965. In addition to the material dealing with the laser and the radio amateur there is additional information about the communications aspects of this exciting new field, as well as detailed descriptions of lasers already on the market.

Finally, there was a very fine letter from W3HSL/6, Roger Kohn, Research Assistant, Microwave Laboratory, Stanford University, Stanford, California. Roger is studying for his Ph.D. and has participated in various laser projects, as well as having built one of his own. He has expressed an interest in helping those amateurs seriously interested in the scientific aspects of laser work, as well as joining in OSCAR-style projects. From the point of location as well as technical qualifications, Roger seems eminently suited to co-ordinate such activities.

In conclusion, I want once again to thank your readers for the fine response to Lasers. It is an indication, I think, of the pioneering spirit of the amateur, who has contributed more to long distance communications than any other group, and gives every reason to believe that this spirit is in no way abating.

Stanley Leinwoll
Radio Free Europe
Two Park Avenue
New York, New York

At the risk of boring a few LETTERS readers, we'd just like to say again that Stan Leinwoll's article, "Lasers," has created a small avalanche of mail—unprecedented at *CQ* for a non-construction type article. We strongly suggest that you dig up the August and September *CQ*'s to read parts I and II of this enlightening article.—*K2MGA*

FCC Bottleneck

Editor, *CQ*:

When the Gettysburg offices were equipped with data processing equipment the public was given to understand that the headaches that were a constant part of their inefficient organization would be relieved and that amateurs might expect their licenses to be processed without appreciable delay.

On May 27, 1964 I sent in my application for an additional station license, since I maintain homes both in Connecticut and Florida. Since I have enjoyed a two letter call for may years I requested the privilege of a two-letter call for my Florida location. A check for the required $20.00 was included with the application.

Now, almost five months later, and with several letters requesting information I am still without a Florida call and cannot get even the courtesy of a reply to my letters. Could you run your business that way? I know I could not.

George R. Caron, W1EQ/4
P. O. Box 322
Boca Raton, Florida 33432

No, George, we couldn't run our business that way either, but of course we're not handicapped by having to use the latest, ultra-ultra computer, hi! We are assured, though, that the processing of applications of all types will be perking along in fine style just as soon as the bugs are worked out.—*K2MGA*

Happiness is a Good November Issue

Editor, *CQ*:

Congratulations on your November Special issue. Thoroughly enjoyed it from cover to cover. Must treat myself to a gift subscription this Christmas. Keep up the good work!

Roy J. Durso, W2KTG
Box 104
Lake Katrine, New York

enter Hallicrafters'

"New Ideas" contest

OVER $10,000 IN AWARDS!

GET FULL DETAILS FROM ONE OF THESE TOP DISTRIBUTORS!

ARIZONA
Phoenix: Henry Radio Co.

ARKANSAS
DeWitt: Moory's Wholesale Radio & Appliance Co.

CALIFORNIA
Anaheim: Henry Radio Co.
Burbank: Electronic City, Inc.
Los Angeles: Henry Radio Co.
North Hollywood: C. Q. Radio Supply
Pasadena: Electronic Components of Pasadena; Henry Radio Co.
Riverside: Mission Ham Supplies
Sacramento: Selectronics
San Francisco: Amrad Supply Co.
San Jose: Quement Industrial Electronics

COLORADO
Denver: Burstein-Applebee Co.

DISTRICT OF COLUMBIA
Washington: Electronic Wholesalers

GEORGIA
Hopeville: Southeastern Radio Parts

ILLINOIS
Chicago: Allied Radio Corp.; Amateur Electronic Supply
St. Francisville: Buzz Electronics

INDIANA
Anderson: Elect. Supply of Anderson
Fort Wayne: Fort Wayne Elect. Supply
Indianapolis: Graham Electronics Supply; Van Sickel Radio Supply
Lafayette: Lafayette Radio Supply
Muncie: Elect. Supply

IOWA
Council Bluffs: World Radio Laboratories

KENTUCKY
Louisville: Mobile Communciations

LOUISIANA
New Orleans: New Crescent Electronics Supply

MARYLAND
Wheaton: Electronic Distributors

MICHIGAN
Detroit: Reno Radio Corp.
Ferndale: Midway Electronics Supply
Flint: Shand Electronics, Inc.
Grand Rapids: Radio Parts, Inc.
Kalamazoo: Warren Radio Co.
Lansing: Main Electronics

MINNESOTA
Minneapolis: Lew Bonn Co.; Stark Electronics
St. Paul: Electronic Market; Stark Electronics

MISSOURI
Butler: Henry Radio Co.
Kansas City: Associated Radio Communications
Kansas City: Burstein-Applebee Co.
St. Louis: Walter Ashe Radio
Springfield: Reed Radio & Supply Co.

NEW HAMPSHIRE
Concord: Evans Radio, Inc.

NEW JERSEY
Paramus: Lafayette Radio Corp.
Springfield: Federated Purchaser

NEW YORK
Farmingdale: Arrow Electronics
Jamaica: Harrison Radio Corp.
Mineola: Arrow Electronics
New York: Arrow Electronics; Grand Central Radio; Harrison Radio Corp.; Terminal Hudson Electronics
Rochester: Rochester Radio Supply Co.
Westbury, Long Island: Adelphi Electronics

OHIO
Cincinnati: Coston's
Cleveland: Pioneer Electronics
Columbus: Universal Service
Steubenville: The D & R Radio Supply Co.
Toledo: Hillebrand Electronics; Warren Radio Co.

OREGON
Portland: Portland Radio Supply

PENNSYLVANIA
Chester: Bell Radio
Philadelphia: Radio Electric Service Co.
Pittsburgh: Cameradio Co.; Tydings
Wyncote: Ham Buerger

SOUTH DAKOTA
Watertown: Burghardt Radio

TEXAS
Abilene: Howard Radio
Dallas: Crabtree's Wholesale Electronics
Fort Worth: Ed Guge Electronics
Houston: Busacker Electronics
Lubbock: R & R Electronics
San Antonio: Radio & TV Parts
Waco: Hargis Co.

VIRGINIA
Norfolk: Priest Electronics

WISCONSIN
Madison: Satterfield Electronics
Milwaukee: Allied Radio Corp.; Amateur Electronic Supply

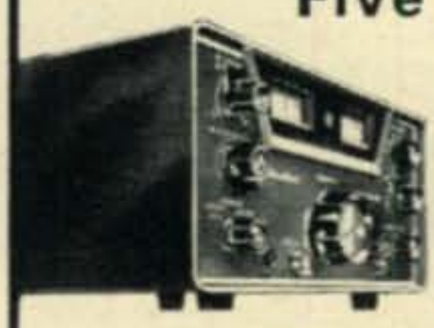
You still have time to enter the biggest and best ham contest ever! Amateur radio *needs your ideas* for improving technique . . . increasing efficiency . . . serving the public . . . promoting good will . . . fostering international understanding. Your idea may *win a valuable award to boot!*

Grand National Award!

Complete deluxe station—Hallicrafters SX-117 Receiver, HT-44 Transmitter, HT-45 Amplifier, two power supplies, HA-10 Low Freq. Tuner, HA-1 Electronic Keyer.
Worth over $1,500!

Five Regional Awards!

SR-160 Transceivers



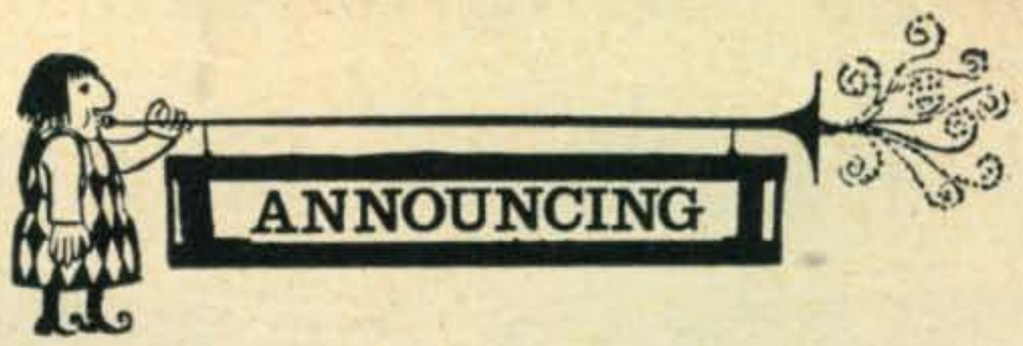
100 Local Awards!

HA-8 "Spatter Guards"

"Quality through Craftsmanship"... **hallicrafters**

5th and Kostner Aves., Chicago, Illinois 60624

For further information, check number 15, on page 106



Eldora, Iowa

A Ham Astronomers Net is being formed for amateur radio ops and astronomers. Ten members so far. Anyone else interested may contact W. Devine, WAØFEX, I.T.S., Eldora, Iowa.

Correction

In the Touch-Key article (November *CQ*, p. 28), fig. 1 dimensions should be taken from the printed figures. The drawing was reduced slightly during engraving. Also the captions for fig. 4 and 5 should be interchanged.

W. E. Turner, K4ECJ

With deep regret we note the passing of William E. ("Wimpy") Turner, K4ECJ, on Sept. 29, 1964.

Morton, Pa.

The Delaware Valley Amateur Radio Club will hold its 10th annual dinner dance on Saturday evening, November 28th, 1964, at the Towne House in Media, Pa. Prizes will be given. For more details contact Gordon Lusky, W3APD, 419 E. Manor Road, Havertown, Pa.

Knoxville, Tenn.

The "Moonlighters of East Tennessee" Amateur Radio Club is conducting a clothing drive for the Save The Children Federation. Save The Children Federation is a non-profit non-sectarian organization working mainly in the areas of Virginia, Eastern Tennessee, and Eastern Kentucky of Appalachia. All clothing shipped to SCF will be processed (cleaned, mended when needed) and made ready for distribution in the above areas. Clothing will also be stockpiled for emergency uses in cases of natural disasters throughout the U.S. and in free countries overseas.

You or your club can help in this project by sending a contribution to Save The Children Federation Processing Center, Knoxville, Tennessee. All contributions over one hundred pounds may be shipped by motor freight collect, but smaller shipments should be sent by prepaid parcel post. All contributions should be marked with your call letters, name and address for proper credit. As a participant in this project of helping others to help themselves, you will receive an Honorary Membership from the "Moonlighters of East Tennessee" Amateur Radio Club, and also a certificate of appreciation from Save The Children Federation. This drive starts on Oct. 6, 1964 and will run for about ninety days. Small or large, your contribution to this project is needed and will be appreciated. Any amateur radio clubs who would like more information on how to conduct the project in their area in conjunction with the "Moonlighters" may contact C. D. Allen, WA4IWT, P.O. Box 374, Knoxville, Tennessee, 37901.

Scientific Expedition

G. Branen Ward, WB6DLQ, a teacher at San Clements High School in San Clements, California will be conducting an expedition to the mouth of the Mackenzie River next summer. The three month trip will start from Seattle, Washington, go up through Canada to the Beaufort Sea and return through Alaska. Mr. Ward is looking for another amateur to go on the trip and also for other amateurs to work the group on the trip. Since this will be basically a scientific expedition, those desiring to go on the trip (which will cost about six hundred dollars) should have a specific scientific intent before applying. *It is not a DXpedition*. All those interested contact Mr. Ward, 3149 Alta Laguna Blvd., Laguna Beach, California.

North Bergen, New Jersey

The Astronomy Club at the North Bergen High School

POWERFUL BIG NEWS

NEW!...2 METER–6 METER RF POWER AMPLIFIERS

More power in the VHF band!... and there is *plenty* of it in the new Gonset 2 and 6 Meter RF Power Amplifiers. Model 903A (2 meter) and Model 913A (6 meter) has a power input of 500 watt in all modes of operation. A 4X 150A is used in the final, and the equipment is rated for CCAS* service. Only 5 watts is required to drive the 903A and 913A to full rated output. Output impedance is 50 ohms nominal with an input impedance of 50 to 75 ohms. The all solid state power supply is self-contained within the amplifier chassis. All stages are metered and all controls are on the front panel for ease of operation. The new linear amplifiers may be used with any of the famous Gonset Communicator series, as well as being ideally compatible for the new Gonset Sidewinder series.

**Continuous Commercial and Amateur Service.*

Amateur Net Price $299.00

NEW!...GONSET SIDEWINDER 6 METER SSB-AM-CW TRANSCEIVER

The new Gonset Model 910A *Sidewinder* offers coverage of the entire 6 meter band in 1 mc segments. Like its mate—the Model 900A 2 meter *Sidewinder*—this ultra-compact transceiver features all-transistor receiver and power supply and partially transistorized transmitter (except mixer, driver, and final stages). Designed for mobile or fixed communications, the unit operates with separate AC (shown above) or DC power supplies.

...COMES IN POWERFUL LITTLE PACKAGES from GONSET

SIDEWINDER SPECIFICATIONS:

TRANSMITTER:	
Power Input:	20 watts PEP (SSB) 6 watts AM 20 Watts CW
Spurious Suppression:	—50 db
Carrier Suppression:	—50 db on SSB
Unwanted Sideband Suppression:	—40 db
RECEIVER:	
Frequency Stability:	Highly stable, utilizes same VFO as transmitter
Sensitivity:	½ mv or better for 10 db $\frac{S+N}{N}$
Selectivity:	Lattice crystal filter for both receiver and transmitter
Spurious Suppression:	—50 db or better
Image Rejection:	—50 db (both receiver and transmitter utilize double conversion)
AMATEUR NET:	$399.50
AC Power Supply	$ 67.75
DC Power Supply	$ 79.50

ANOTHER NEWSWORTHY NOTE: *the Gonset GSB-201 Linear Amplifier was recently increased from 1500 to 2000 watts PEP (SSB). For those who operate on 10 to 80 meters—the GSB-201 is a natural companion for any of today's exciters.*

WOULD YOU LIKE TO BE PLACED ON OUR NEW PRODUCT MAILING LIST?

We'll send you complete information on the products above and keep you informed of new Gonset developments from time to time. Merely write Dept. CQ-12.

GONSET, INC.

ALTEC LANSING CORPORATION

LTV *A Subsidiary of Ling-Temco-Vought, Inc.*

1515 SOUTH MANCHESTER AVENUE, ANAHEIM, CALIF.

For further information, check number 17, on page 106

planning on building a radio-telescope. They are looking for information as to the best wave length for receiving as well as the best type of antenna system to use. Anyone who has this type of information, please contact Mr Louis Tacionis Jr., WB2GNW, North Bergen High School Science Dept., c/o Mr. Withey, 7417 Kennedy Blvd., North Bergen, New Jersey.

Chicago, Illinois

The Six Meter Club of Chicago announces the new slate of officers for the 1965 season. They are: President, Jack Hellwig, K9ZWU; Vice President, Len Lukas, W9FVB; Secretary, El Lukas, W9AFA; Treasurer, Val Hellwig, K9ZWU; Recording Secretary, Desmond Goggins, K9RVG; Members at Large, Bob Weiss, W9AVB and John Lange, K9ARA; Sergeant at Arms, Ray Staira, W9CEJ.

New Rochelle, New York

The Communications Club of New Rochelle will hold its fourth annual dinner and ham radio get together on Saturday evening, December 26, 1964. The event will be at the Davenport Club in New Rochelle. There will be prizes given. For more specific information contact Richard B. Braine, at the Communications Club of New Rochelle, 189 Drake Ave., Apt 1G, New Rochelle, New York.

Proposed Conditional License Changes

The following is the complete text of the proposed rule making by the FCC mentioned in last month's ZERO BIAS.

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

In the Matter of
Amendment of Sections 97.9(d)(1) and 97.27(a) of the Commission's Rules governing eligibility for the Conditional Class license in The Amateur Radio Service

NOTICE OF PROPOSED RULE MAKING

By the Commission:

1. The commissioner has under consideration the provisions of Sections 97.9(d)(1) and 97.27(a) of the rules governing eligibility for the Conditional Class license in the Amateur Radio Service. These rule sections provide that an individual may apply for the Conditional Class license if his actual residence and proposed station location are more than 75 airline miles distance from any Commission Field Office or quarterly examination point.

2. Review of the present status of the Conditional Class license shows that there are now more than 40,000 holders of this authorization. Over 90% of these licensees established their eligibility on the basis of being more than 75 airline miles distance from a Commission Field Office or quarterly examination point. Almost without exception, these licensees obtained an authorization after passing a code test and written mail examination under the supervision of a volunteer examiner.

3. Conditional Class licensees comprise over 20% of all licensees who are entitled to the higher amateur operating privileges. While this percentage is not alarming, it is the result of a constant increase through the last decade. This the Commission does not regard as desirable since it is our policy that, where feasible, the qualifications of those applicants for the higher classes of amateur licenses be directly verified by Commission personnel.

4. Accordingly, the Commission proposes to amend Section 97.9(d)(1) and 97.27(a) to provide that only those individuals whose actual residence and proposed station location are more than *one hundred and seventy five airline miles* distance from a Commission Field Office, quarterly or *semi-annual* examination point shall be eligible for the Conditional Class license on a distance basis. It is not anticipated that these increased limitations will impose an undue burden upon applicants. There will be very few locations where potential applicants may have to travel more than 150 miles. Where travel conditions are difficult, such as in mountainous areas, there are almost invariably examination points well within 100 miles of potential applicants.

[*Continued on page 88*]

All in one low cost receiver the HQ-IIOA-VHF

Now, for the first time, complete amateur band coverage from 2 to 160 Meters° in one low cost high performance receiver—the new HQ-110A-VHF. Outstanding operating convenience is combined with the highest standards of communication receiver design including separate 2 & 6 meter Nuvistor front ends for superb sensitivity and signal to noise ratio. Convertors, antenna plugs, external power supplies, jury-rigged switches have been eliminated—now you can *enjoy* VHF operation.

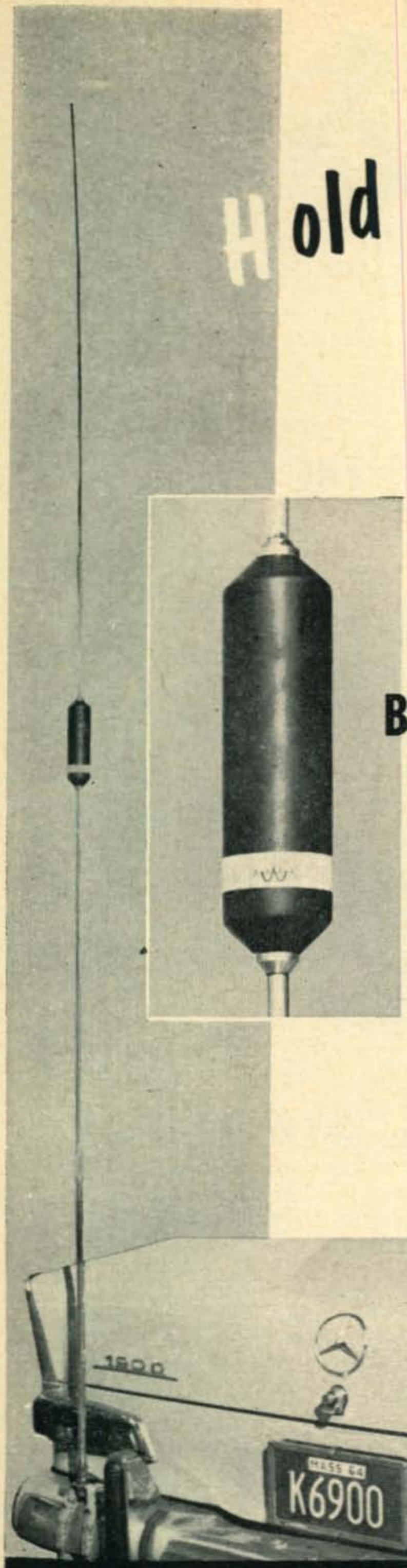
Every operating convenience for ALL bands and ALL operating modes – CW, SSB, and AM – are contained in one compact package. Separate detectors for CW/SSB and AM—Variable selectivity Q-Multiplier—High electrical and mechanical stability—Full dial coverage from 2 to 160 meters—Built in crystal calibrator—Automatic Noise Limiter—Sensitivity of 1.5 uvolts AM, 0.7 uvolts CW for 10:1 S/N—Built in S meter.

Compare the HQ-110A-VHF with any competitively priced unit – feature for feature, it can't be beat, (and the others don't have VHF).

° *VHF in the incomparable HQ-170A-VHF too. Send for details.*

HAMMARLUND MANUFACTURING COMPANY
A GIANNINI SCIENTIFIC COMPANY
73-88 Hammarlund Drive • Mars Hill, North Carolina 28754

For further information, check number 19, on page 106



Hold Everything...!

Here's *Waters* NEW AUTO-MATCH!

4db Stronger Mobile Antenna

Combine stronger structural strength with stronger signal strength and **voila** .... Waters New AUTO-MATCH Mobile Antenna!

Frankly, we hadn't expected to announce AUTO-MATCH for several weeks. But with completed field tests corroborating our every engineering expectancy of operating superiority and structural durability, we decided to beat the gun.

Briefly, the Specs:

AUTO-MATCH operates with only a coil-change on every ham band with its maximum radiation efficiency giving up to 4 db more signal strength than is found in other commercial mobile antennas. The tapered radiator tip is of drawn 17-7 PH stainless steel and adjusts to all frequencies. Interchangeable Top-Center loading coils are molded in low-loss Epoxy and are completely sealed against moisture and water seepage. High Q stable inductance handles 500 watts of RF and at resonance presents an "Auto-Match" of 50 ohms for the coaxial feedline. The sturdy lower mast is made of 6061 ST6 aircraft aluminum tubing with a stainless steel mounting stud welded in standard base-mount thread. The upper mast is of solid tapered drawn aluminum rod to provide added strength and ease of upright mounting. The built-in foldover for garaging drops AUTO-MATCH to car-top level. AUTO-MATCH fits any standard mounting base or bumper mount without change or modification. And remember .... AUTO-MATCH is rugged, very rugged — designed to last for car after car, rig after rig! You can place your order with your distributor now.

PRICES

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

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

For further information, check number 20, on page 106

A Christmas CQ . . .

to the XYL whose OM wks CW.

NEW

Waters **CODAX**™

AUTOMATIC KEYER

For the happiest ham on frequency come Christmas Day, surprise that OM with the smooth-performing new Waters CODAX, Keyer. Never anything like it!

Each paddle of the built-in double paddle keyer adjusts individually to his touch for gap and tension with spacing and timing from 5 to 50 WPM fully automatic. Plugged into the mike jack CODAX works CW on **either** upper or lower sideband . . . . AM too, of course! With the receiver's phone-output plugged into CODAX he can monitor his own signal as well as the station he's working. CODAX employs solid state digital circuitry, has an hermetically sealed "Reed" relay and is self-powered. Interconnects with any rig in a jiffy without drilling or modification. Won't even need gift-wrapping it's that attractive. So if you'd be wearing mink on your birthday, give the OM a CODAX Keyer for Christmas. $92.50

New too!

NUVERTER®
2 and 6 Meter Converter

Now . . . . . the NUVERTER! Adds sharp 2 and 6 coverage to any superheterodyne that tunes 10 meters. And it installs without modifying . . . . . requires no external relays or switches. A single function switch selects wanted band and matching antenna . . . . . uses receiver's AVC and also has manual gain control on the panel. Circuitry includes Nuvistor converters, high-stability crystal oscillators and integral power supply. Broad-banded to cover 1.8 megacycles in three 600 KC segments on both 2 and 6 meters, $175.

WATERS

MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

For further information, check number 21, on page 106

SIDEBAND ENGINEERS'

new! SB34

COMPLETE, SELF-CONTAINED, 4-BAND (80-40-20-15) SSB TRANSCEIVER, NEEDS ONLY MIC., ANTENNA, POWER SOURCE.

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

Connect the equipment directly to the 12 volt vehicle battery... or plug it into the 117 volt AC wall outlet. (Two power cables are provided—one for AC—a second for DC operation).

ONLY 500 MILLS STANDBY DRAIN FROM VEHICLE BATTERY

Drain-saving panel switch turns off transmitter tube filaments and power supply for casual listening.

EXPANDED FREQUENCY COVERAGE

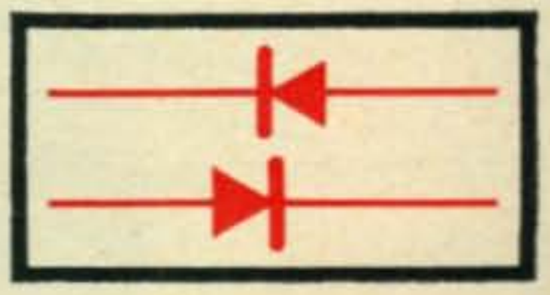
250 kc, 80-40-20-15, with overlaps covering MARS, out-of-band DX.

DELTA RECEIVER TUNING

Receiver is tunable several kilocycles ± transmitter frequency.

SOLID-STATE DIAL CORRECTOR

Varactor circuit sets transmitter frequency to dial calibration.



SOLID-STATE SWITCHING

Receive to transmit switching is all solid-state. No troublesome relays. **A breakthrough!**

OTHER FEATURES: SINGLE-KNOB, DUAL-SPEED TUNING • LOW FREQUENCY DRIFT • VOX AND 100 KC CRYSTAL CALIBRATOR AVAILABLE AS ACCESSORIES. (SB-34 is pre-wired to accept VOX and Calibrator—has receptacles on rear of the chassis for this purpose).

SBE **SIDEBAND ENGINEERS** 317 ROEBLING ROAD, SOUTH SAN FRANCISCO, CALIF.

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

RAYTHEON

SBE

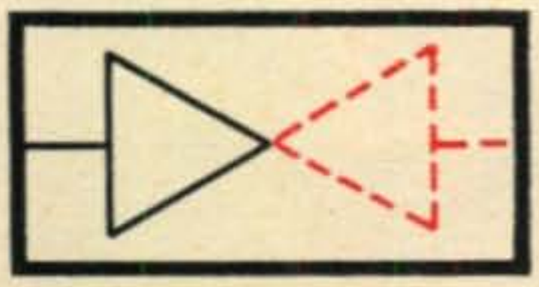
SB-34 . . . FEATURE-WISE, DOLLAR-WISE, THE BIGGEST SSB TRANSCEIVER VALUE . . . EVER!

Photograph shows home station installation of SB-34 with matching amplifier.

Now . . . from **SBE** . . . a completely new SSB transceiver, **SB-34.** All of the design features introduced originally in the SB-33, and now well proved, have been retained . . . and an entirely new series of "plus performance" features have been added. SB-34 is handsome equipment—conservatively styled, attractively appointed . . . comes in a physical "package" even smaller than SB-33. Transistors and diodes replace vacuum tubes throughout except in RF driver and Final Amplifier stages for substantial reduction in current drain—cooler operation—long life expectancy.

Suggested price. (Including built-in AC/DC power supply)

$395



BI-LATERAL MIXERS/AMPLIFIERS

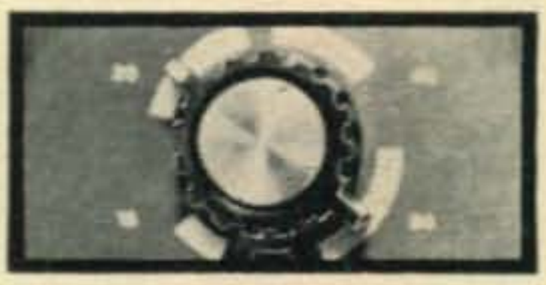
Same transistors operate both transmit/receive by switching direction of amplification.

COLLINS MECHANICAL FILTER

Used both transmitter and receiver—gives steep slopes . . . clean, sharp transmitted sigs.

PANEL SWITCH SELECTS USB or LSB

Sidebands are locked to carrier—no dial shift.



SIMPLE TUNE-UP AND OPERATION

One knob controls bandswitch/exciter tuning.

HIGHLIGHTS: 135 watts p.e.p. input (slightly lower on 15). **Freq. range:** 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc, 21.2-21.45 mc. 23 transistors, 18 diodes, 1-zener diode, 1-varactor diode, 2-6GB5's PA, 1-12DQ7 driver. **Speaker built in** (external speaker provisions)

SIZE: 5"H, 11¼"W, 10"D. Approx. 20 pounds.

SBE 317 Roebling Road, South San Francisco, Calif.

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

NAME

NUMBER STREET

CITY ZONE STATE

For further information, check number 23, on page 106

3 Reasons Why You Should Treat Yourself To New Ham Gear This Christmas

1 Deluxe HEATHKIT® SB-200 KW Linear Amplifier!

• 1200 watts P.E.P. input SSB—1000 watts CW • 80 through 10 meter band coverage • Built-in SWR meter—Antenna relay—Solid-state power supply • Automatic Level Control (ALC) • Shielded, fan-cooled amplifier compartment • Pre-tuned cathode input circuit for maximum efficiency & low distortion • Circuit-breaker power supply protection—no fuses • Designed for 120/240 volt operation. Neat, compact and transportable (only 35 lbs.). The sturdy, yet lightweight construction of the SB-200 is achieved through the use of a heavy-gauge one-piece aluminum chassis that is partitioned for extra strength and isolation of circuits. Easy assembly is assured with clean, open circuit layout and high quality, well-rated components. The modern low-profile styling of the SB-200 makes it a neat, compact desk-top linear that is ideal for use anywhere!

Kit SB-200, 42 lbs.....$200.00

Note: Unit suitable for overseas operation.

SB-200 SPECIFICATIONS—Band coverage: 80, 40 20, 15 & 10 meters. **Maximum power input:** 1200 watts P.E.P. SSB, 1000 watts CW. **Driving power required:** 100 watts. **Duty cycle:** SSB, continuous voice modulation; CW, 50% (key down time not to exceed 5 min.). **Third order distortion:** 30 db or better at 1000 watts P.E.P. **Output impedance:** 50 to 75 ohm unbalanced; variable pi-output circuit. SWR not to exceed 2:1. **Input impedance:** 52 ohm unbalanced; broad-band pre-tuned input circuit requires no tuning. **Meter functions:** 0-100 ma grid current, 0-1000 ma plate current, 0-1000 relative power, 1:1 to 3:1 SWR, 1500 to 3000 volts high voltage. **Front panel controls:** Load; Tune; Band; Relative Power Sensitivity; Meter Switch, Grid-Plate-Rel. Power-SWR-HV; and Power Switch, on/off. **Tube complement:** Two 572B/T-160-L (in parallel). **Power requirements:** 120 volts AC @ 16 amperes (max.), 240 volts AC @ 8 amperes (max.). **Cabinet size:** 14⅞" W x 6⅝" H x 13⅜" D. **Net weight:** 35 lbs.

2 Deluxe HEATHKIT® SB-300 Receiver!

• Complete coverage of 80 through 10 meter amateur bands • All crystals included, plus provision for VHF converters • Hermetically sealed 2.1 kc crystal bandpass filter • Built-in 100 kc crystal calibrator • Smooth, non-backlash vernier dial mechanism • 100 cps stability after initial warmup • 1 kc dial calibrations—100 kc per dial revolution (provides bandspread equal to 10 feet per megacycle) • Provision for transceive operation with SB-400 Transmitter • Prebuilt linear master oscillator (LMO), wiring harness and two heavy-duty circuit boards for fast, easy assembly.

Kit SB-300, less speaker...22 lbs.....$265.00

SBA-300-1 Optional AM Crystal Filter (3.75 kc) 1 lb.....$19.95

SBA-300-2 Optional CW Crystal Filter (400 cps) 1 lb.....$19.95

SBA-300-3 6 meter converter, 2 lbs.....$19.95

SBA-300-4 2 meter converter, 2 lbs.....$19.95

Export model available for 115/230 VAC, 50-60 cps; write for prices.

SB-300 SPECIFICATIONS—Frequency range (megacycles): 3.5 to 4.0, 7.0 to 7.5, 14.0 to 14.5, 21.0 to 21.5, 28.0 to 28.5, 28.5 to 29.0, 29.0 to 29.5, 29.5 to 30. **Intermediate frequency:** 3.395 megacycles. **Frequency stability:** 100 cps after warmup. **Visual dial accuracy:** Within 200 cps on all bands. **Electrical dial accuracy:** Within 400 cps on all bands. **Backlash:** No more than 50 cps. **Sensitivity:** Less than 1 microvolt for 15 db signal plus noise-to-noise ratio for SSB operation. **Modes of Operation:** Switch selected: LSB, USB, CW, AM. **Selectivity:** SSB: 2.1 kc at 6 db down, 5.0 kc at 60 db down (crystal filter supplied). AM: 3.75 kc at 6 db down, 10 kc at 60 db down (crystal filter available as accessory). CW: 400 cps at 6 db down, 2.5 kc at 60 db down (crystal filter available as accessory). **Spurious response:** Image and IF rejection better than 50 db. Internal spurious signals below equivalent antenna input of 1 microvolt. **Power requirements:** 120 volts AC, 50/60 cps, 50 watts. **Dimensions:** 14⅞"W x 6⅝"H x 13⅜" D.

3 Deluxe HEATHKIT® SB-400 Transmitter!

• Built-in power supply • Complete transceive capability with SB-300 Receiver • Linear Master Oscillator frequency control • Built-in antenna change-over relay • All crystals supplied for complete 80-10 meter coverage • Automatic level control for higher talk power, minimum distortion • 180 watts P.E.P. SSB, 170 watts CW • Crystal filter type SSB generation • Operates SSB (upper or lower sideband) & CW • VOX & PTT control in SSB operation, VOX operated CW break-in • Crystal controlled heterodyne oscillators • 1 kc dial calibration—100 kc per dial revolution • Dial bandspread equal to 10 feet per megacycle • 500 kc coverage per bandswitch position • Switched 120 V AC for external antenna relay • Sturdy, lightweight, heavy-gauge aluminum construction throughout • Neat, modern "Low-Boy" styling! • Variable loading!

Kit SB-400, 33 lbs.....$325.00

Export model available for 115/230 VAC, 50-60 cps; write for prices.

SB-400 SPECIFICATIONS—Emission: SSB (upper or lower sideband) and CW. **Power Input:** 170 watts CW, 180 watts P.E.P. SSB. **Power output:** 100 watts (80-15 meters), 80 watts (10 meters). **Output impedance:** 50 to 75 ohms—less than 2:1 SWR. **Frequency range:** (mc) 3.5-4.0; 7.0-7.5; 14.0-14.5; 21.0-21.5; 28.0-28.5; 28.5-29.0; 29.0-29.5; 29.5-30.0. **Frequency stability:** Less than 100 cps per hr. after 20 min. warmup. **Carrier suppression:** 50 db below peak output. **Unwanted sideband suppression:** 55 db @ 1 kc. **Intermodulation distortion:** 30 db below peak output (two-tone test). **Keying characteristics:** Break-in CW provided by operating VOX from a keyed tone (Grid block keying). **ALC characteristics:** 10 db nominal @ 0.2 ma final grid current. **Noise level:** 40 db down from single tone output. **Visual dial accuracy:** Within 200 cps (all bands). **Electrical dial accuracy:** Within 400 cps (all bands). **Audio input:** High impedance microphone or phone patch. **Audio frequency response:** 350 to 2450 cps at 6 db. **Power requirements:** 80 watts STBY, 260 watts key down @ 120 V AC line. **Dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

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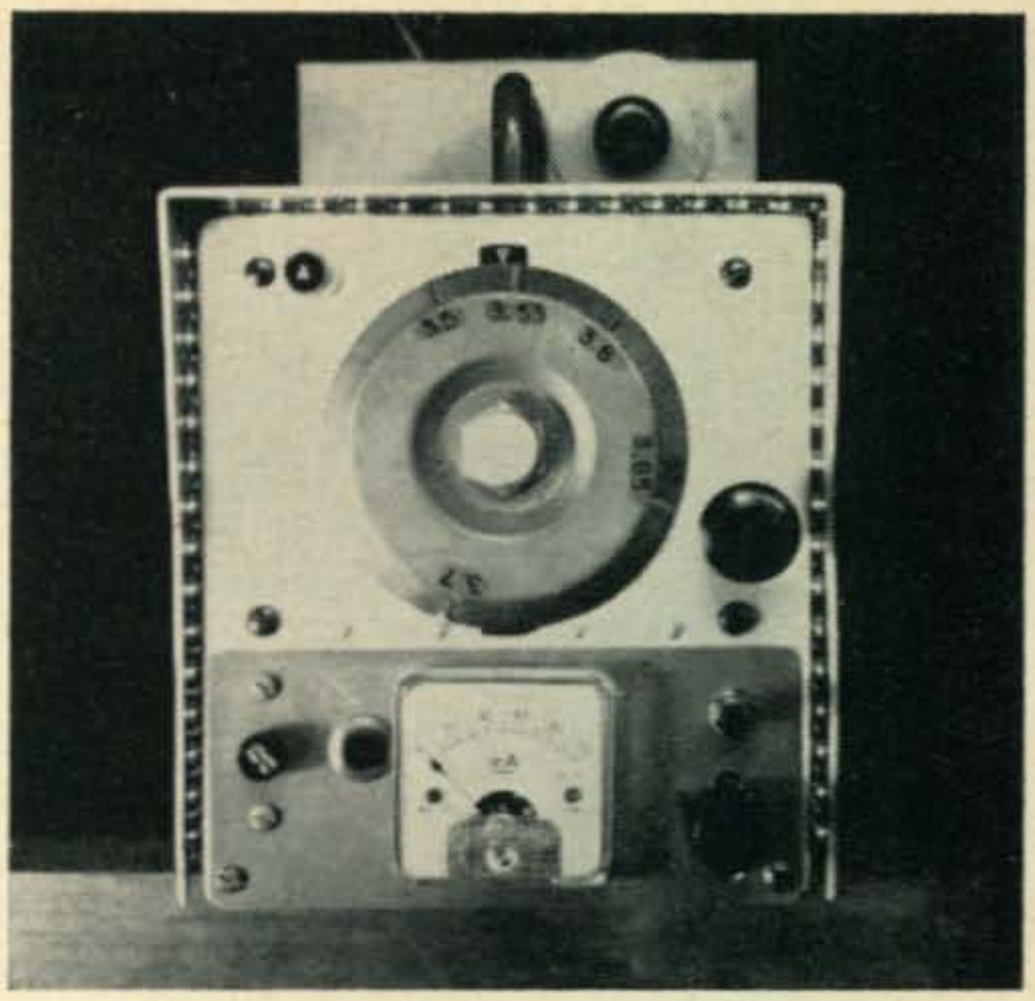
The ARC-Port

A Portable 80M Transmitter-Receiver Using the ARC-5 Receiver



Front view of the Arc Port, an 80 meter transmitter-receiver. The knob to the lower right of the meter is the V.F.O. FREQUENCY. Above this is the volume control. The p.b. to the left of the meter is the CAL. switch.

BY E. H. MARRINER*, W6BLZ

Using an 80 meter ARC-5 as a base, the author has added a small transmitter with 18 watts input. The receiver is modified and is bandspread to cover only the c.w. portion of the band. Included is a special time delay keying circuit and an antenna tuner to help match those non-descript vacation antennas.

FEELING dull, tired and wheezy after hours of yakking on that smoking sideband rig? Why not a change and do some building before you forget what the parts symbols mean. Get ready for your vacation or a field day. Here is a compact 18 watt c.w. transmitter on the back of an 80 meter ARC-5 receiver, which is a lot of fun to build. The receiver is modified a bit by replacing the old mica capacitors, bandspreading the c.w. band and putting in a crystal controlled b.f.o. These modifications give you all kinds of room under the chassis to vent your imagination on compacting a rig into one package, including the power supply.

About The Rig

Mounting the transformer on the back apron of the ARC-5 just left room for three tube sockets. Searching around for tubes in the transmitter, this combination seemed to be the only logical choice: The pentode section of a 6U8 was used for the v.f.o. driving an Amperex 6360 final amplifier. This tube is not a baby, it will handle 100 ma at 300 volts; however the v.f.o. only drives it to 65 ma plate current, fully loaded. It's a rugged tube and you don't have to worry about the plates getting red. The other socket was used for a voltage regulator.

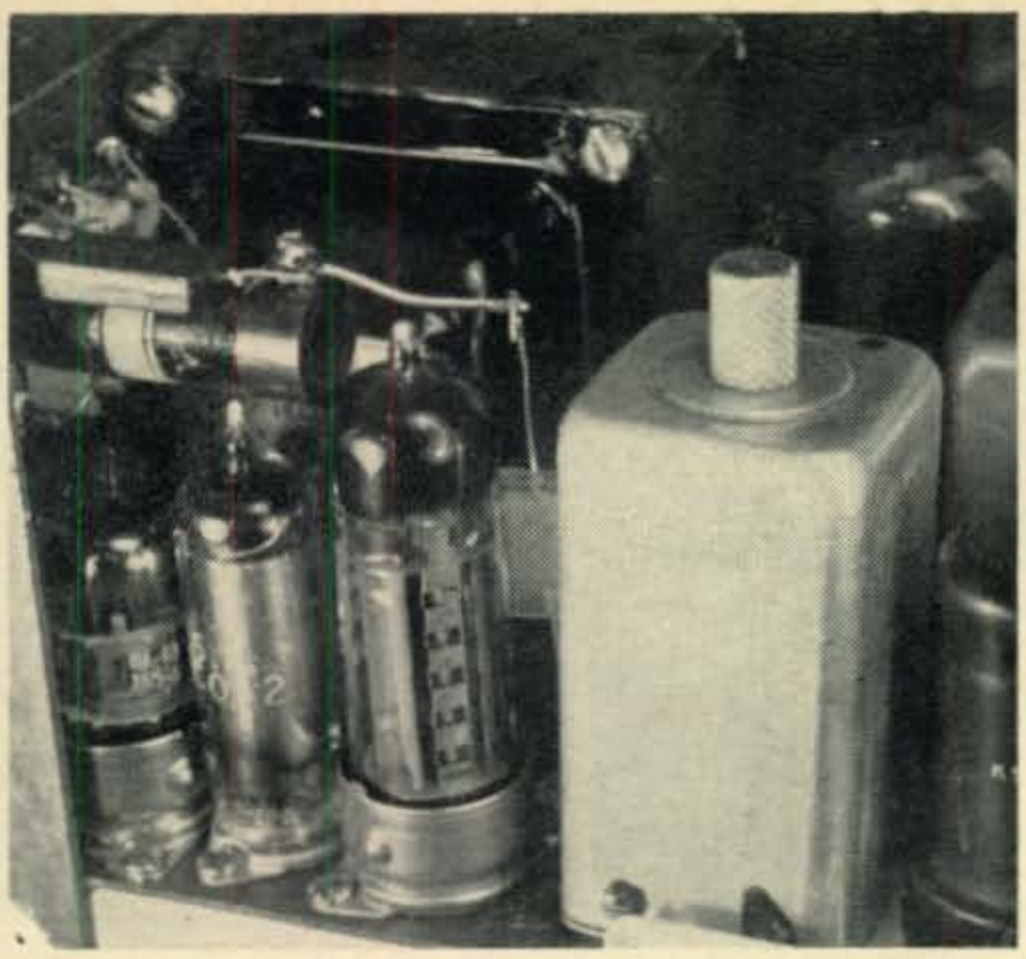
Being pushed for room, the v.f.o. coil and tuning capacitor was mounted up in the front compartment away from the heat. It just fits, and with the bottom cover plate on the chassis, enough room is left around the coil. This Hartley oscillator is solid both mechanically and in frequency stability. The stability is increased by leaving the grid circuit on 1.7 mc and doubling in the plate circuit to 3.5 mc. Small coax RG-174/U is used to connect the coil to the v.f.o. tube.

The voltage for the transmitter and receiver is switched with a relay to reduce the drain on the transformer. Using the triode half of the 6U8 as a keyer tube, voltage is supplied to the v.f.o. tube all of the time the 6360 cathode is being keyed. When you let go of the key, the voltages automatically switch to the receive position and the release time can be set for any interval of hold-in. In other words, to send, all you have to do is press the key. There are no switches to turn; the oscillator is on while you are keying, but goes off automatically when you stop.

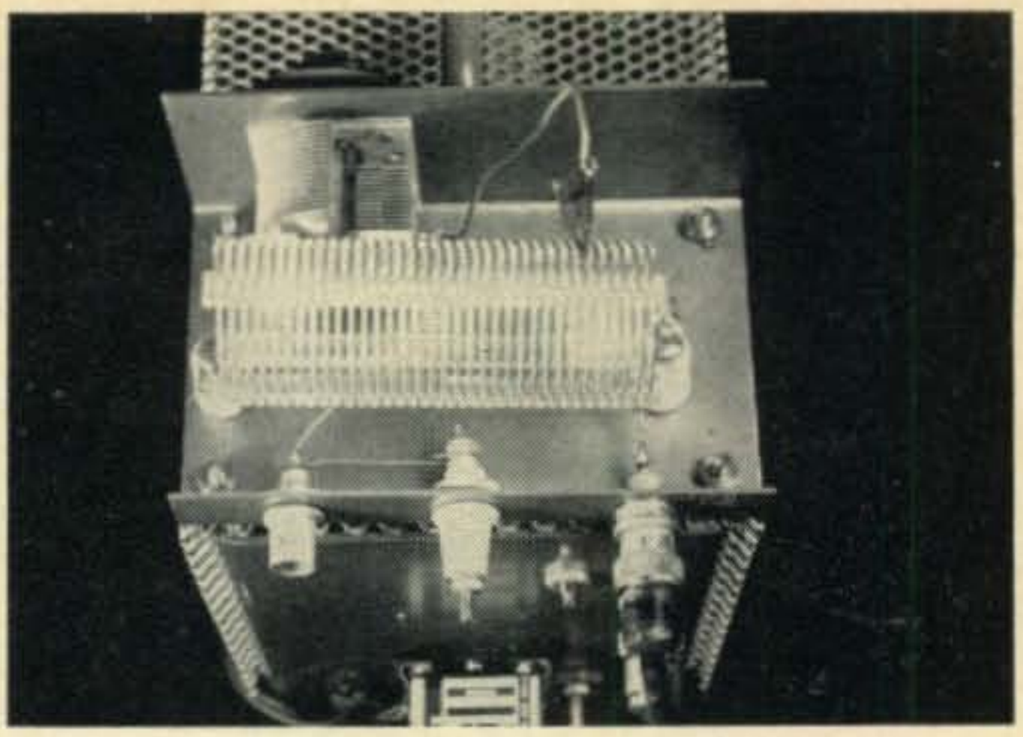
The final amplifier, the 6360, is tuned using a combination compression type capacitor and varying the slug on the XR-50 coil, to cover the whole 3.5 mc to 3.7 mc band. The compression type capacitor can be obtained with a shaft and knob and is the only tuning capacitor that will fit in the tight space at the back of the chassis. Everything seems to really fit snuggly and in an orderly fashion on the chassis.

The receiver portion is essentially the same

*528 Colima Street, Lo Jolla, California.



Side view of the rear section shows the three added tubes that comprise the transmitter. The power transformer is visible in the rear. The output coil, L_3, and the link winding, L_4, can be seen above the tubes and the compression trimmer is just visible behind the coil.



Rear view of the Arc Port shows the antenna tuner mounted on top. Note the keyer circuit battery on the bottom of the rear apron.

old ARC-5 except that it has been bandspread to cover the 3.5-3.7 range and a crystal b.f.o. has been added. All of the old mica capacitors were taken out and replaced with 0.02 mf micas. The process of removing all of these parts, especially the old b.f.o. can, leaves an amazing amount of space underneath the chassis for new parts.

Receiver Construction

Before starting, haywire a power supply together on the bench and check out the receiver to make sure that it is working. When you make changes modifying the wiring, check it from time to time and see if it still works. Without going into too much detail, the first things to change are the large mica capacitors. The wires can be traced back to their source, clipped and a 0.02 mf ceramic soldered in its place. The output transformer can be changed and the new one mounted on the side of the chassis and at the same time make sure to put a 0.005 ceramic capacitor from the plate of the 6V6 (or 12A6) audio output to ground to replace the one removed. This prevents transients from breaking down the transformer insulation and also prevents audio oscillation.

Now after all of this modification and the receiver still says "A OK," you can try to bandspread the receiver. Leaving three rotor plates in the tuning capacitor will spread the band from 3.5 to 4.0 mc. If you are strictly a c.w. nut, just one plate on the rotor is all that is needed. This is not too hard to do but just don't lose the 80 meter band in the process. A signal generator will help but is not absolutely necessary; a 3.5 kc crystal marker is just about needed. One plate will spread the band from 3.5 mc to 3.7 mc and a slight change in capacity will shift the dial. The final check should be made with the cover over the tuning capacitor.

Here's how to go about the change. First remove the slotted plate on each of the sections. Next unsolder the brace on top holding all of the rotors together. To get the plates out here is the magic formula. Wiggle each plate back and forth 50 times with long nose pliers and then give a downward push and it will roll right out. Keep your left hand on the shaft to prevent it from moving or the ball bearings will come out and its no fun to get them back in place. Now put a 82 mmf silver mica capacitor across the oscillator and mixer coils. Across the antenna coil section, put a 62 mmf silver mica. This one has to be a little less because it has the small variable plus any capacity of the antenna.

Somewhere along the line the b.f.o. transformer can be removed and a crystal b.f.o. wired in. See fig. 1.

Power Supply

After you are satisfied with the performance of the receiver based on its operation with a temporary supply, we can proceed with the rear deck work. A plate, shown in fig. 2, can be made to cover the rear deck after the deck has been nibbled out to within ⅛" of the chassis edge.

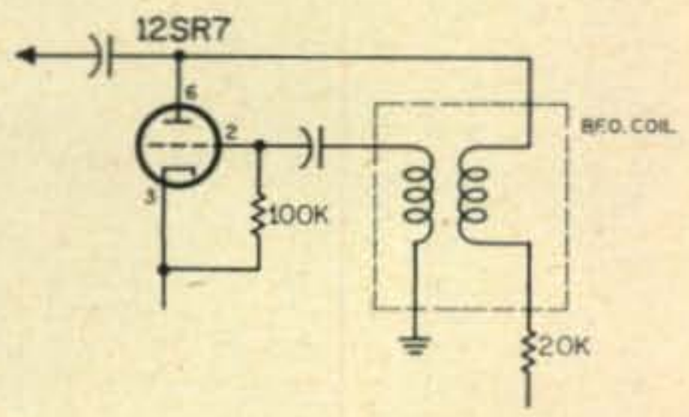


Fig. 1—Original ARC-5 b.f.o. circuit and the modified crystal controlled version. The r.f.c. is a Miller #4652 and the crystal is an International FA-9 pig tail type cut to 1416 kc.

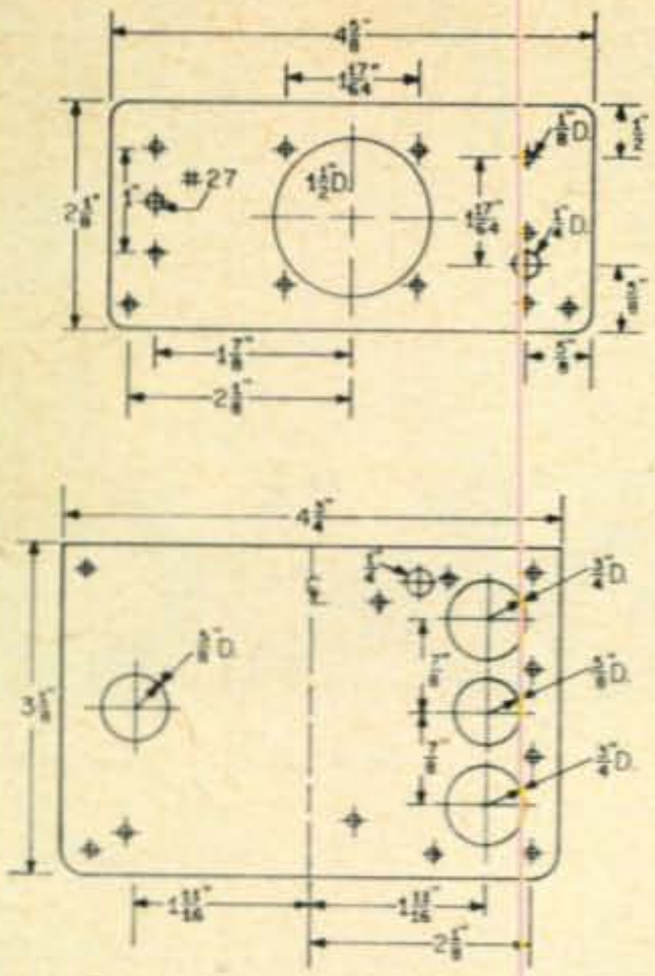


Fig. 2—Dimensions of the front and back plates for the ARC-Port.

The supply voltage to the receiver section was reduced to 250 volts through a 3.5 k, 10 watt resistor. This is shown in fig. 3. The screen voltage is reduced to 100 volts through a 25k series resistor. Since the 6K8 triode section (receiver local oscillator) was hooked up to the regulator tube for a steady voltage, the variation on the screens due to plate current drain at various gain settings was not stabilized with a bleeder arrangement.

A small loudspeaker of the type used in transistor radios was mounted over the 6SK7 tube. Its rating of 0.25 watts doesn't seem to be a problem. It's loud and sharp for c.w. with its limited frequency response. An output transformer, 5k to 4 ohms is mounted below chassis as shown in the photographs.

Transmitter Section

First wind the v.f.o. coil, tapping it six turns up from the bottom end. I scraped the wire and twisted it together and then brought the pig-tail over to a terminal which was made by tapping a 4-40 screw into the base of the form. Coax cable (RG-174) was used to connect the coil to the tube socket. A 410-20 mmf silver mica capacitor was used as a padder across the 100 mmf variable tuning capacitor. With this combination the tuned circuit should hit 1.7 mc with the bottom cover in place. The coil can be mounted an equal distance between the chassis and the cover..

It is probably easier to wire the v.f.o. and 6360 amplifier tube before tackling the keying

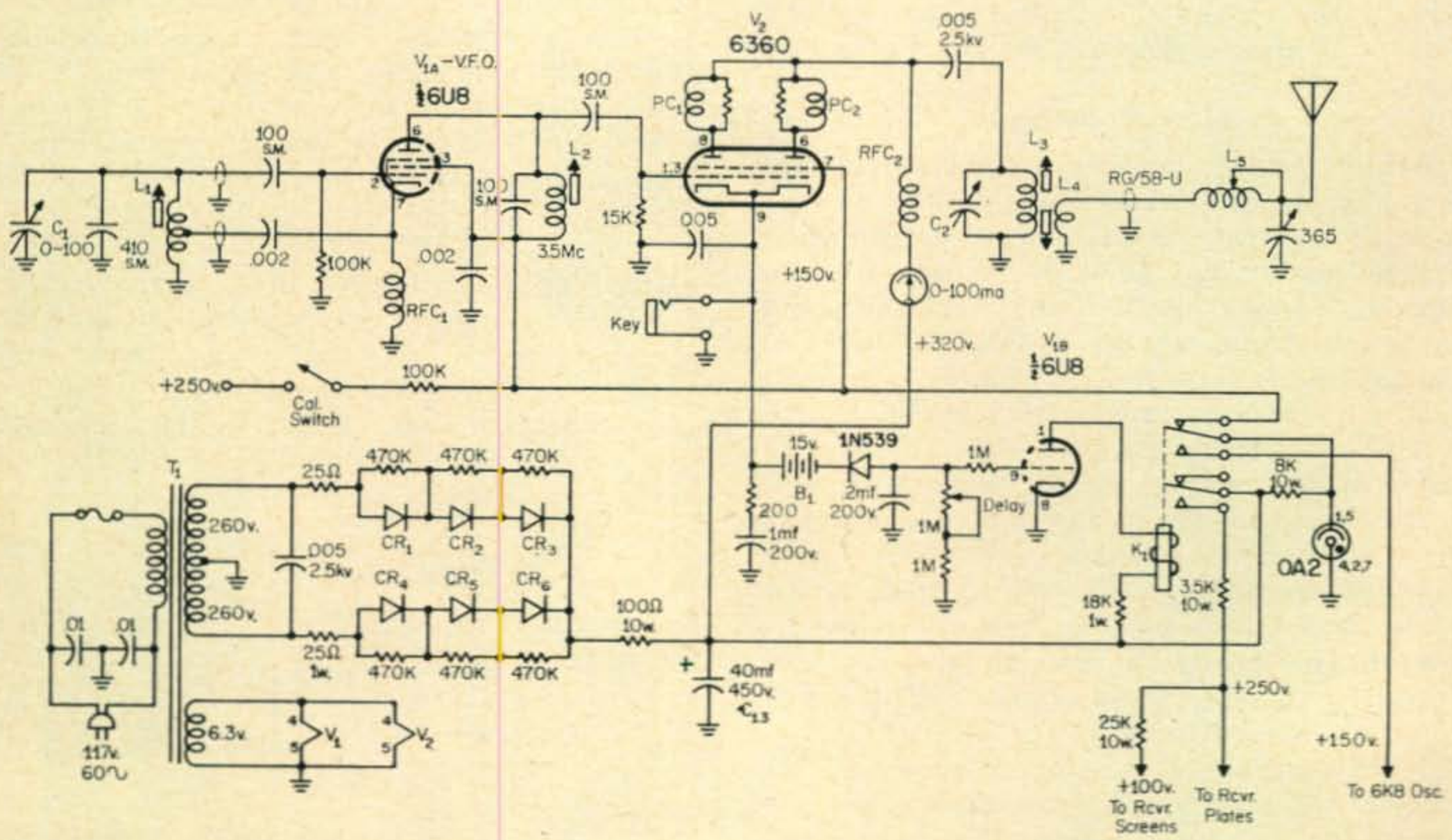
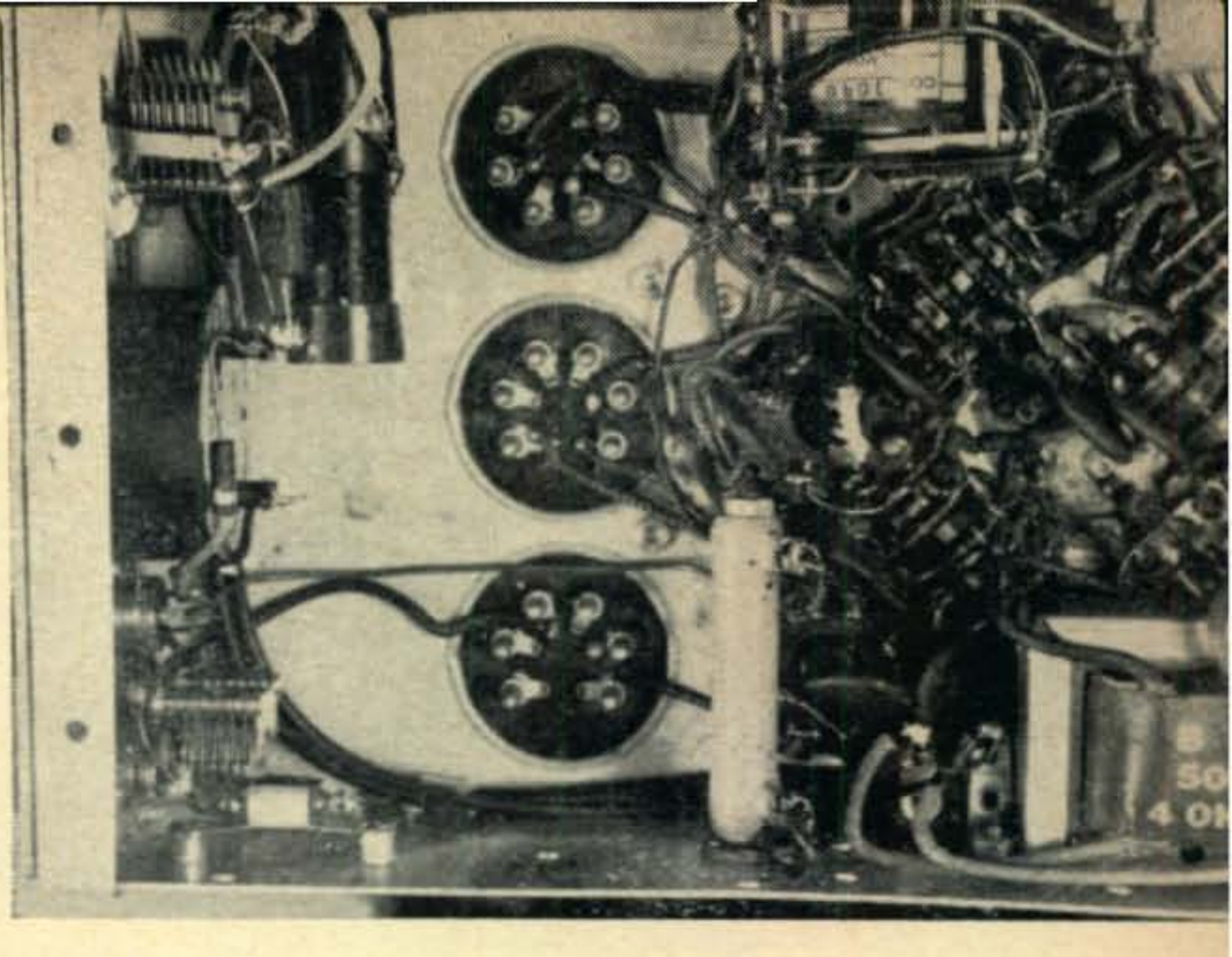


Fig. 3—Circuit of the transmitter, power supply and keyer that, when added to the ARC-5 receiver, makes up a neat 80 meter vacation portable. All resistors are ½ watt unless otherwise noted; all capacitors greater than one are silver micas in mmf and less than one are disc ceramics in mf unless otherwise noted. The 1 mf and 0.2 mf in the keyer circuit should be low loss mylar types.

B_1—15 v. battery Burgess type Y10.
C_1—100 mmf, A.P.C. type with ¼" shaft.
C_2—65-340 mmf El Menco L-30 compression trimmer.
CR_1-CR_6—0.25 amp 400 v. p.i.v. diodes.
K_1—D.p.d.t. relay with 10K coil.
L_1—38t #26 e. tapped 6t up from ground, wound on National XR-50 form.
L_2, L_3—38t #26 e. wound on National XR-50 forms.
L_4—5t link of hook-up wire wound on cold end of L_3.
L_5—3½" length of Airdux #1010. (1¼" dia., 10 t.p.i.).
PC_1, PC_2—5t #20 tinned wire on a 47 ohm ¼ watt resistor.
RFC_1—2.5 mhy ferrite choke. Miller #6302 or equiv.
RFC_2—0.62 mby ferrite choke. Miller #4650 or equiv.
T_1—260-0-260 at 90 ma, 6.3 v. at 3 a. Stancor PC-8404 or equiv.

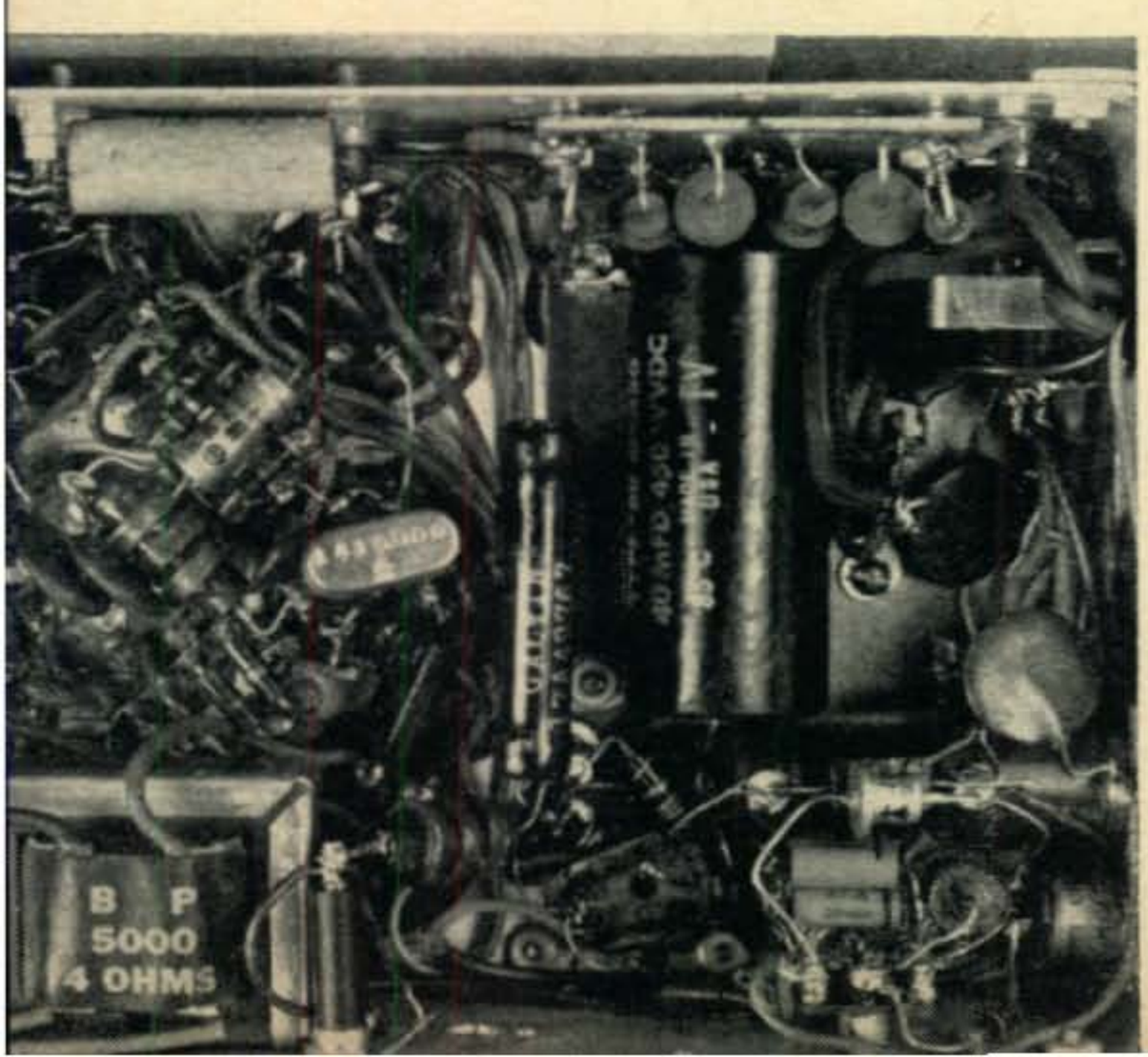


Bottom view of the front section of the modified ARC-5 with the coil bank removed shows the v.f.o. tuning capacitor in the upper left corner with its XR-50 coil form to the right of it. The relay, K_1, may be seen in the upper right corner.

circuit and it leaves more room to work under the chassis. The plate circuit of the 6360 is mounted topside, and a compression type capacitor is used for plate tuning. This capacitor can be obtained with a shaft if desired, or if you have to use the screw slot type a washer can be glued on for a knob. Using the combination of the compression type capacitor and the slug adjustment, the range will cover 3.5 mc to 3.7 mc, doubling in the plate circuit.

I find the keying circuit handy although many may want to use either a small toggle switch or a relay to change the voltages from transmit to receive. Using the keyer circuit, the relay is energized in the RECEIVE position to make a more fool-proof circuit. The advantage of the keying circuit is there is no switch to flip when you transmit. Just press the key and send; when you let go, the receiver comes back on after a delay determined by the setting of the 1 meg delay control which is mounted at the back of the chassis. It is a subminiature type potentiometer. The small 15 volt battery mounts on the back of the rig in modified fuse clips for easy replacement. The drain is very light and should last the shelf life of the battery; ours has been in for months.

There is no trouble with the keying circuit once it is built. The value of the series plate resistor was set at 18K as this permitted enough current flow to close the 10K d.c. relay. Relay coils other than 10K might need a different value series resistor. Also the keying 1N539 diode was used because of its high back resistance and low leakage to prevent the charge from draining away on the 0.2 mf holding capacitor. There may be other diodes that will work just as well but of the several tried, this one seemed to do the job best. A Mylar 0.2 mf should be used here as it has low leakage and worked out right. Other types might have more leakage. I set my delay to hold the v.f.o. on between words.



Testing

Most of the adjustments probably were made by the constructor as he went along but here is how I did it. When the v.f.o. and 6360 were wired up and finished I temporarily put on the bottom cover and set the dial to 3.5 mc. The slug was tuned for zero adjustment on the v.f.o. coil and then shifted to about 3550 kc where the plate coil was peaked up for maximum drive and output. The final tank circuit was link coupled direct into a 50 ohm carbon resistor for this adjustment and a field strength meter watched for maximum indication at this frequency.

The grid circuit of the 6360 should draw about 2 ma which is all that could be obtained from the v.f.o. Normally the 6360 uses 3 ma of drive to obtain 100 ma plate current. We could get 65 ma with 2 ma drive. More could be obtained by experimenting with the tap on the v.f.o. coil in conjunction with varying the grid resistor in the v.f.o. and 6360. Increasing the screen to its normal 200 volts does not seem to improve anything. A little more could be squeezed out by using capacitor input filter but the difference in signal strength does not seem worth the regulation trouble.

The output of the final is coupled to an L network on top of the chassis. The idea is that any length of wire might be used when on vacation. In a motel, a 25 foot length is about all you can hang in the room while in a mountain cabin you could get quite a long run. You will have to experiment for the number of turns for your particular installation. Using 60 feet of wire strung out the window, I found the coil, tapped six turns from the coax input end, loaded it up to 65 ma when the capacitor was peaked. This is 18 watts input.

[*Continued on page 100*]

Bottom view of the rear section of the 80 meter portable transmitter receiver. The upper right corner is occupied by the power supply with the diodes mounted on a board against the chassis flange. The key jack is located in the upper right corner also. The bottom right hand corner contains L_2 and the miniature delay pot for the keyer circuit. The new receiver output transformer is in the lower left of the chassis.

More Output From Your Hammarlund HX-50

BY MOE JOFFE,* W2BNY

An increase input to the final, from 90 watts to 135 watts is possible with some simple modifications described below. Also given are the simple steps to reduce the idling current to about 5 ma.

RECENT experiments with the HX-50 Transmitter have indicated that more power output is possible by making a few simple changes. In its present form, the HX-50 Transmitter/Exciter is capable of 90 watts d.c. input to the final amplifier on s.s.b. and c.w. which is sufficient power to drive most linear amplifiers. However, an increase to 135 watts d.c. input is readily possible. To do this the following steps are necessary.

1) Substitute for the 6DQ5 output tube an 8236 tube manufactured by Tung-Sol.

2) Substitute a home-made silicon rectifier plug-in unit in place of the 5R4GYB rectifier tube (V_{108}).

The 6DQ5 tube can be replaced directly with the 8236 which has a carbon anode. The plate dissipation of the 6DQ5 as a horizontal deflection amplifier in TV service is 24 watts. The plate dissipation of the 8236 has a rating of 60 watts ICAS. Thus, with the new tube, the load current may be increased to 225 ma and the power input to the final amplifier thereby increased to 135 watts. This corresponds to an r.f. output of 75 to 90 watts.

The HX-50 presently employs a 5R4GYB rectifier tube in the high voltage power supply. This tube should be removed and a silicon rectifier plug-in unit constructed and plugged into the tube socket in place of the 5R4GYB. This plug-in unit can be made by using the base of a defunct tube and connecting a combination of six 470K, ½ watt resistors and any six 600 volt PIV-750 ma diodes to it as shown in fig. 1. The diodes must be soldered across the proper pins to simulate the elements of the 5R4GYB tube. To be safe, three diodes should be wired in series with each leg. The arrangement increases the plate voltage approximately 50 to 60 volts and. in addition, results in better regulation.

Idling Current

Now, another little hint to improve you. HX-50. In recent production of the HX-50 Transmitter/Exciter, a modification has been made to reduce the standby current of the 6DQ5 amplifier from 50 ma to approximately 5 to 10 ma. This increases the life of the tube and at the same time reduces the heat generated within the enclosure. If your set bears the production code #4 next to the serial number, the modification has been made in it. If not, and you would like to include it, this can be done very easily and is applicable whether or not you have changed the output tube. Simply proceed as follows:

1) Unsolder the ground end of resistor R_{142} (3.9K, 1W) located near the BIAS ADJ potentiometer.

2) Add a 6.8K, 1W resistor between the open end of R_{142} and ground.

3) Add a piece of hookup wire (7½ inches long) from the junction of R_{142} and the 6.8K resistor to the terminal of relay K_{102} to which a brown wire is already connected. This relay is located at the side of the chassis in the vicinity of the power transformer.

With the above modification, the final plate current in the STANDBY position, or under the condition of no modulation in the VOX position, will normally be in the order of 5 to 10 ma.

To set or check the normal operating bias of the 6DQ5 (or 8236) tube proceed as follows:

1) Set the OPERATION control to MOX and the FUNCTION control to USB (or LSB).

2) With no modulation, adjust the BIAS AJD potentiometer (R_{143}) for a cathode current reading of 50 to 60 ma.

You will find the above modifications easy to make and extremely worthwhile. The life of the output tube will be longer and the output of the HX-50, running barefoot or used to drive a linear amplifier, will be increased to 75 to 90 watts for s.s.b. or c.w. operation. ■

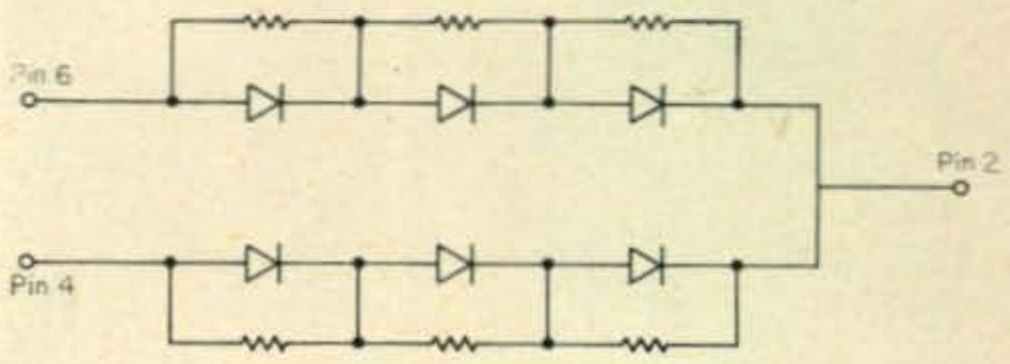


Fig. 1—Circuit arrangement for the diodes used in the plug-in unit to replace the 5R4GYB. Each diode is rated for 750 ma with a p.i.v. of 600 volts. The equalizing resistors are each 470K, ½ watts.

*100 Prospect Avenue, Hackensack, New Jersey.

A Transistorized HV-LV Mobile Supply

BY MURRAY GELLMAN*, K2CBO

Here is a compact, inexpensive d.c. to d.c. converter that can be assembled for under fifty dollars. It is a simple construction job, a reliable performer and provides a versatile set of output voltages with generous current ratings. In brief, it is ideal for that mobile s.s.b. rig.

THIS versatile compact d.c. to d.c. converter has many applications. It is suitable for mobile operation, field days and vacation camping trips; in short, just about what all d.c. to d.c. converters are used for. It weighs less than three pounds and is built in a 4" × 6" × 8" chassis.

The unit uses two oscillator transformers. Transformer T_1 serves for the low voltage outputs of 100 volts and 250 volts. If desired, only this section may be built to power a mobile receiver or replace vibrator type power supplies of older type receivers. Transformer T_1 is potted and the terminals are suitable for printed circuit techniques or conventional wiring approaches. The entire low voltage power supply, namely T_1 and Q_1 and Q_2 run completely cool and the design is suitable for continuous duty.

The larger transformer, T_2, provides the high voltage for the transmitter, 800 volts. This supply, as designed, is only suitable for intermittent operation. This is adequate for a.m. and more than adequate for s.s.b. For continuous duty four transistors are required in the oscillator circuit rather than the two shown in fig. 1 and the use of more generous heat sinks would also be required. The transformer ratings are adequate to serve for continuous duty.

The power supplies exhibit excellent starting characteristics and operated faithfully in environmental tests in temperatures ranging from 15° C to +60° C. Reliable starting is enhanced further by the sequential relay control system to be discussed later.

To make the entire package more enticing, it is a simple construction job as well as a reliable performer and provides of a set of flexible output voltages with adequate current ratings.

Circuit Description

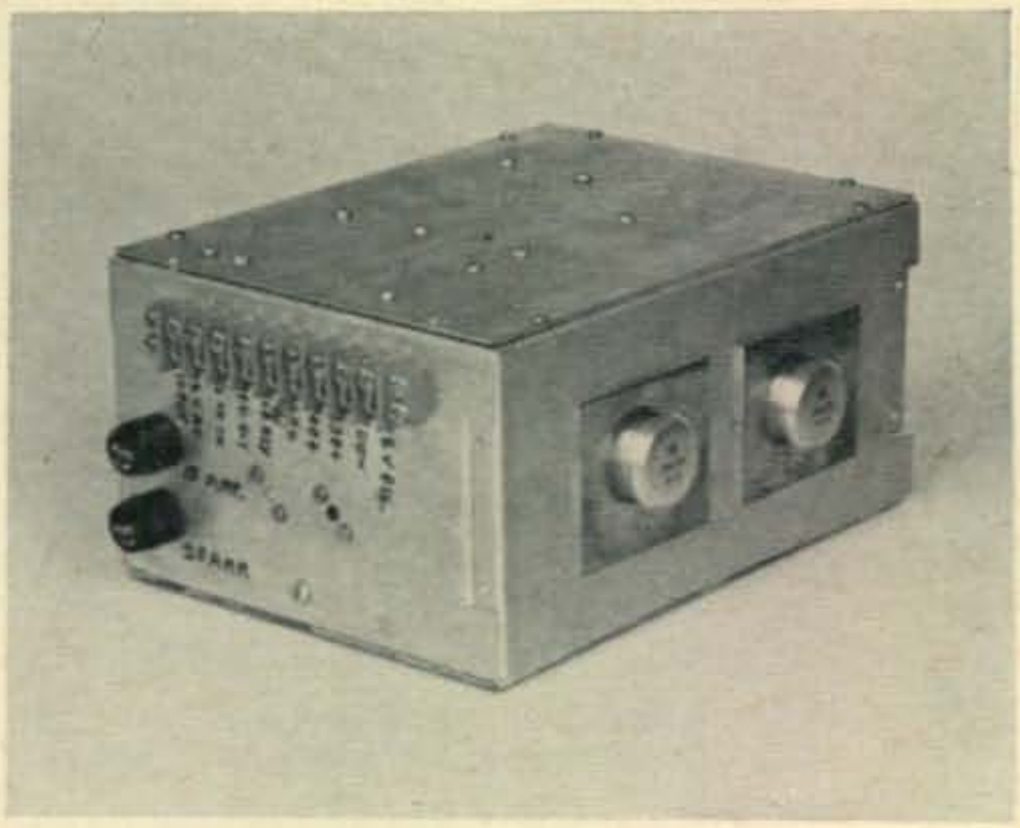
The theory of operation for d.c. to d.c. converters has been covered many times before and need not be covered again here.[1] Merely describing the circuit features should be adequate to convince you that this is the supply for you.

Low Voltage Section—The oscillator section employs two low cost Motorola transistors in what may be described basically as a multivibrator. The plus 12 to 15 volt input is applied to the emitters of Q_1 and Q_2 when K_1 is energized. Voltage is also applied to those filaments connected to the terminal marked FILS.

The pi-filter consisting of L_1 and the two 50 mf capacitors serves a dual purpose. It acts as a hash filter and prevents switching transients from the oscillator from spreading through the receiver via the filament circuit. It also acts to prevent pulses and transients from the automobile regulator circuit from entering the power supply.

The two secondary windings 3-4 and 5-6 provide square wave outputs of 100 volts and 250 volts. The 100 volt winding is used for the bias

[1]Practical Design of a D.C. to D.C. Converter, *CQ*, May 1963, P. 29.



View of the d.c. to d.c. converter package. It measures 4" × 6" × 8". The transistors shown are Q_3 and Q_4, used in the h.v. section. The copper plate heat sinks are clearly visible. The two transistors for the l.v. supply are on the left side plate and not visible.

*1268 East 12th Street, Brooklyn, N. Y. C., New York.

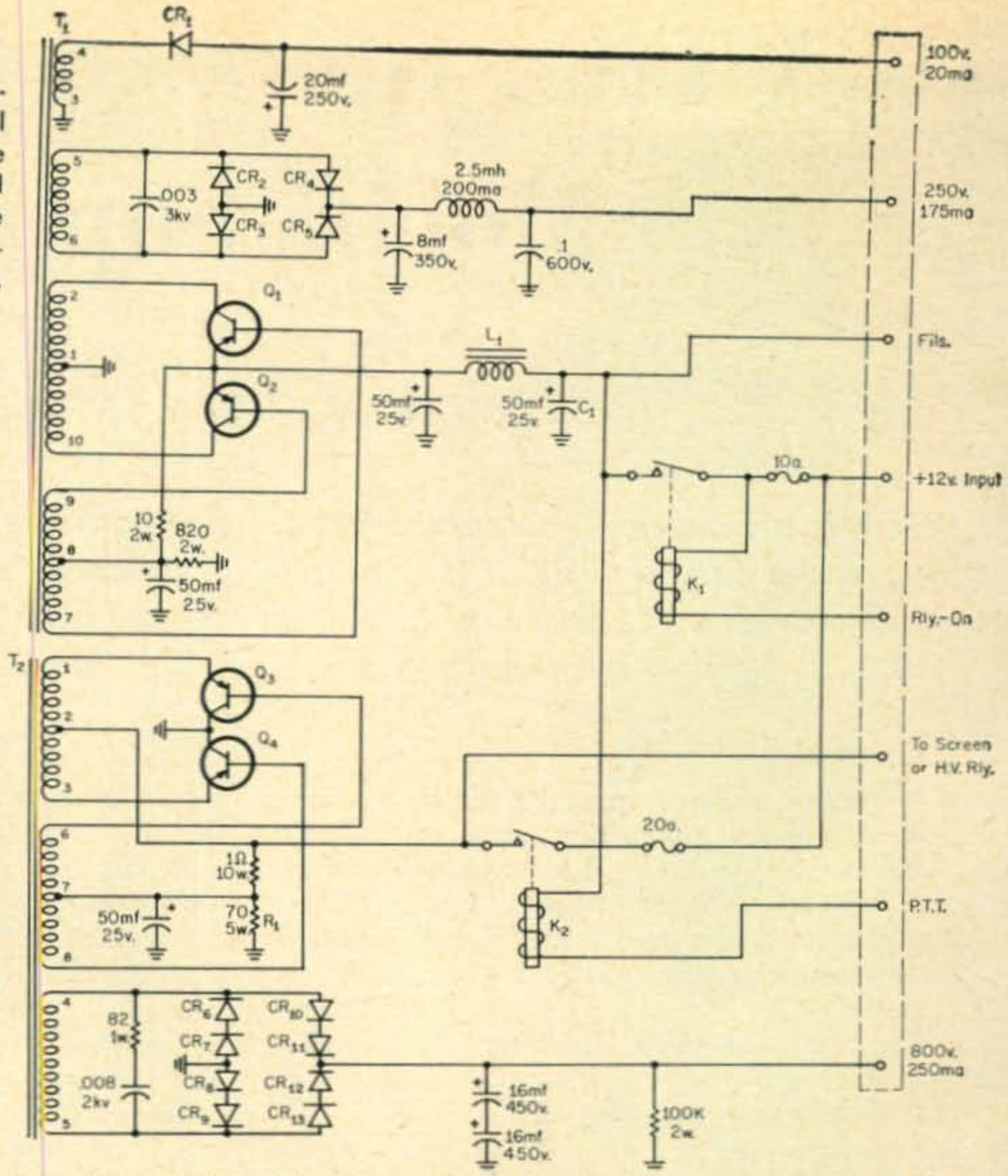


Fig. 1—Circuit of the dc. to d.c. converter suitable for handling a small s.s.b. transceiver. All capacitors are in mf. Filter L_1 is wound as directed in the text. The transformers are available from Sydmur, POB 25, Midwood Station, Brooklyn 11230, N.Y.C.

CR_1 to CR_{13}—Sarkes Tarzian F6 or equivalent—500 ma, 600 V p.i.v.
K_1, K_2—S.p.s.t. relay 12 v.d.c., Potter Brum., MB3-D.
Q_1, Q_2—Motorola 2N442.
Q_3, Q_4—Motorola 2N278.
T_1—250 v.a.c. at 125 ma and 100 v.a.c. at 20 ma. Sydmur #25-1.
T_2—800 v.a.c. at 250 ma, Sydmur #85.

supply. Simple half wave rectification with a little filtering suffices. Not much filtering is needed, even for half-wave rectification since the oscillator frequency of this circuit is in excess of 2,000 cycles.

The 250 volt winding output is fed to a bridge rectifier circuit. A 0.003 mf three kv buffer capacitor is placed across this winding to absorb switching transients that could cause the peak voltage to rise above the ratings of the diodes. The output ripple frequency of the full-wave bridge circuit is twice the input frequency or in excess of 4000 cycles. This does not place a great demand on the filter circuit and it can be quite moderate. The filter "choke" is really an r.f. choke that acts to suppress hash rather than to filter in the conventional sense. The 8 mf provides all the filtering needed and the r.f. choke and the 0.1 mf form an L filter for the hash.

High Voltage Section—This portion of the power supply operates only when relay K_2 is energized by the push-to-talk switch. As a result there is an economy insofar as useless power drain from the *A* line is concerned. The oscillator circuit (Q_3, Q_4) is in the grounded collector configuration despite the increase in design problems for T_2. The major advantage is that a most efficient heat sink can be arranged when there is no need to insulate the transistor case from the sink or chassis .

The output winding produces 800 volts at 250 ma and is fed to a bridge circuit. Here, eight diodes are used, two in each leg. The series combinations are used to provide an adequate p.i.v. rating for each leg. The diodes are matched closely enough so as not to require equalization with 470K 1 watt resistors. If you are a purist and wish to equalize them, go to it.

Note that this winding also has a buffer capacitor; it too serves to absorb switching transients to protect the diodes.

The oscillator section of the h.v. supply operates at about 600 c.p.s. and a single section 8 mf is adequate for filtering and provides good dynamic regulation. However, the 8 mf is composed of two 16 capacitors placed in series for an increased voltage rating. Again, equalizing resistors may be used if desired by making up the bleeder of two 50K resistors, one across each of the electrolytics.

Control Circuit

The opening statements of the discussion of the h.v. section indicated that there are some

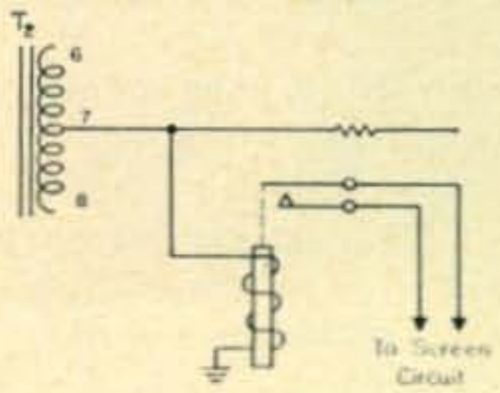
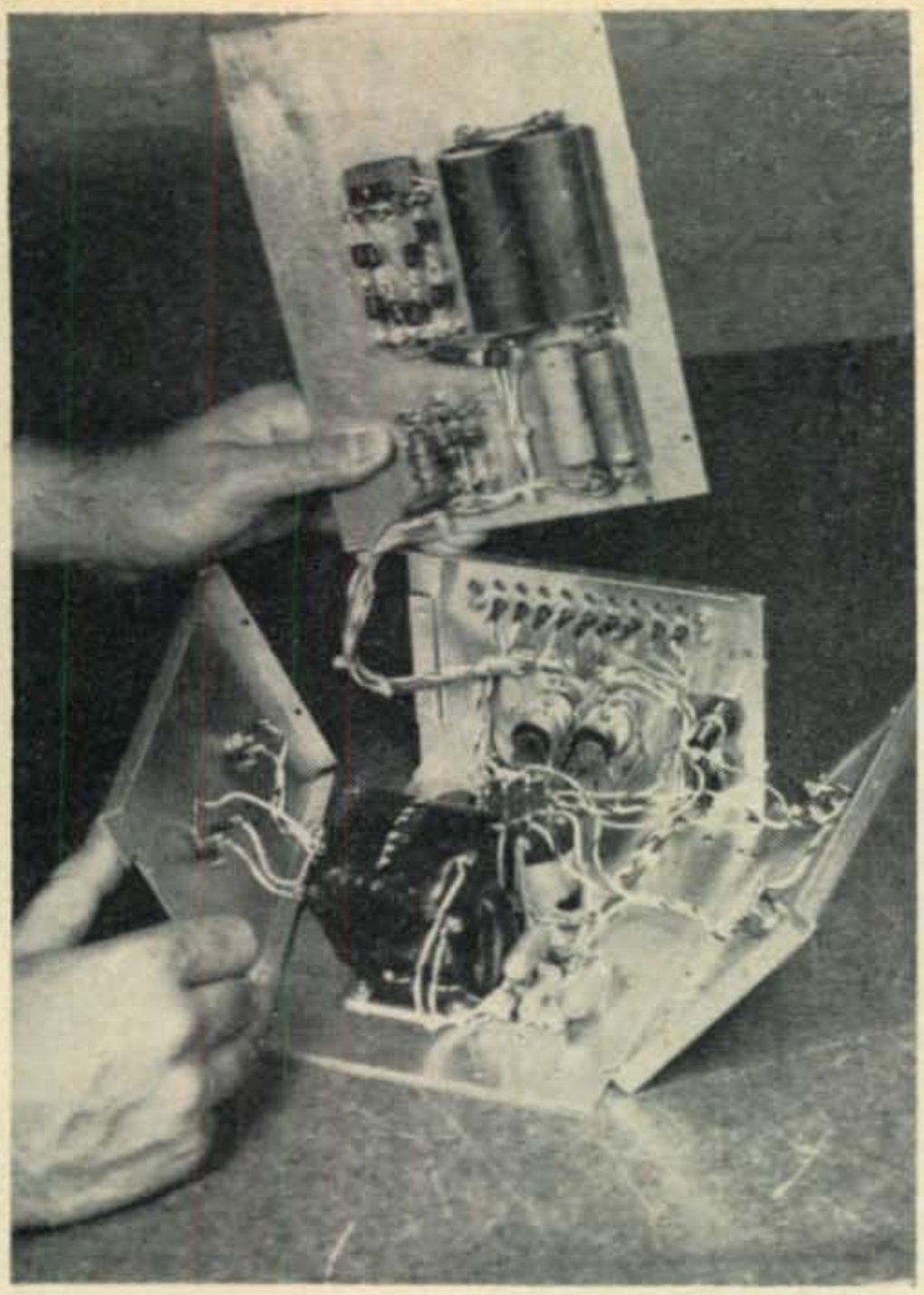


Fig. 2—Addition of relay K_3 to the high voltage section, as shown above, can help insure trouble free starting under all conditions.



Exploded view of the d.c. to d.c. converter. The two transformers are on the bottom plate with T_2 in the foreground and T_1 just to the rear. The relays, K_1 and K_2, are on the control panel and the diodes and filters are mounted on the top plate.

supplies of this type that run the h.v. section continuously, at a waste of power. The reason it is done is to overcome the starting problem. It makes as much sense as never shutting off your car engine because it is sometimes hard to start.

The starting problem can be overcome in several ways. First, proper design permits starting over a wide temperature range. After temperature considerations, the next is to prevent the circuit from having to start with a heavy or low impedance load placed on the output. This heavy load is placed on the supply inadvertently, in most instances, by poor timing. The screen voltage of the final p.a. is derived from the 250 volt output of the low voltage section. Thus, the screen voltage is on constantly. To operate the final a blocking bias is removed. Now, with no blocking bias and full screen voltage, the power supply sees a low impedance load and starting is sluggish or impossible.

This is simply prevented by a sequential control system that can be followed in fig. 1. Power is applied to the input but goes nowhere until K_1 is energized by the ON-OFF switch. This, incidentally, permits the remote location of the power supply since the switch leads can be made as long as you like. Energizing K_1 places voltage at one end of the K_2 relay coil. When the press-to-talk switch is depressed it grounds the remaining side of the K_2 coil energizing it. This fires up the h.v. section and places plus 12 volts at a terminal where it can energize a screen voltage relay or a relay that fires up the power supply for a linear.

An even more foolproof system is shown in fig. 2. Here, a relay whose winding resistance is equal to R_1 is inserted instead of R_1. As the oscillator bias is applied, relay K_3, pulls in and applies screen voltage to the final. It closes somewhat slower than K_2 because of the delay of the 50 mf, thus affording even more time for the oscillator to start before the load is applied.

Construction

The entire power supply is built on a 4" × 6" × 8" Sezak chassis or equivalent. This size can be reduced somewhat by more careful planning but it is always nice to have that extra inch if possible.

In the low voltage power supply, the two transistor cases (the collectors) must be insulated from the chassis. Two Cinch Jones anodized washer kits (Model 2W2) or equivalents are employed for this. Use liberal applications of silicone paste to assure good heat transfer. The cases of transistors in the high voltage section can be grounded directly and copper plates 2¼" × 2¼" × ⅛" are adequate for heat sinks. Here, too, liberal applications of silicone grease are needed. If commercial heat sinks are desired, Augat Bros., type #9009-1G1 or equivalent are suitable.

Inductor L_1 consists of one layer of #22 E. wound on a 2" length of ⅜ diameter ferrite rod. The ferrite rod is from a b.c. antenna.

Layout the panels. Drill and deburr all holes especially around the transistors. Mount the diodes across terminal strip as shown in the photos. Put a loop in the pigtail of each diode to act as a small heat sink.

Mount the transistors and the barrier strip, insulating each of the lugs that pass through the chassis with spaghetti.

Wire the panels separately leaving 2 foot leads to tie into the main chassis plate and control panel. Cut the leads to size and cable with lacing cord or plastic clamps.

Parts locations are not critical except for C_1. This capacitor *must* be placed at the relay contact to prevent radiation of hash.

All A plus wiring should be done with #16 wire while the rest of the circuit can be completed with #20 or 22.

When completed, the entire cabinet should be sprayed with a zinc chromate undercoat and then a coat of flat black. This includes the transistors but not the barrier strip or fuse holders. The undercoat may be dispensed with if the chassis is thoroughly cleaned with alcohol to remove all grease. ■

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

Part V

This series began with a coverage of the basic fundamentals of RTTY, the Teletype code, Teletype machines, On-Off signals and f.s.k. This installment covers some of the basic circuits used for f.s.k. and two-tone circuits.

PART four of the RTTY series concluded with an explanation of the f.s.k. system. This installment discusses the actual f.s.k. circuitry used in the v.f.o. section of transmitters, and also discusses two tone circuits.

Unfortunately, practically no transmitters make provisions for frequency shift keying, even the expensive ones. An exception to this was the Central Electronics 100V and 200V transmitters. They not only provided for f.s.k. but made the frequency shift variable by the simple turn of a knob on the front panel. Hammarlund is now manufacturing a transmitter that provides for f.s.k. It is hoped that this neglect will be corrected by all manufacturers in the near future.

F.S.K. Circuits

There is no standard f.s.k. circuit that is equally adaptable to all transmitters. The circuit will vary, depending upon the transmitter. Basically, most of the circuits depend upon the addition or removal, during the keying process, of a small value of capacitance or inductance in the v.f.o. or crystal oscillator circuit that will shift the transmitter frequency the required amount. Some of the circuits are very simple. In fact, none of the more common ones are too complicated or very difficult to add to most transmitters.

It is not within the scope of this text, nor practical, to give circuits for converting specific commercial transmitters to f.s.k. The basic circuitry is covered here so that the individual operator may choose the method best suited for his particular transmitter.

In the early days of RTTY, the 6AL5 (dual diode) tube was used extensively in the "diode switching" of f.s.k. circuits. However, with the rapid development of solid-state devices, the crystal diode has replaced the tube in most f.s.k. circuits. It is generally conceded that the average ham is familiar with the germanium diode or at least its action as a rectifier or detector. Fortunately, the practical application of the diode to "switching" in f.s.k. circuits is neither more complicated or involved than rectifier action.

The operation of the solid state or semiconductor diode is described in terms somewhat different than used in vacuum tube diodes. The vacuum tube and semiconductor diode symbols are shown in fig. 30 (A). When the diode is biased so as to conduct, as shown in fig. 30 (B), it is said to be *forward* biased. When biased with a polarity that prevents conduction it is said to be *reverse* biased.

In a vacuum tube, when the plate is made negative with respect to the cathode, so little current flows that for all practical purposes we can say that reverse current does not exist. However, in the solid state diode this is not so. Due to minority carriers, when the semiconductor diodes are reverse biased, a small current *does* flow. This reverse bias current is generally considered undesirable and is referred to as leakage current.

The basic circuit of f.s.k. by means of a diode

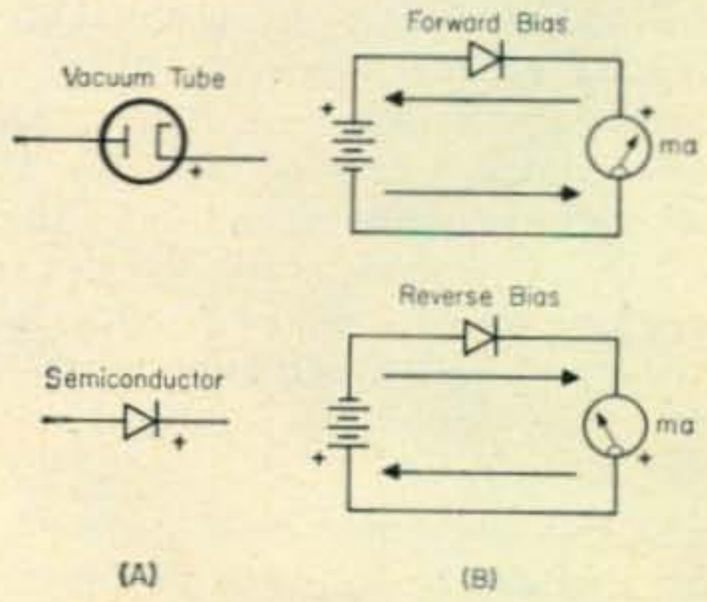


Fig. 30—(A) Comparison between the vacuum tube diode and semiconductor symbol. The terminal marked + on the semiconductor is the equivalent of the cathode. The arrow of the semiconductor symbol points *against* the direction of electron flow. (B) shows the heavy current flow when the diode is forward biased and the very slight current when the diode is reverse biased. Note carefully, the *directions of current flow* in each example. When reverse biased the leakage current flows in the opposite direction.

*6906 Kingsbury Drive, Dallas 31, Texas.

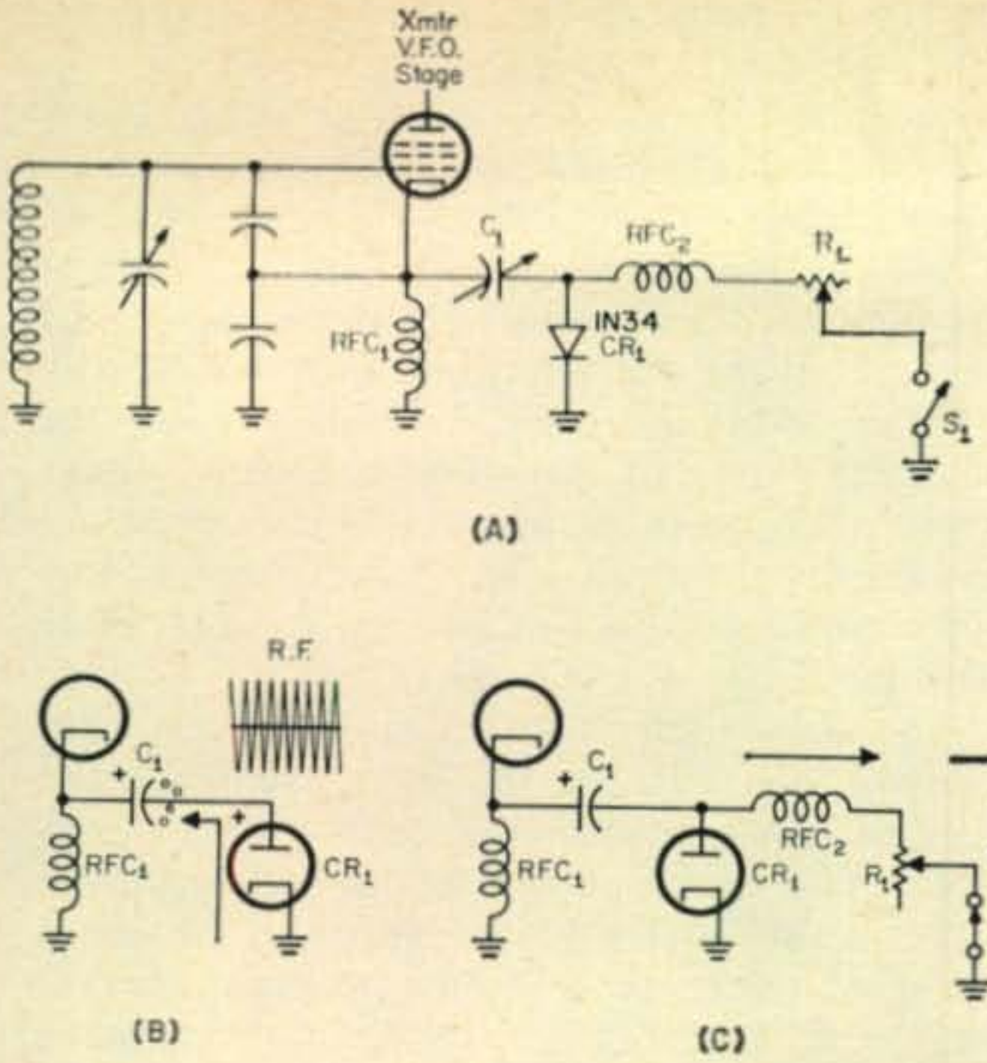


Fig. 31—(A) Basic frequency shift keying circuit with diode switching. (B)—Equivalent circuit when S_1 is open. Capacitor C_1 charges to the peak r.f. voltage and cuts off diode CR_1. (C)—When S_1 is closed C_1 can discharge and the diode CR_1 conducts longer effectively shunting C_1 across C_2. This lowers the oscillator frequency.

is illustrated in fig. 31 (A). When switch S_1 is open there is no conduction through the circuit consisting of RFC_2 and R_1. The equivalent circuit is shown in (B). Some of the r.f. energy developed by the oscillator stage appears across RFC_1 and is coupled to the diode CR_1 through C_1. On the first positive half cycle CR_1 conducts and charges C_1 as shown in (B). Capacitor C_1 charges to the peak value of the r.f. signal and as the polarity indicates will prevent the diode from conducting further. Only when the charge on C_1 falls below peak r.f. will CR_1 conduct. The charge does eventually drop slightly due to leakage through the capacitor and diode and C_1 recharges on the positive half cycles. Because the diode is continually reversed biased at a value equal to the peak r.f., we may say that for all practical purposes it does not conduct and C_1 is not in the circuit across RFC_2.

When switch S_1 is closed, the circuit is as shown in (C). Now the charge on C_1, caused by the conduction of CR_1 during the positive half of the r.f. cycle, can leak off through RFC_2, R_1 and S_1. How rapidly the charge leaks off is determined by the setting of R_1. When the value of R_1 is very low the charge leaks off rapidly and CR_1 is able to conduct for a greater period on each positive half cycle. Thus C_1 is in the circuit, in parallel with C_2 and becomes a factor in determining the frequency of the oscillator. In other words, the diode conducts when the switch is closed and doesn't conduct when the switch is open. The setting of R_1 can control the amount the diode conducts and therefore how effectively capacitor C_1 is in parallel with $r.f.c._1$. Increasing the resistance of the pot R_1 decreases the frequency shift which is maximum when the pot resistance is zero.

This means that the frequency increases on *space* when the switch (keyboard contacts) is open. This is in reverse to what it should do, so the v.f.o. would be keyed upside down if your transmitter is of the v.f.o. buffer, amplifier type design. If, on the other hand, your transmitter is of the heterodyne type, the frequency shift could be in the right or wrong direction, depending upon your transmitter design.

Keying right side up with this circuit can be accomplished by replacing C_1 with a variable inductance of about 50 microhenries maximum, depending upon the frequency of the v.f.o.

Reversing the diode polarity does not alter the operation as described, in any way, except to rectify on the other half of the r.f. cycle due to the self-rectifying action of the diode.

The function of RFC_2 in fig. 31 is to isolate the r.f. energy of the oscillator circuit from the lines running out to R_1 and S_1. Switch S_1 as you may realize now, is the keyboard contacts and the lines running to the contacts in the machine may be rather long. To prevent the capacity leads from affecting the oscillator we use RFC_2.

Dry Keying

Two typical methods that have been used to frequency shift key the v.f.o. of amateur transmitters are shown in fig. 32 (A) and (B). These systems, shown in fig. 32 do not apply voltage to the keyboard contacts and are thus called

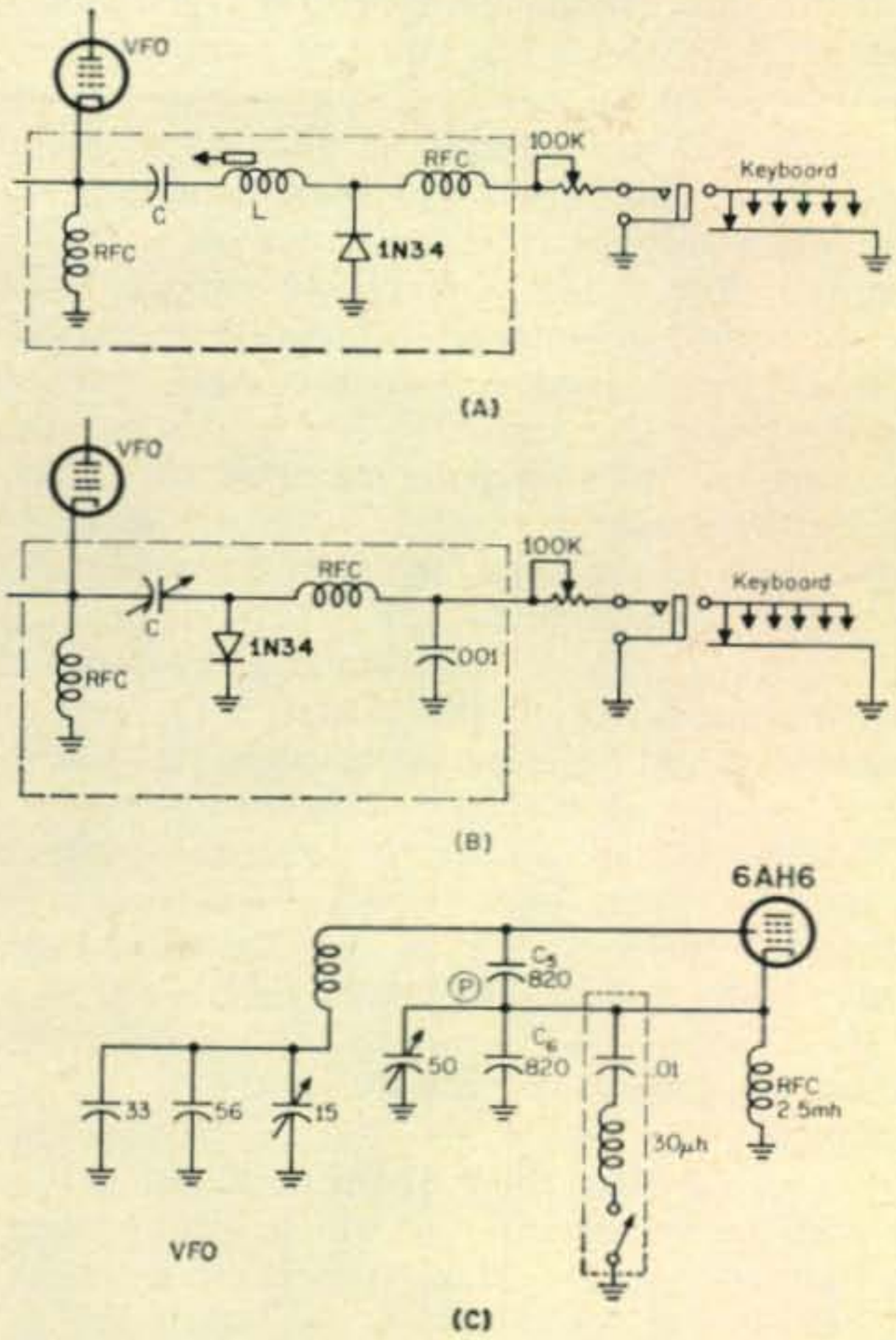


Fig. 32—Three typical frequency shift keying circuits for the v.f.o. using "dry keying" contacts. Circuit (A) uses an inductance to shift the frequency and (B) uses a capacitor. Circuit (C) is that of the author's v.f.o. showing the values for practical operation. This is further discussed in the text.

"dry." That portion of the circuit in the dotted line enclosure should be as close to the v.f.o. tube as possible. In addition, that portion of the circuit should be rigidly anchored and should be as well engineered as the v.f.o. circuit to which it is being added. The mounting of the potentiometer and jack is not critical and they can be located at any convenient place available on the transmitter.

It is certainly not the intent here to give an exact circuit including the values of all components that will work for any v.f.o. In the first place, there is the problem of keying the v.f.o. in such a way that one is keying right side up. If it is not possible to conveniently key your v.f.o. right side up, it may be simpler to use a relay to key with the keyboard contacts operating the relay (relay with s.p.d.t. contacts). Secondly, the circuitry for all v.f.o. circuits is not the same and each must be considered separately. Normally, the value of C should be less than 50 mmf for the circuit shown in fig. 32(B) and about 0.01 mf for fig. 32(A) and L should be less than 50 μh. However, these values can vary over considerable limits, dependent upon the v.f.o. circuit as well as the operating frequency.

The 1N34 acts as a diode switch in both circuits (A) and (B) of fig. 32. Consider that in fig. 32 (A) C is fairly large (in the order of 0.01 mf) and acts as a coupling capacitor and that inductance L is sufficiently large enough to shift the v.f.o. frequency the required maximum that may be used. The shift is controlled by the 100K potentiometer which should be adjusted in the *mark* condition which is with the keyboard circuit closed. The maximum shift occurs when the pot is at zero resistance. If the required shift at this point is not enough, then the slug-tuned inductance L should be increased.

When the keyboard is in the *mark* (closed position) a path to ground is provided for the d.c. current resulting from rectification of the r.f. by the diode. This conduction in the 1N34 diode likewise provides for a low resistance and direct path to ground for the r.f. circuit through inductance L. Thus, inductance L becomes a contributing factor in the overall v.f.o. circuit frequency. Adding L naturally causes a shift in the frequency of the v.f.o. upward (increase).

This can best be shown by again referring to the author's own v.f.o. modification shown in the dotted enclosure.[5] Note that the basic f.s.k. modification is shown as a 0.01 mf capacitor, a 30 μh inductance, and a switch, all in series from cathode to ground. Obviously, if the 30 μh inductance were not in the circuit, closing the switch would place the 0.01 mf capacitor across the 850 mmf capacitor C_6, which would lower the frequency of the v.f.o. Now, mentally break the circuit and insert the 30 μh inductance as shown. It is a well known fact that inductive reactance is determined from the formula, $X_L = 2\pi FL$ and capacitive reactance is determined from the formula, $X_C = 1/2\pi FC$ and $1/L_t = 1/L_1 + 1/L_2 + 1/L_3$ *etc.*

From these formulas one may quickly determine the respective reactances at the v.f.o. operating frequency (5100-5700 kc). The reactance, X_L, is in the neighborhood of 1000 ohms (962 ohms at 5.1 mc and 1076 ohms at 5.7 mc) and X_C is in the neighborhood of 3 ohms, with the exact value of each depending upon the frequency setting of the v.f.o. dial. The voltage vectors of X_L and X_C are at 180 electrical degrees phase relationship with each other, acting in opposition. In this instance the net reactance would be $X_L - X_C$, inductive.

When the switch is closed (in the dotted enclosure of fig. 32(C)) the inductive reactance discussed above is placed directly across capacitor C_6. The vector current of the net reactance (X_L) is in 180° phase relationship with the vector current of capacitor C_6. The resultant current would be the algebraic sum of the two, thus being less than either of the two and the impedance, Z, from point P to ground (across C_6) would be increased.[6] This produces the same effect that reducing the value of C_6 would have, which means that the frequency would be increased.

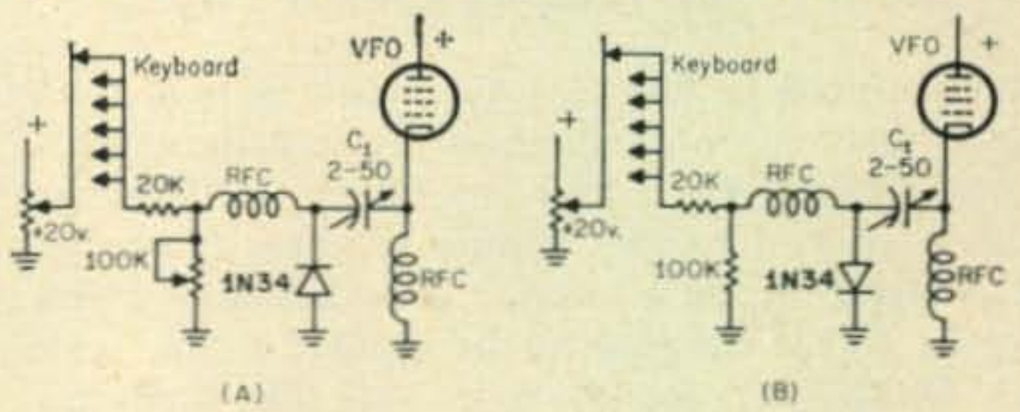


Fig. 33—Two circuits illustrating "wet contact" keying of the v.f.o. Circuit (A) has a potentiometer to adjust the frequency shift while (B) does not. The shift in (B) is adjusted by setting the 2-50 mmf capacitor.

Wet Contacts

Another f.s.k. method is one called the "controlled voltage" system or "wet contacts" and is illustrated in fig. 33 (A) and (B). In fig. 33 (A) the diode is not biased by self-rectification but is blocked by the application of plus 20 volts to the cathode terminal when the keyboard is closed *(mark)*. When the keyboard opens *(space)*, the diode is unblocked, rectifies r.f., charges C_1 which then discharges through the *RFC*. and the 100K pot. This permits the diode to conduct and places C_1 in the oscillator circuit to lower the frequency in the *space* position.

If it is desired to raise the frequency during the *space* period, an inductance can be substituted for C_1 as discussed previously or the circuit of fig. 33(B) may be used. Note that the diode is reversed in this circuit and there is no shift potentiometer. The shift is controlled by the 2-50 mmf capacitor and it must be positioned in such a manner in the v.f.o. compartment that it is accessible. The plus 20 volts is applied to the plate of the diode on the mark. The diode conducts and places the 2-50 mmf in the oscil-

[5]Tucker, D. J., Copeland, J. L., "A Single Sideband Exciter," *CQ*, February, 1962, page 54.

[6]Tucker, D. J., *Introduction To Practical Radio*, (New York: The MacMillan Co.) pages 218 to 270.

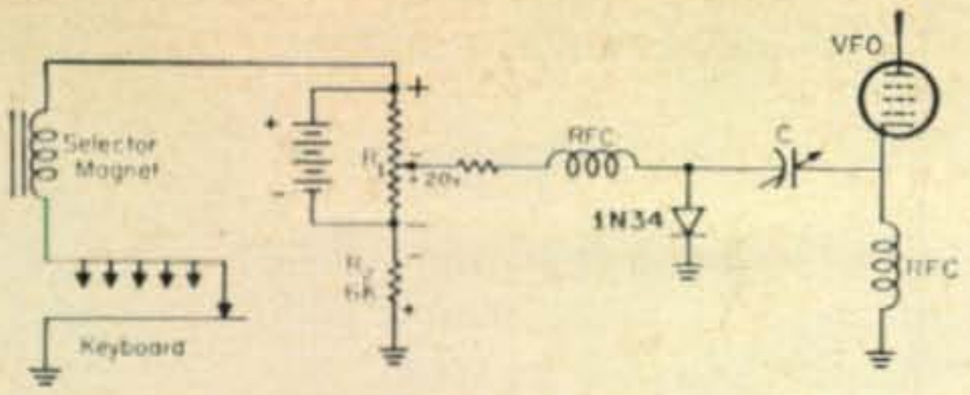


Fig. 34—The above circuit biases the diode with a fixed voltage in either the forward or reverse direction. The operation of the circuit is given in the text.

lator circuit. The *space* removes the plus voltage from the diode plate and the capacitor C_1 charges on the r.f. half cycles cutting the diode off as previously explained.

The circuit shown in fig. 34 is completely voltage controlled and provides both the forward and reverse bias. The power supply voltage is impressed across R_1. When the keyboard contacts are open *(space)* the drop across the lower portion of R_1 is the only voltage applied to the diode plate. The diode conducts and the shift capacitor C is in the circuit.

For *mark*, the keyboard contacts close and a current flows through R_2 The value for R_2 is chosen so that it provides a drop in excess of 20 volts. As the polarities show, the drop across R_2 cancels the drop across the lower part of R_1 and the diode is now reverse biased; C is now out of the circuit. The resistor in series with the *RFC* limits the diode current.

It should be realized that it is almost impossible to add the f.s.k. circuit of fig. 31 or any of the other circuits for that matter, to a v.f.o. without experiencing a slight frequency shift because of the capacitive effect of the added circuit as well as the very small leakage current of the diode in the reverse direction as mentioned earlier. The calibration of the v.f.o. shouldn't be appreciably affected if the parts and associated wiring are carefully wired and placed.

Two Tone Signal Reception

C.w. telegraphy is a single tone transmission. The reception of c.w. through the use of a beat frequency oscillator is something that the amateur has been familiar with for a very long time. The operator is able to produce a low frequency beat note when the b.f.o. is placed near the carrier or a shrill high pitch beat note when the b.f.o. is tuned some distance from the carrier. This is illustrated in fig. 35. Usually, the operator adjusts the b.f.o. so that the beat note is most pleasing or easiest to copy.

The same approach is used to copy an f.s.k. signal with the amateur receiver except that now two carriers beat against the b.f.o. in the i.f. circuit. Also, it now makes a difference if the b.f.o. is on the high side or the low side. Figure 36 (A) and (B) show the mark and space signals properly located in the receiver i.f. bandpass. Figure 36 (A) shows the audio frequencies developed when the b.f.o. is on the high side of the i.f. bandpass.

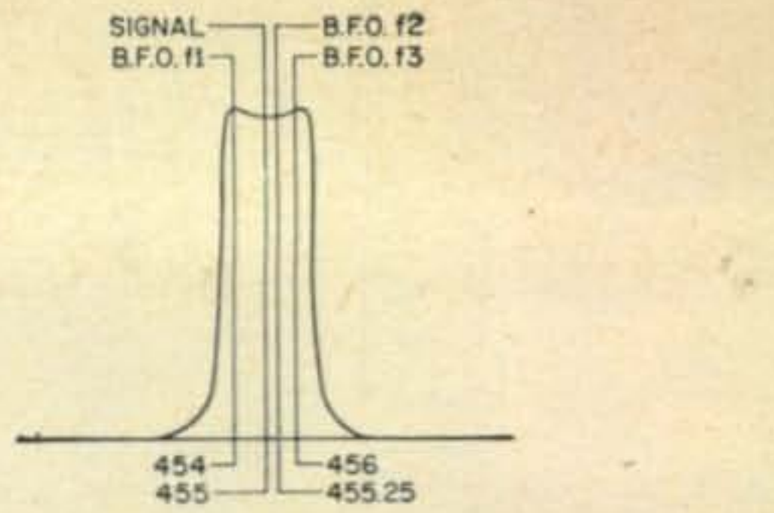


Fig. 35—The curve above illustrates b.f.o. action. The received signal is at 455 kc. When the b.f.o. is at f_1 (low side) or f_3 (high side) a beat note of one kc will be heard. If the b.f.o. is set at f_2, a 500 cycle note will be heard for the same input signal.

When frequency shift keying a transmitter, the *mark* signal is the higher frequency and the space signal the *lower* frequency. When receiving the signals the b.f.o. is set to convert the mark signal to 2125 cycles and the space signal to 2975 cycles. (This is for an 850 cycle shift at the transmitter.) Why these frequencies are used will be explained in a few moments. Now notice that with the b.f.o. on the high side as in fig. 36(A) we accomplish this. Figure 36(B) shows how the same *mark* and *space* signals produce reversed audio tones when the b.f.o. is shifted to the low side of the i.f. bandpass. Why shift it then? Actually it isn't shifted to the low side unless the *mark* and *space* signals are reversed. How do they get reversed? This could happen at the transmitter as explained previously. A careless operator could transmit the *mark* signals as the lower frequency and the *space* as the higher frequency. When receiving this transmission, setting the b.f.o. on the low side would

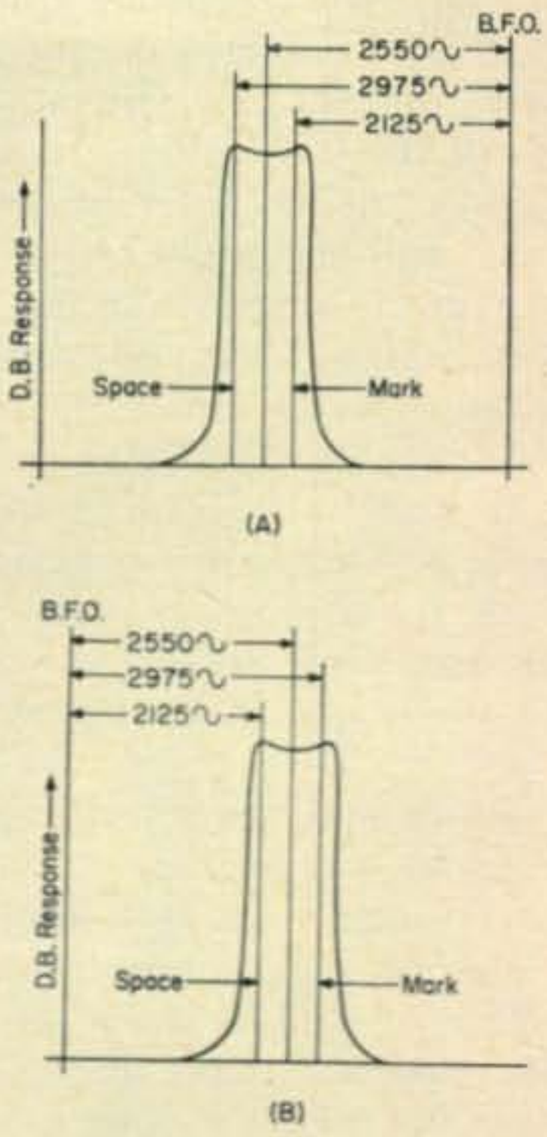


Fig. 36—I.f. bandpass of the receiver in (A) shows the b.f.o. located on the high side. The space and mark signals are properly located to produce the correct audio tones. In (B) the b.f.o. is located on the low side of the i.f. and with the same mark and space signals the wrong audio tones are produced.

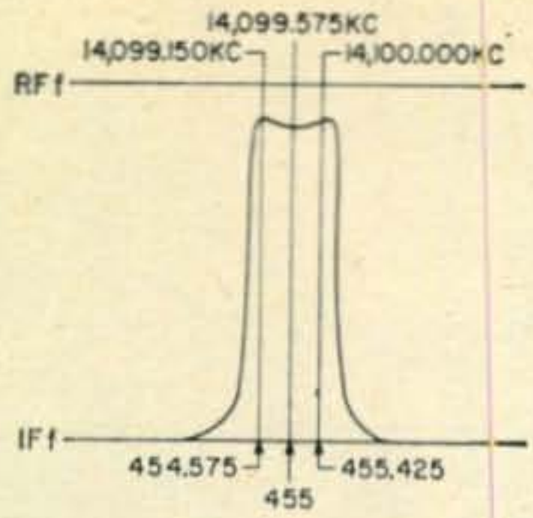


Fig. 37—The above illustration shows how the mark and space signals are converted to i.f. signals of specific frequencies as explained in the text.

correct the audio tones and produce 2125 cycles for mark and 2975 cycles for space.

The problem of low or high side settings becomes even more involved and no exact standard can be set. We cannot say, "Always set your b.f.o. to the high side to receive normal RTTY transmission." It simply wouldn't be so because the design of the receiver itself is involved.

Let's review the action of a superheterodyne converter stage. In order to convert an r.f. signal to the i.f. frequency the oscillator must be either 455 kc below or above the r.f. signal. Either oscillator frequency will do the job. In some receivers the oscillator works below the incoming signal, in others above the incoming signal and in still others above on some bands and below on others. Let's see what difference it makes. Consider first the receiver with the oscillator working below the incoming signal. The center frequency of the r.f. signal is 14,099.575 kc and to produce a 455 kc signal the oscillator is 14,099.575 —455 kc or 13644.575 kc. This is shown in fig. 37A. Now when the transmitter is keyed it will rise 425 cycles on the *mark* and drop 425 cycles on the *space* signal. The mark frequency is 14,100.000 and is converted to 14100.000 kc —13644.575 kc or 455.425 kc. The space signal will be 14,099.150 kc and when converted will appear as shown in fig. 37.

This is all normal; but what happens when the receiver oscillator works *above* the r.f. signal? The mark and space signal reverse positions and the copy is flipped. The b.f.o. must now be moved to the low side for correct copy.

Stop to think, for a moment, what the effects are in double and triple superhets where some oscillators are above and others below the signal frequencies.

All of the above may seem a bit complicated and far-fetched to the beginner. Actually you don't need to literally take your receiver apart to see if it "zigs or zags" or if it zig-zags and then zags. With a little practice in tuning in RTTY signals, you will soon find out whether you need to set the b.f.o. of your particular receiver on the high side or the low side for the reception of RTTY signals that are in turn properly sent (right side up) in the first place. Then there is the terminal unit or converter (the mysterious "black box" yet to be covered) which has a *reversal switch* which further simplifies this whole subject! When in doubt, throw the switch.

Audio Frequencies

I am sure that you are wondering as to why the b.f.o. is set so that the two beat notes received are 2125 cycles *(mark)* and 2975 cycles *(space)*. The b.f.o. can be set at some other point producing two tones such as 1275 cycles and 2125 cycles or for that matter, 1000 cycles and 1850 cycles. The 2125 cycle and 2975 cycle frequencies were chosen because they were standard with the wire services for many years. Most of the converters in use in the ham bands are designed for these two audio frequencies. Much experimenting is presently being carried on with other frequencies. In fact, other shifts are used which naturally means other frequencies. If a shift of 425 cycles was used, *mark* and *space* would now be 425 cycles apart such as 1275 cycles *(mark)* and 1725 cycles *(space)*.

Receiver Bandpass

It should be noted that the positioning of the mark and space signals in the pass-band of a receiver i.f. can have a lot to do with the reception of the two signals. The correct positioning of the two frequencies, regardless of what they might be, is shown in figs. 35, 36 and 37. The two frequencies, regardless of what they are, should *straddle the center of the passband*. With a very sharp passband to be found in so many of our receivers these days, this is very important. It wouldn't take a lot of misadjustment of the b.f.o. to slide one or the other of the two frequencies clear out of the i.f. passband and you would have the equivalent of an On-Off system with just one tone supplying the information.

One should not only be familiar with the band-pass capabilities of his receiver but have a full understanding of the relationship between the receiver i.f. bandpass, the two f.s.k. frequencies, and the b.f.o. frequency. One should know the exact setting for his b.f.o. to position the f.s.k. signals such that they straddle the center of the i.f. passband as has already been pointed out. If one is not sure of the correct setting of his receiver b.f.o. for this, then he should determine this before he seriously tries to copy RTTY. One way to do this is to transmit the *mark* and *space* frequencies alternately from your own transmitter v.f.o. and tune your receiver so that the response is equal for the two frequencies. Naturally, this should be done with the receiver b.f.o. off and watching the S-meter while you are tuning the input of the receiver. If you tune either frequency for maximum S-meter reading, then the other one will read lower on the S-meter. This is because you have the one with the highest S-meter reading in or near the center of the i.f. passband of your receiver and obviously the other frequency is to one side or the other. The object is to tune each such that they straddle the center of the receiver

[*Continued on page 99*]

Tom, WA2GGB operating at FO8AQ-FP8CB/FO8, Tahiti.

Tahiti Nui

BY TOM TAORMINA,* WA2GGB/5

The 1964 DXpedition of FP8CB/FO8 to the Pearl of the South Pacific.

I SUPPOSE that every amateur, at one time or another, has had the desire to go on a dx-pedition of some sort. Perhaps the most intriguing and exciting thing about a dx-pedition is looking forward to the unexpected, unplanned, and unforeseen happenings.

Chuck Coleman, WA2WBH/FP8CB, and I started out from New York City with passports, two unconfirmed round-trip plane tickets from Los Angeles to Tahiti, a KWM-2, and a lot of time and ambition. We explained our plans to go to Tahiti to Arnie Trossman of *CQ* magazine the day before we left, and when we left his office, he knew as much as we did about what was to come. We had no contacts or friends on the Island. We had no hotel reservations, and had no idea what we were going to do when we got there. One thing we did know was that we were going further away from home than either of us had ever been before and, by one means or another, we were going to get a signal on the air from FO8.

Our first accomplishment was driving cross country in three and a half days, hitting snow in three states and avoiding it in ten others. My little Corvair was loaded to the gunnels, but we had plenty of gas and guts and a mobile rig in case we got stuck.

The Flight

Our plane left Los Angeles airport on February 8. Normally the flight to Tahiti is the second longest flight in the world (7½ hours), but we were bucking a strong head-wind all the way and we had to double back to Hawaii to refuel. After a thirteen hour flight, we touched down at the Faaa Aerodrome in Tahiti. Customs didn't open our suitcases so they didn't discover the KWM-2 or the 135 foot trap dipole rolled up in my suitcase. My electronic keyer, however, was packed up in a shipping carton and it was immediately taken from me and we were told that we could have it back when we showed them some sort of authorization to have it from the local government. Neither of us spoke French, so we couldn't argue with them. We left well enough alone.

There are six hotels on the island and there was a sweet-talking vahini (native woman) from each one waiting to grab up the new arrivals. We soon found ourselves in a small hotel outside of Papeete, where we spent the first night.

Contact

We knew that we had to find a native amateur before we could even attempt to operate. The next morning we remembered what Ted Henry had told us before we left Los Angeles. There were only two amateur stations that he knew of on the Island: The radio club station, FO8AA, and Ray Natua, FO8AQ. We were still lost, because we knew of no way to find either of these. We walked into town that morning and rented a car. We drove around the island for a few hours and by some luck we spotted an obscure little sign, nailed to a tree, with two words of English on it; 'Radio Club.' We followed the little dirt road it pointed to. It led us to a little metal shack and a two element beam, which was FO8AA. All three operators were there that day: FO8AA, BJ, and BK. All of them are Frenchmen, none speaking English, but all made us very very welcome. For half an hour we attempted to converse with them by sign language and 'Q' signals and finally made them understand that we wanted to meet FO8AQ, who

*4311 Silverwood, Houston, Texas

speaks fluent English. They wanted so much to discuss amateur radio with us, but the language barrier was just too great. Finally, they all got into their little cars and, in a caravan, they led us to FO8AQ's home.

Once again amateur radio showed its fraternal ties. Ray Natua, FO8AQ, lives in a nice little home on the outskirts of Papeete. He runs the weather radio-teletype for the airport and makes a comfortable living for his wife and daughter. When we arrived, he greeted us and once he found out we were amateurs from the United States, he became the Santa Claus of the South Pacific to us. Anything we needed was ours. Anything he could do for us he would do, with no expectation of being rewarded or repaid for it. His only reward was seeing us have a good time and enjoying the island to the fullest.

We talked to Ray for many hours that afternoon. The first thing he did was get us set up at the hotel Matavai, where he knew the owner and arranged for us to string up antennas and run the radio gear from our cabin.

A License

Our next problem was to secure a license. Ray said that this would be an impossibility. He had seen many American tourists come and go with ham gear and all had no success getting licensed. He said that the last visitor to get licensed was Danny Weil, five years ago, and that there wouldn't be any licenses issued until there was reciprocal licensing for people of French possessions who visit America. Ray was sure that we were bucking a brick wall by trying to get licensed or even get permission to operate, but that we could unofficially operate FO8AQ if we wanted to. Nevertheless, we were determined to operate under our own call and we wanted to try to get it.

That afternoon, Chuck went into the Post Office to see the head of telecommunications. I waited in the lobby for more than an hour for him to come out. When he finally did emerge, he was escorted by a gentleman who was introduced to me as Mess'r Lebaye, assistant to the Head of Telecommunications, and the only one in the

Ray, FO8AQ operating at home using our KWM-2.

Chuck, WA2WBH/FP8CB and Ray, FO8AQ on Tahiti.

department who spoke any English. Between Chuck's letter of introduction from a French official in Washington, his amateur license from another French possession (St. Pierre et Miquelon, FP8CB), and his convincing them that we were on a scientific expedition for the study of radio propagation, they granted us permission to operate an amateur radio station from Tahiti. The only stipulations to the grant were that we would operate under the supervision of FO8AQ and that when we were through, we would give them a detailed report of our findings on worldwide radio propagation conditions from Tahiti during this low in the sunspot cycle, to aid in their own communications links. We met both conditions gladly.

By late that afternoon, Mess'r Lebaye had escorted us to the customs office and promptly had our keyer returned to us, and we were on our way with the best wishes of the Department of Telecommunications.

For the next few weeks our operation went wonderfully. After a few days we had made over 800 contacts on all bands, s.s.b. and c.w. We kept daily schedules with HC8FN on Galapagos, WB6IWB/MM on the Merchant Marine ship 'Golden Bear', and Chucks father, W2JAE. At night we held schedules on 75 meter s.s.b. with W1BU, and we made it almost every night; Tahiti to Boston on 75.

Flora and Fauna

The island itself is beautiful. The daily temperature varied between 80 and 95 degrees, with a usual passing shower about 1 o'clock in the afternoon. The scenery was magnificent. Anything that could grow, grew. Anything that could swim could be found in one of the hundreds of beautiful lagoons surrounding the island. The flora completely surrounded the island and the coconut palm trees grew as high as W1BU's towers. Any time we were hungry we could pull off the road and find mangoes, papaya, coconut, or some other exotic fruits growing wild and we could eat to our hearts content. When we were thirsty, a natural spring or stream was

always nearby and we could get a drink of some of the purest water in the world.

The people were wonderful, too. After a weeks coaching from Ray, a few loud red, blue, and orange shirts, white shoes, a flower behind the ear, and a good sun tan, we soon became part of the native population. The natives really treated us royally. Their honesty and outright unselfishness made us feel like honored guests during our whole stay there. One evening Chuck struck up a conversation with a Tahitian soldier. When it came time for the soldier to leave, he removed a large bronze medalion from his uniform and gave it to Chuck as an expression of his friendship.

Crisis

About 6 o'clock one morning, during our second week there, Ray knocked on our cabin door and woke us up with the news that we had to move our gear before it was confiscated. I can assure you that this is not pleasant news to receive at any time of day, especially not first thing in the morning.

After much investigating we found out that two French Legionnaires had moved into the cabin next to ours. They evidently heard all the late night noises from the radio set, and they concluded that W1BU's resonant baritone voice echoing through our cabin every evening was some sort of super-spy plot against the French Government. They reported the strange goings on of us American "spies" to their commanding officer who started a full scale invetsigation of us. Naturally, the first one they investigated was Ray, who was supposed to be supervising our operation. Ray got to us as fast as he could and we moved all the gear to his house, and we used his location and beam antenna for the remainder of our stay there. It must have taken quite a bit of explaining to all the offiicals involved in the investigation to satisfy them of our honest intentions, but Ray did it and Franco-American relations were once again restored.

Return Cruise

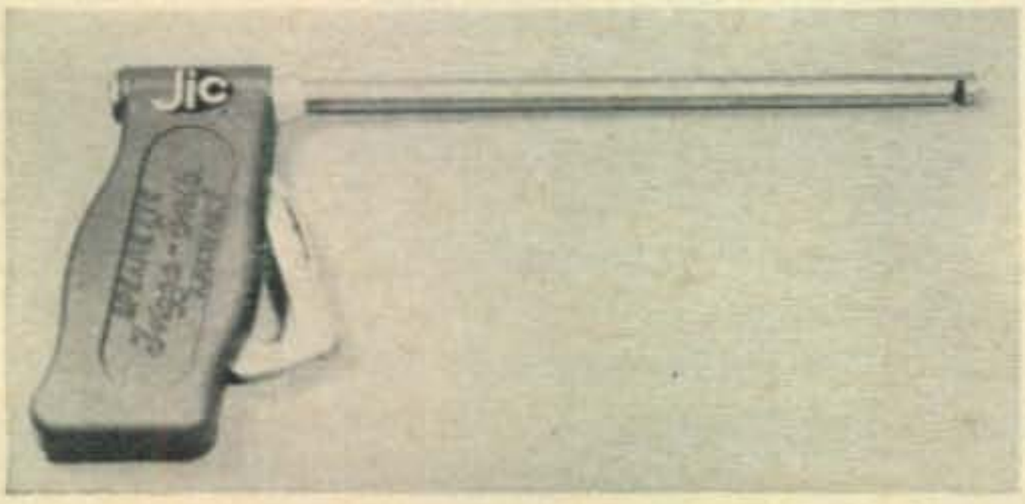
When we left home, our original intention was to cover as many other islands in the South Pacific as possible. From Tahiti we were to fly to New Caledonia and Fiji, but our flight was cancelled and we were told that it would be another month before we could be booked again. When the opportunity arose for us to join the crew of the yacht "Wanderer" we jumped at the chance. We were told that we would cruise the Pacific for a month and a half and that we could operate our amateur station from Wallis, Samoa, Caroline, and Palmyra Islands as we traveled through the Pacific and we would wind up in Newport Beach, California, where my car was. Chuck got on the air that afternoon for his regular schedule with his father. He was quite excited with the news of our new plans, but before he could even get one word across to his father, the word came through the ozone that Chuck's draft notice had arrived at home that day, and he was to report the day we got home. All that was said after that was, "Get home, boy, Uncle Sam needs you." Naturally we cancelled the boat trip and had to fly home.

The time to leave came all too soon. But in leaving we were given the opportunity to do a service for Ray, to show some small token of our appreciation for his help and hospitality. Ray's young niece developed a rare heart disease and facilities in Tahiti are not advanced enough to take care of such ailments. Since Ray speaks fluent English and is very well educated, he has Time and Newsweek magazines sent to him from the States. In one of the magazines he read of a heart clinic in San Francisco. He wrote to them and sent them the case history of his niece. They replied that they might be able to help her with open heart surgery. The family scraped up the money for the flight and medical fees and they made arrangements for the girl and her mother to accompany us on our flight back to the states. When we boarded the plane, they were left with us for the long flight back to Los Angeles. We did our best to see that all of their needs were taken care of and that her seat was converted into a bed so that she could rest during flight. When we arrived in Los Angeles, we saw to it that they disembarked with no trouble and we left them in the capable hands of Pat Walsh, W6JFM, who had an ambulance waiting to complete their trip.

We were left in capable hands too: Old mother earth, U.S.A. ■

New Amateur Products

Jonard Trigga-snip



THE Jonard Trigga-snip is a wire cutter, stripper and puller. Designed for easy reach in deep chassis, it has a long tubular nozzle with a stainless steel rod that moves forward to cut or grab when the trigger is compressed. The Trigga-snip has a screw knob to adjust the stroke for cutting various size wires. The body is made of aluminum for light weight, and the nozzle is chromed. The barrel diameter is ¼", overall length 7". The price for the Trigga-snip is $4.75. For more information contact Jonard Industries, Precision Tools Div., 3733 Riverdale Avenue, Bronx, New York 10463.

Eliminating TVI In Modern Transmitters

BY HERBERT S. BRIER,* W9EGQ

TVI is generally considered a problem in the homebrewed transmitter, but frequently is present in even the highest quality commercial units. Whether or not you have TVI with commercial gear often depends on your proximity to the TV station and the viewer's TV set. The author outlines some general techniques that will help decrease this needless type of interference in commercial equipment.

ARE you one of those lucky hams who can operate his transmitter on any amateur band without a trace of interference on his own TV receiver? Or do you have a "little" TVI but figure that you are OK with your neighbors, because they haven't complained and you don't operate during the popular early evening TV viewing hours? Well, not too often, anyway.

This is what Steve, WA9EZJ, thought until a windy night a few months ago. The next morning he discovered 30 feet of the coaxial cable and the control cable to his tri-band beam in his back yard were missing, his 80 meter dipole had been cut down, his TV antenna (which had been mounted on the roof of the house) was missing, the TV antenna mast was bent so that its tip was touching the roof. In addition, the ladder which Steve had thoughtfully left leaning against the telephone pole which supported his beam for the convenience of the vandal was gone.

These discoveries convinced Steve that his "little" TVI had made one of his neighbors restless. Procuring a long microphone cable so that he could look at the family TV receiver while he operated his transmitter, Steve discovered that the pride of his life, a newly-acquired linear amplifier, completely blotted out channel 2 and seriously interfered with channel 5[1] if he operated above 14 mc. Yes. He had a high-pass filter on the TV receiver and a low-pass filter on the transmitter.

Further tests showed that the TVI was equally bad with or without the low-pass filter. Substituting a dummy antenna for the beam made little difference in the TVI produced without the low-pass filter in the circuit. With the low-pass filter between the amplifier and the dummy antenna, the TVI *increased*. Using the exciter alone reduced the TVI greatly, but it did not eliminate it entirely.

Why?

Analyzing these results indicated that the major source of the problem was direct radiation from the amplifier or its power and control cables. The fact that inserting the low-pass filter between the amplifier and the dummy load increased the TVI in the nearby TV receiver clinched this conclusion. Without the filter, part of the interfering harmonics were harmlessly burned up in the dummy load. But with the filter installed, they could not reach the load and were radiated directly from the amplifier.

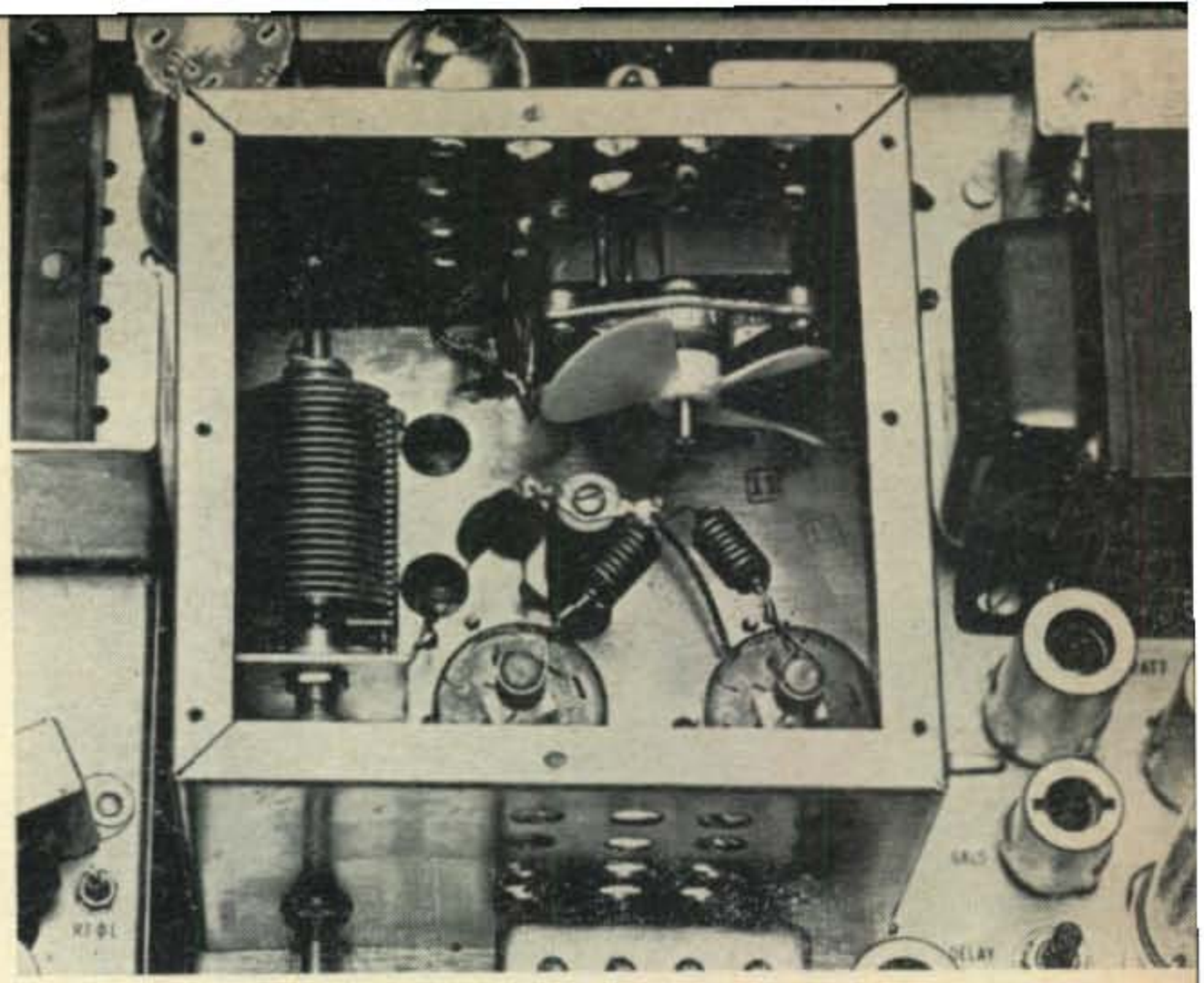
Our recommendation was that if he wished to live in peace with his neighbors and continue to use the amplifier, he would have to improve the amplifier's shielding and incorporate whatever lead filtering that was necessary to eliminate the TVI. Also that a little more shielding wouldn't hurt the exciter either.

Steve took the easy way. He returned the amplifier to the ham from whom he had purchased it. (It caused no TVI in this ham's primary TV service area.) Then we went to work on the exciter, an HT-37. (Actually, Steve worked: I bossed.)

Let us stress that because the equipment mentioned here happens to be Hallicrafter's doesn't mean that Hallicrafter gear is more prone to

*385 Johnson Street, Gary, Indiana 46402.

[1]TV channels 2 and 5 are the two locally-assigned in the Chicago area.



Inside view of the TVI shield on the HT-37 shows the two 6146 final amplifiers, the tuning capacitor and the cooling fan. When the lid is in place the box provides good r.f. shielding. Photos by WA9DMO.

TVI than that of other manufacturers. *This isn't true!* After WA9EZJ's experience, most of the area hams took a critical look at their own situations, and they discovered that TVI was no respecter of brand names. More on this later.

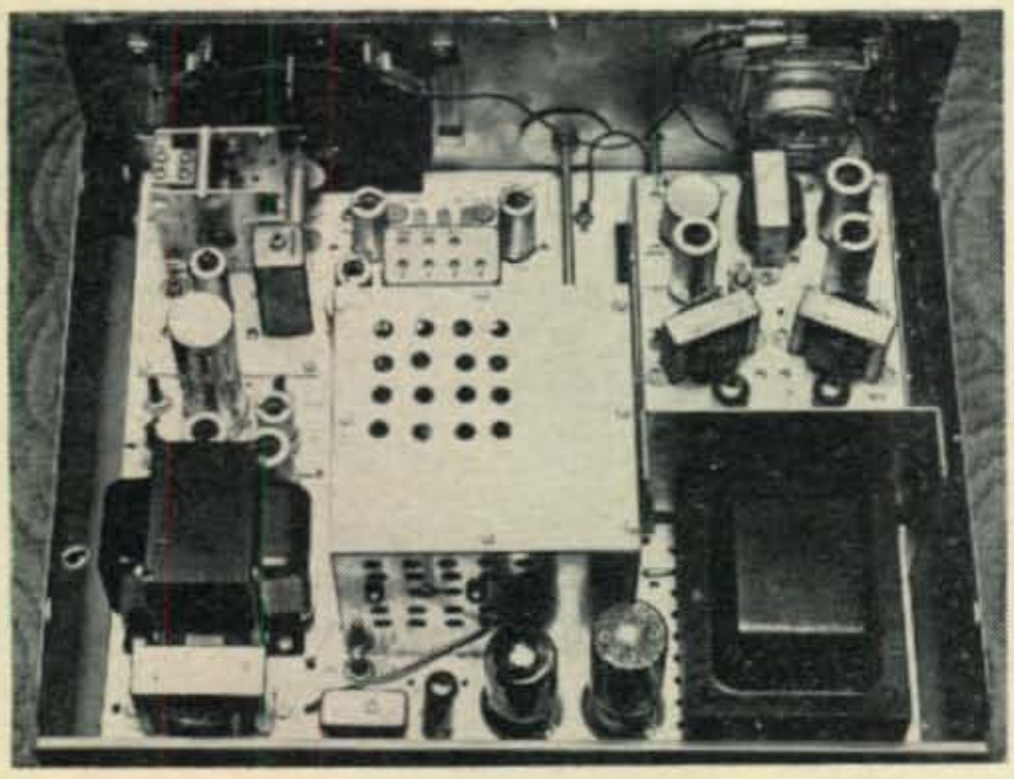
Working on the HT-37

Inspection of the HT-37 chassis (see the photograph) reveals that its 6146 amplifier, the plate tuning capacitor, and the r.f. choke are not shielded, except for the transmitter top cover, which is certainly not r.f. tight. Fortunately, the components are closely grouped together and can be easily enclosed in a 6" square box. (Bud AU-1039 or equivalent.)

Besides the box, you will also need a small tube-cooling fan (Allied Radio Catalogue #39A457D or equivalent), four 0.005 mf ceramic bypass capacitors, three feet of shielded wire, and a 2-lug terminal strip.

Start the job by loosening the set screw holding the circular dial to the amplifier capacitor drive shaft, and pull the shaft free of the plastic shaft coupler on the capacitor. There is a "flat" on the shaft, so don't twist, just pull.

Unsolder the bare wire coming from the amplifier coil (under the chassis) from the stator terminal of the variable capacitor. Then remove the nut holding the capacitor to the mounting bracket, remove the two self-tapping screws that hold the bracket to the chassis, turn the bracket around, and remount it, using the same screws and holes.



Next, remount the variable capacitor on the bracket and replace the wire on its stator terminal. It will be necessary to bend the solder lug backward for the lead to be long enough. This modification moves the variable capacitor forward approximately an inch to accommodate the rear wall of the new shield box between the rear of the capacitor and the 5R4GY and 5V4G rectifier tubes.

Temporarily replace the extension shaft on the capacitor to determine how much the shaft protrudes beyond the panel and saw off the excess length. Remember there is a "flat" on the back end of the shaft which you wish to retain; so do the sawing at the other end.

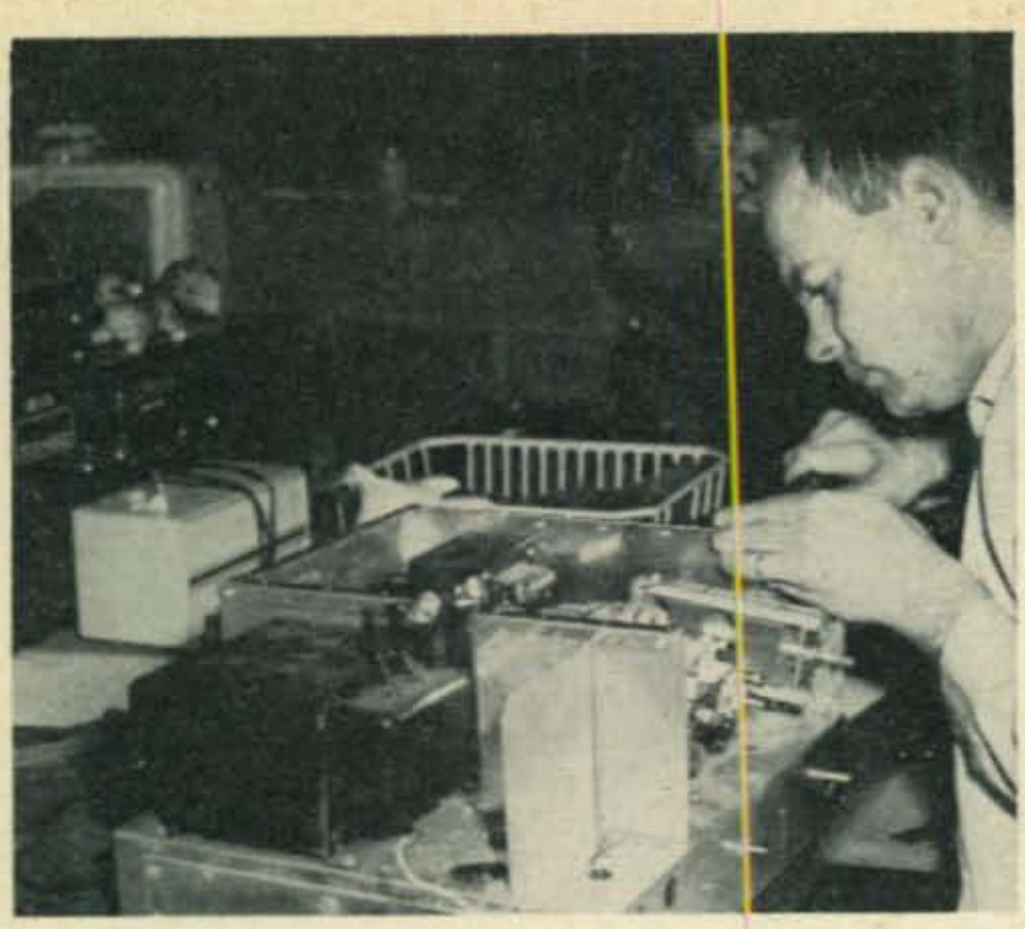
Saw off the box 1¼" from one of the open ends with a fine-toothed metal saw. This side will be the bottom of the shield box. Temporarily screw the cover on the box and spray the box inside with a dull black, heat-resistant paint (Plastic-Kote 203 or equivalent) to improve the box's cooling efficiency.

After the paint has dried (5 minutes), remove the top and set the box around the amplifier components. Position it so that its rear edge lines up with the two holes already in the chassis—one behind the tuning capacitor and the other in front of the bias-adjust potentiometer—and its right edge lines up with the center ventilating hole beside the right 6146. Hold the box in position and pencil the locations of these holes on the front and side of the box. Mount a spade bolt at each mark to fasten the box to the chassis. Once again, temporarily set the box in place and lay out the mounting holes for the fan motor so that the fan will blow directly on the 6146 tubes. Also locate the hole on the front of the box for the variable capacitor shaft.

Now drill about twenty-five ⅜" holes in the box behind the fan, another 15 or 16 holes in the top plate above the 6146's, and another 10 or 12 holes in front of the 6146's for ventilation.

Mount the fan in the box and carefully check for clearance between the fan blade and the

Finished appearance of the TVI shield that encloses the final stage of the HT-37. Note the holes necessary to provide adequate ventilation for the 6146 amplifiers.



K9AKF hard at work adding the shielding to a final amplifier as explained in the text. Photo by K9AXS.

amplifier r.f. choke. There is not much extra room here, but by sliding the fan blade far enough back on the motor shaft, there will be sufficient clearance between the fan blade and the r.f. choke.

Bolt the terminal strip to one of the motor mounting screws, cut the motor leads to length, and connect them at the terminal strip. Prepare two 18" lengths of shielded wire by sliding back the shield braid from one end of each wire approximately ¾" and stripping off ½" of insulation from the wire. Wrap one lead of a 0.005 mf disc ceramic capacitor lead around the shield, and the other capacitor lead around the bared center conductor. Solder both connections. Connect these prepared wires to the motor leads at the terminal strip, and ground their shields to a solder lug under the mounting screw.

Mount the box permanently to the chassis and thread the shielded leads through the hole in the chassis near the v.r. tube, and terminate them on the lugs of the terminal strip to the right of the power transformer where the primary (black) leads of the transformer are connected. Cut the shielded leads to length and add the capacitors as described above before soldering the leads in place. Ground the shields of the leads wherever convenient throughout their length.

After these changes were made, operation of the HT-37 produced no observable TVI on any channel. Unfortunately, however, Steve was not happy with his clean-but-weak signal from the HT-37 for very long. So he soon purchased a new Hallicrafters HT-41 linear amplifier to match the HT-37. His signal reports went up, but his TVI problems were back with him. Operations above 14 mc completely blotted out the sound and picture on channel 2 and chopped up channel 5 badly!

Cleaning up the Amplifier

Careful examination of the amplifier indicated that it should not be too difficult to enclose its above-the-chassis r.f. components in an r.f. tight box while leaving the power transformer and 866 rectifiers outside the box.

Materials required for the job are a supply of sheet aluminum, about eight feet of ¾" × ¾" or ½" × ½" × ⅛" aluminum angle, a handful of spade bolts, a box of 6-32 × ¼" round head machine screws and a 6-32 tap wrench or a box of 6-32 self-tapping screws. The aluminum sheet may be either solid or perforated stock from a hardware or department-store's do-it-yourself aluminum rack. Or it may be a sheet of aluminum siding obtained from a builder's supply store. Such aluminum siding comes in 4' × 8' sheets, and is the source of the aluminum we used.

The right side of the box is simply a straight piece of aluminum running the depth of the chassis (approximately 13") with a height approximately ⅜" less than the distance from the chassis to the top of the panel.

The left side is approximately 14" long. It runs parallel to the power transformer from the rear of the chassis to the front of the transformer, jogs out to the left for an inch to clear the plastic tank coil support and continues to the front panel.

Cut four pieces of aluminum angle equal in length to the height of the side pieces, and screw them to the front and back of both pieces. Screw another 13" length of angle to the top of the right side piece. Of course, it will take two or three pieces of angle for the left side of the box, because of the jog in it. Also, it is necessary to notch out the ends of the angles to insure good tight fits at the corners. Space the mounting screws about two inches apart.

Steve used spade bolts to fasten the box to the chassis. Bill used aluminum angle, theoretically the better method; the exact method is not too important, however. Just be sure that there are no open cracks between the sides of the box and the chassis. Juggle the mounting holes around as necessary to avoid puncturing wires and components under the chassis while drilling the holes.

Assuming that the box is built of solid aluminum sheet, drill about forty ¼" holes in the back panel for ventilation before mounting it. Also drill a pair of holes to accommodate the two fan-mounting screws.

There are two choices for closing up the front of the box. Steve chose to make the amplifier panel the front of the box. If done carefully, this method does not detract from the attractiveness of the amplifier. Bill preferred not to drill holes in the panel. Instead, he removed it, made a separate front for the box, and then replaced the panel.

The top of the box is, of course, another piece of aluminum cut to size with plenty of ventilating holes drilled in it. Here we positioned the first row of (five) holes directly over the tubes and

drilled seven additional rows of holes between the first row and the front panel.

Results

At WA9EZJ, the shielding eliminated all TVI, except for a few light lines on channel 2, on a TV receiver three feet from the amplifier. At the W9VEY/K9AXS installation, all TVI was eliminated. In both installations, however, removing the low-pass filter from the output circuit brought back the TVI as much as ever.

Although Steve's remaining TVI didn't travel more than 100 feet, he was still gun shy; so he enclosed the output loading capacitor below the chassis in a separate aluminum box, which reduced the interference a little more. Then, he replaced all the leads to the meter switch, including the leads to the meter itself, with shielded leads prepared as described earlier, and his TVI was gone completely, *as long as the TV receiver itself was in good condition.*

This qualification is necessary, because Steve has two TV receivers—one with an erratic channel selector switch. As soon as the switch acts up in the slightest, his transmitter puts lines on its picture, while the other receiver never shows any interference.

TVI With Other Equipment and in Other Locations

As mentioned previously, TVI is no respecter of brand names. Rather it is a matter of signal strength and the distance between the TV stations and the TV receiver, the distance between the ham station and the TV receiver and the difference between the frequency used by the ham station and the TV channels. As a result, a transmitter that causes no TVI when operated within a few miles of a TV transmitter may blot out the same transmitter on nearby receivers when both the receivers and the ham transmitter are 40 or 50 miles away from the TV station.

For example, one local ham using an HT-41 in an area where TV reception is particularly good, reports that his unmodified HT-41 produces negligible TVI.

Incidentally, an odd form of TVI turned up in several Heathkit Warrior amplifiers. They produced quite a bit of local TVI when their metering switch was turned to the grid-current position, more than any other position. Replacing the lead between the nearest 811 grid terminal and the switch with an Ohmite Z-50 r.f. choke eliminated this problem. Then, replacing all the leads to the switch, especially the meter leads and the other d.c. and a.c. power leads with shielded wire gradually eliminated the remaining TVI.

Conclusion

This article was written to dispel belief among too many amateurs that TVI resulting from the operation of modern amateur transmitters is the fault of the TV receiver and that the ham can do nothing to his transmitter to eliminate the interference. On the contrary, most modern TV receivers of reputable manufacturers are not very susceptible to overload interference from transmitters operating on frequencies below 30 mc. (Note that we say *nothing* about 50-54 mc operation in channel-2 areas.)

Only when you can operate your transmitter with negligible interference to your own TV receiver *on any channel* (using an extra high-pass filter on the receiver, if necessary) are you safe in assuming that your transmitter is actually "clean." And if it isn't, methods similar to those outlined in this article will make it clean. ■

Costa Rica and Public Law 88-313

On September 18, 1964, the first bi-lateral agreement for reciprocal licensing, under public law 88-313, was signed by Costa Rica and the United States. The following photographs were taken during that event, and supplied to us by the Radio Club de Costa Rica. The radio club was instrumental in getting the agreement signed.

From left to right: Leslie Boss, TI2QKX, Mr. Francisco Urbina, Minister of Communications, Mr. Daniel Oduber, Minister of Foreign Affairs, Mr. Raymond Tellez, Ambassador of the United States, Mr. Sydney Sasso, TI2SS, Secretary of the radio club, Mr. Santiago Marsh, TI2SM, Mr. Rolando Angulo, TI2RAZ, President of the radio club, Mr. Edward N. Fogler, Mr. Humberto Pérez, TI2HP, and Mr. Luis H. Andrés, Director of the Radio Control Office.

His Excellency, Mr. Raymond Tellez, delivering his address after the signature of the reciprocal agreement, behind them standing at the right, in the usual order, TI2RAZ, TI2SS and TI2HP.

CQ World Wide SSB DX Contest Results

BY ROBERT W. STANKUS,* W2VCZ

Top Scorers

Top Ten—Single Operator

DL3LL	388,315	PZ1AX	226,570
ZL1AIX	321,750	VK2AHT	216,692
YV5BIG	273,969	K2HLB	212,333
G4CP	233,840	ZC5AJ	202,616
CX3BH	228,105	WA2SFP	174,704

GETTING a big boost from the PROPAGATION department, the *CQ* SSB DX Contest continues to grow by leaps and bounds. With over 500 logs to show for the effort, s.s.b. continues to prove it is the principal medium for voice work. In spite of reduced operating hours for participants in the single operator category, records continue to fall.

Principle gripe from the gang seemed to center around the need for two breaks totaling twelve hours. Your author who operated from K2HLB found it necessary to scuttle all plans for 40 and 80 meters, this being necessary to maintain a satisfactory QSO-per-hour average. I do hope this will be rectified by contest time next April.

Again dominating the picture and successfully defending his reign as "Champion" was Harry, DL3LL. He talked up to the tune of 388,315 points and gave Warren, ZL1AIX a real battle. Warren needed a few more W's to work, but wound up with 321,750 good for second place.

K2HLB and WA2SFP once again proved their mastery in the USA by leading the pack again. Both boys used stacked arrays for their aluminum curtain.

In the single band category, our hats go off to HC2JT for a superb job. SM5BLA made it a real battle but fell short by 4200 points. Stateside, K2HWL came up with a beautiful effort but just couldn't garner enough 3 pointers to make the top ten. Jack was head and shoulders above everyone else here in W land.

Our hats also are tipped for Foy's performance at W4RLS, who managed to stay with it in spite of many difficulties, to emerge as the 21 mc champ world wide. With low m.u.f.'s, it takes a lot of patience to run up over 20,000 points on a pretty dead band.

In the multi-op category 9A1ZG just barely nosed out the very fine group from GB3RAF. The rare call brought home more than 200 prefixes and that was the difference. Ed Bissel, W3MSK continues to dominate the multi-op field here in the USA. A fine array of operating talent plus a tremendous antenna setup gave W3MSK the nod over Ron, K6EVR.

With the next contest pencilled in for April 10 and 11, it is time to spruce up the antenna systems for competition is expected to be real keen. Continued good luck and I'll see you in the pileups. ■

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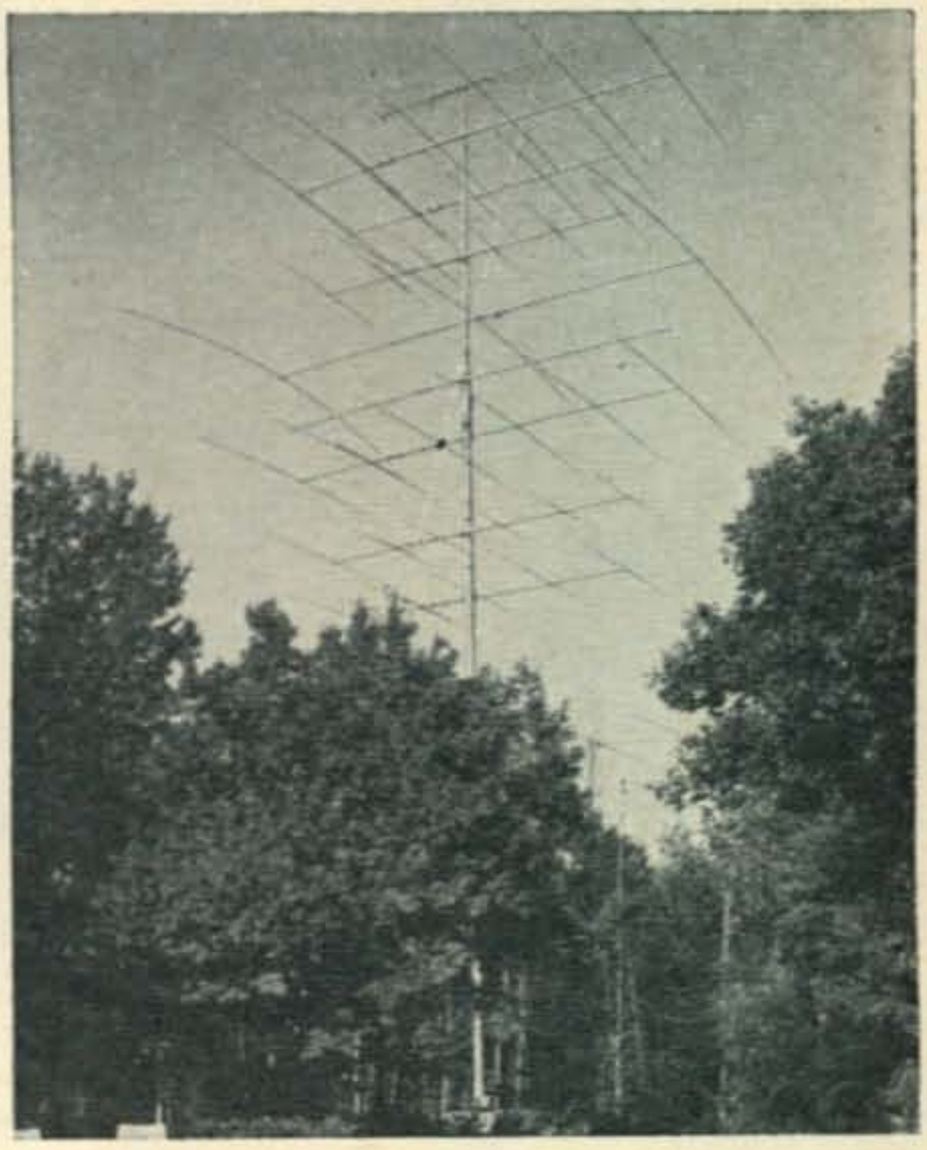
Almost, but not quite, the winner in the Multi-Op category was GB3RAF. Less than 2000 points spelled the difference as 9A1ZG took the honors.



At K2HLB, antennas played a major role. That top array measures about 120 feet above ground level!

Top Scorers—Single Band

Top Ten—Single Operator

HC2JT	354,522	TI2HP	197,904
SM5BLA	350,406	EA4GZ	197,456
VS1LP	227,040	PZ1CE	178,562
4X4LC	203,665	5A5TW	169,016
UW3UF	201,142	DJØIK	165,000

SINGLE OPERATOR

North America

United States

W1FZ	**A**	**27,455**	**85**	**323**
W1BFA	"	14,430	65	222
W1PLJ	"	864	18	48
K1DII	21	990	25	45
W1BPW	**14**	**101,808**	**126**	**808**
W1AWE	"	3,384	36	94
K2HLB	**A**	**212,333**	**199**	**1067**
WA2SFP	"	174,704	179	976
W2GKZ	"	15,812	67	236
K2HWL	**14**	**162,486**	**162**	**1003**
WB2CNA	"	99,008	136	728
WA2HOK	"	65,472	124	528
WB2CCO	"	53,001	117	453
W2FZJ	"	48,578	107	454
W2BHS	"	31,527	93	339
W2QKJ	"	13,986	63	222
K2DGI	"	4,699	37	127
W2JB	"	40	4	10
K2GXI	**7**	**3,650**	**50**	**73**
WA2WMT	"	592	37	16
W3TLN	**A**	**95,410**	**145**	**658**
K3BNS	"	43,092	114	378
K4BVV	**A**	**120,554**	**158**	**763**
W4FPS	"	51,045	123	415
K4ISV	"	34,132	106	322
K4WHD	**14**	**93,148**	**146**	**638**
W4HKJ	"	31,208	94	332
W4NJF	"	10,260	60	171
W4OM	"	7,497	49	153
W4HA	"	5,500	44	125
W4RLS	**21**	**20,405**	**77**	**265**
W4EEO	"	560	14	40
WA4SUR	**28**	**1,450**	**25**	**58**
W5AJY	**A**	**21,420**	**90**	**238**
WA5ALB	**21**	**6,550**	**50**	**133**
K5ABV	"	1,035	23	45
W4OSG/5	**14**	**924**	**28**	**33**
K5WAT	**7**	**1,254**	**33**	**38**
W6AM	**A**	**142,310**	**190**	**749**
W6VSS	"	110,007	153	719
WB6BEE	"	2,016	42	48
WA6WPG	"	1,104	23	48
K6CT	**28**	**510**	**15**	**34**
K6AEZ	**21**	**3,555**	**45**	**79**
K6AHV	**7**	**4,365**	**45**	**97**
W7ESK	**A**	**51,765**	**119**	**435**
W7LBN	**14**	**2,244**	**33**	**68**
K7VYU	"	1,519	31	49
W7DLR	"	774	18	43
W8CLR	**A**	**28,992**	**96**	**302**
W8HUD	**14**	**20,880**	**87**	**240**
WA9BNX	**A**	**5,907**	**63**	**158**
K9ZJV	"	4,815	45	107
WA9IIJ	"	4,320	45	96
W9OKM	**14**	**19,090**	**83**	**230**
WØEZO	**A**	**19,320**	**84**	**230**
WØLBS	"	3,780	42	90
KØJPL	"	1,428	28	51
WØIFQ	**21**	**6,048**	**54**	**112**
WØNFA	**14**	**25,389**	**93**	**273**
KØDUB	"	8,100	60	135

Bermuda

VP9FK	**14**	**57,200**	**104**	**550**

Canada

VE2BV	**14**	**8,450**	**50**	**169**
VE3ES	"	**29,016**	**93**	**312**
VE3DYB	"	17,570	70	251
VE4SC	"	**3,344**	**38**	**88**
VE6TP	"	**49,410**	**122**	**405**
VE6SF	"	20,480	80	256
VE8RG	"	**102,448**	**152**	**674**
VE8AH	"	40,716	108	377

Hawaii

W5FAS/KH6	**A**	**53,284**	**77**	**692**
KH6FBJ	"	52,022	74	703
W7UXP/KH6	**21**	**6,237**	**33**	**189**

Newfoundland

K5YAA/VO1	**A**	**131,190**	**155**	**922**
VO1BR	**14**	**87,630**	**115**	**762**
WA9JWR/VO1	"	45,255	85	533

Costa Rica

T12HP	**14**	**197,904**	**168**	**1178**

Africa

Angola

CR6DX	**A**	**22,120**	**70**	**316**

Libya

5A5TW	**14**	**169,016**	**148**	**1142**

Morocco

CN8AW	**14**	**67,886**	**91**	**746**

Nigeria

5N2CKH	**14**	**69,651**	**109**	**639**

Rep. of Congo

9Q5RK	**A**	**28,914**	**79**	**366**

S. Rhodesia

ZE1AC	**14**	**81,795**	**95**	**861**

Tanganyika

5H3JR	**A**	**39,220**	**37**	**1060**

9A1ZG managed to pick up those extra few points to put them over the top in the Multi-Band, Multi Operator category. L. to r. the operators are: DJ4ZT, DL9XO, and DJ1ZG.

Asia

Iran

EP2AU	**14**	**149,562**	**126**	**1187**
EP3HS	**14**	**1,280**	**20**	**64**

Israel

4X4DK	**28**	**168**	**8**	**21**
4X4PQ	**21**	**504**	**21**	**24**
4X4LC	**14**	**203,665**	**161**	**462**

Japan

JA1BRK	**A**	**79,517**	**131**	**607**
JA1CFN	"	1,890	21	90
JA1BK	**14**	**39,298**	**98**	**401**
JA1ADN	"	13,740	60	229
KA2BW	"	12,798	54	237
JA5HT	"	7,849	47	167
JA1BNW	"	680	17	40
JA2BAY	**7**	**1,800**	**15**	**120**

Laos

XW8AU	**14**	**3,360**	**35**	**96**

W. Malaysia

9M2JJ	**14**	**10,904**	**58**	**188**

Mongolia

JT1CA	**14**	**54,320**	**97**	**560**

Singapore

VS1LP	**14**	**227,040**	**160**	**1419**

Asiatic U.S.S.R.

UW9AF	**A**	**53,559**	**99**	**541**
UAØEK	**14**	**11,526**	**51**	**226**
UAØKWA	"	3,939	39	101
UAØGF	"	3,000	30	100

Azerbaijan

UD6BR	**A**	**45,361**	**84**	**540**
UD6KAR	**14**	**91,332**	**129**	**708**

Georgia

UF6UB	**3.5**	**333**	**9**	**37**

France

F2MO	**A**	**2,337**	**41**	**57**
F3II	"	1,880	20	94
F7DO	14	68,248	76	898
F3EG	"	42,480	80	531

Germany

DL3LL	**A**	**388,315**	**185**	**2099**
DL4PP	"	108,747	129	843
DL3DW	"	108,680	130	836
DL2OX	"	105,504	157	672
DJ3WE	"	60,243	129	467
DL7EN	"	51,084	129	396
DL8DX	"	44,616	132	338
DJ2QZ	"	38,430	122	315
DL9PU	"	36,464	106	344
DL7AD	"	35,000	100	350
DJØJZ	"	24,534	94	261
DJ4IZ	"	10,164	77	132
DJ5HN	"	8,618	62	139
DJØIK	**14**	**165,000**	**150**	**1100**
DL7BA	"	129,409	133	973
DJØGT	"	104,394	127	822
DL5AO	"	83,025	123	675
DL4VR	"	18,450	75	246
DL2PO	"	17,155	73	235
DL6EY	"	4,161	37	113
DJ2YA	**3.5**	**10,530**	**78**	**135**

Greece-Crete

SVØWGG	**14**	**158,983**	**149**	**1067**

Greenland

OX3JV	**14**	**135,042**	**142**	**951**

Italy

I1RB	**A**	**96,585**	**137**	**705**
I1AMU	**14**	**130,130**	**154**	**865**
I1DFA	"	11,952	83	144

Top Scorers—All Band

Top Five—Multi-Operator

9A1ZG	349,002	W3MSK	267,460
GB3RAF	347,072	5A2TZ	250,432
UA1KBW	192,060		

Armenia

UG6AW	14	26,460	98	270

Kazakh

UL7FA	**14**	**34,868**	**92**	**379**

Kirghiz

UM8KAB	**14**	**42,504**	**92**	**462**

Turkoman

UH8BO	**14**	**27,548**	**71**	**388**

Uzbek

UI8AG	**14**	**10,488**	**76**	**138**

Europe

Bulgaria

LZ1DV	**14**	**24,395**	**85**	**287**

Czechoslovakia

OK3CDR	**A**	**75,210**	**115**	**654**
OK1ADP	"	18,172	77	236
OK1ADM	"	12,444	68	183
OK2BDB	"	8,970	68	130
OK1VK	"	6,710	61	110
OK1JX	"	1,872	36	52
OK1MP	**14**	**24,726**	**78**	**317**
OK2WCG	"	8,684	52	167
OK1ZC	"	1,416	24	59
OK1VE	**3.5**	**6,670**	**58**	**115**

Denmark

OZ5BW	**A**	**44,464**	**112**	**397**
OZ4RT	"	18,094	83	218
OZ4FA	"	13,032	72	181

England

G4CP	**A**	**233,840**	**182**	**1285**
G3NEZ	"	42,510	109	390
G3PEU	**21**	**1,932**	**23**	**84**
G3KZQ	**14**	**155,385**	**135**	**1151**
G2QT	"	66,700	100	667
G3MEA	"	14,080	80	176
G5HZ	**7**	**3,619**	**47**	**77**

Faeroes Island

OY8KR	**14**	**7,224**	**43**	**168**

Finland

OH2DX	**14**	**57,000**	**114**	**500**
OH2WI	"	43,232	112	386
OH1NQ	"	32,643	93	351
OH5TM	"	25,784	88	293
OH4OO	"	17,472	78	224
OH3TA	"	2,904	33	88
OH2TH	**7**	**4,606**	**49**	**94**
I1CWX	**7**	**3,984**	**48**	**83**

Netherlands

PAØHBO	**A**	**150,482**	**134**	**1123**
PAØPAN	"	15,576	59	264
PAØEEM	**14**	**22,800**	**75**	**304**
PAØLOU	"	5,428	46	118

N. Ireland

GI3CDF	**3.5**	**21,070**	**98**	**215**

Norway

LA5HE	**14**	**24,102**	**78**	**309**

Poland

SP5KS	**14**	**1,890**	**27**	**70**

Portugal

CT1KF	**14**	**8,268**	**53**	**156**

Roumania

YO3ZA	**14**	**15,169**	**77**	**197**
YO3GY	"	1,827	29	63

San Marino

M1AC	**14**	**92,435**	**95**	**973**

Scotland

GM3JDR	**14**	**57,959**	**121**	**479**
GM3CIX	"	38,315	97	395

Spain

EA4GZ	**14**	**197,456**	**164**	**1204**

Sweden

SM6SA	**A**	**102,396**	**106**	**966**
SM6BGG	"	**82,600**	**140**	**590**
SM6BXV	"	1,881	33	57
SM5BLA	**14**	**350,406**	**206**	**1701**
SL2AD	"	84,224	128	658
SM5ANH	"	63,612	114	558
SM5KV	"	39,204	99	396
SM7BK	"	32,205	113	285
SL6AL	"	12,390	70	177
SM5AZU	"	12,348	63	196
SM2BYW	"	7,809	56	137
SM5BPJ	"	4,240	40	106
SM5CHA	"	3,663	37	99

Switzerland

HB9UD	**A**	**15,484**	**79**	**196**
HB9ZY	**14**	**143,290**	**140**	**1028**

European U.S.S.R.

UA3KOO	**A**	**46,592**	**112**	**416**
UA3KYA	"	42,056	69	609
UA6FD	"	23,808	96	248
UW3UF	**14**	**201,142**	**163**	**1234**
UA3KAA	"	104,412	132	791

[*Continued on page 98*]

A No-Clobber Converter For 6 Meters

BY ELWOOD C. THOMPSON*

For years v.h.f. converters were designed with one objective in mind; the lowest possible noise figure.[1] It's time to consider other factors, such as cross-modulation and overload, as is being done in commercial circles.

A CONVERTER to handle crosstalk, noise and overload problems satisfactorily has either excellent linearity or extremely high selectivity between the antenna and first r.f. stage and this is practically impossible with the current state of the art.[2,3] Blocking bias voltages on the r.f. amplifier and mixer grids reduce the overall gain and effects, adversely, the overall linearity of the mixer. To achieve good cross-modulation and overload characteristics, the mixer should be as linear as possible. Conventional mixers are not linear mainly because the local oscillator voltage swings the tube from nearly cutoff to almost zero bias and at the present time no available tube is linear near cutoff or near zero bias. As long as the signal remains small in comparison to the local oscillator voltage, the mixer is very linear. However, when a tube (non-linear) element has two or more signals impressed upon it, one or possibly both signals can be strong enough to drive that element into the non-linearity region (off the linear portion of the curve).

Mixer

The mixer should provide little, if any, gain. Running a mixer at *low level* reduces cross-modulation, as this usually takes place in the mixer of the converter. The mixing action, the conversion of the high r.f. frequency to a lower one, should be controlled by such a selection of parameters that mixing action just barely takes place. The communications receiver following the converter should supply the necessary gain.[4]

In the interests of preventing cross-modulation and overload, the experimental converter shown in fig. 1 was designed and constructed according to the following specifications and performed substantially above expectation.

R.F. Amplifier

The r.f. amplifier in this circuit borrows heavily from a previously published design and is known as a cathode-coupled r.f. amplifier.[5] The high input impedance presented by the cathode follower input stage gives increased selectivity and *extremely light loading* of the antenna input circuit. Normally the cathode bias for this type circuit is developed across a resistance of approximately 100 to 470 ohms. Increasing this cathode resistance to approximately 1000 ohms lowers the mutual conductance and advantageously raises the noise figure. However, when using the high G_m Nuvistors, raising the bias does not increase the noise figure appreciably, but the immunity to overload and cross-modulation is increased. The plate circuit of the grounded-grid stage and the mixer grid circuit are connected to separate tuned circuits and are coupled together by a one turn link. This double tuned circuit has a unifrom frequency response over the entire band. A metal shield is inserted between the two coils to prevent i.f. feedthrough. This shield stops signals coupled through the antenna input at the i.f. frequency from entering the mixer and being amplified.

As can be seen in fig. 1, the cathode coupled mixer uses parallel connected plates and a common cathode impedance.[6] The signal frequency is coupled to the first grid and the injection frequency is coupled to the second grid, which reduces the loading effect and increases the rejection of spurious responses. The cathode bias for the mixer is set at approximately *twice* the

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[1]Hadlock, C. F., "Design Considerations of 50 Mc. Converters," *QST*, March 1957, page 17.

[2]Main, R. H., "A Folded Line Cavity," *CQ*, January 1958, page 32.

[3]Heller, D. L., "Eliminate Overload," *CQ* December 1962, page 88.

[4]Jablin, J. L., "Which Receiver to Follow the V.H.F. Converter," *CQ*, February 1964, page 42.

[5]Marshall, J. P., "An Unusual 6 Meter Preamp," *VHF Horizons*, April 1963, page 20.

[6]Ives, R. L., "All Purpose Mixer," *Radio Electronics*, May 1964, page 51.

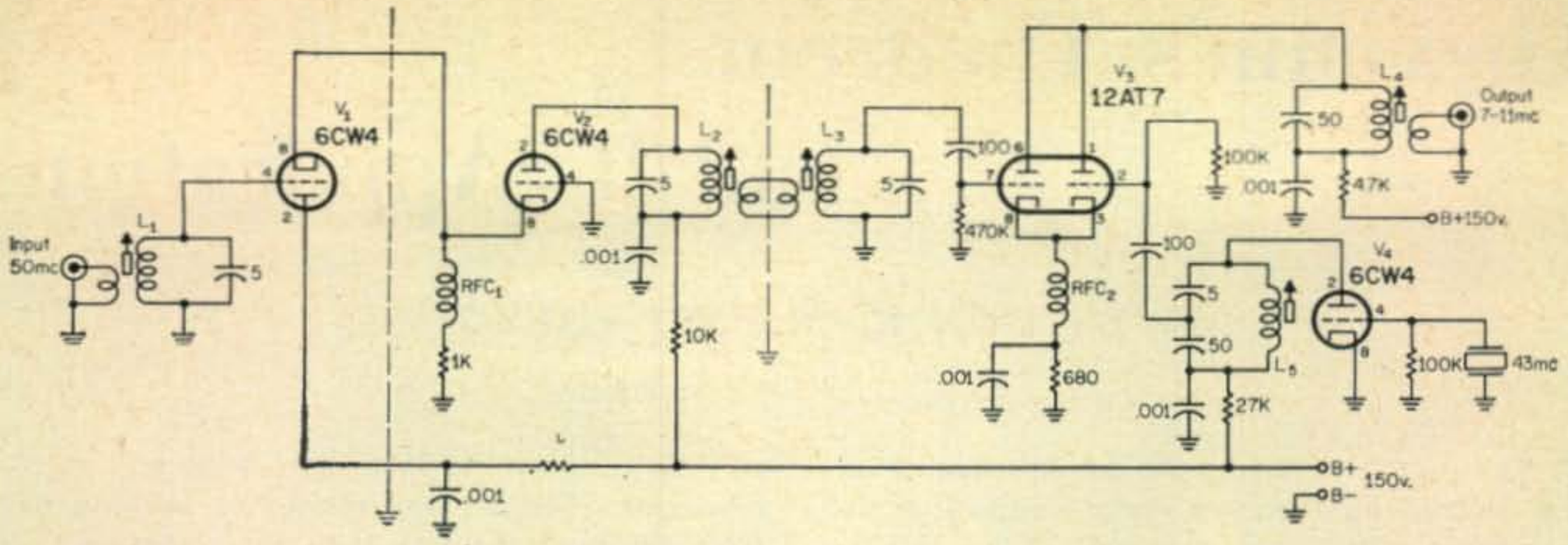

Fig. 1—Circuit of a six meter overload proof converter. All resistors are ½ watt and all capacitors are in mmf unless otherwise noted. The power requirements are 125-150 volts at 25 ma and 6.3 volts at 0.7 amps. Filament wiring is routine, therefore not shown.

L_1—10t #28E., close wound on ¼" slug tuned form, CTC type LSM (white slug).
L_2, L_3—12t #28E., close wound on ¼" slug tuned form, CTC type LSM (white slug).
L_4—26t #30E., close wound on ⅜" slug tuned form, CTC type PL55 (red slug).
L_5—20t #28E., close wound on ¼" slug tuned form, CTC type LSM (red slug).

RFC_1—2.2 microhenries or approx. 20t #24E., on ¼" form.
RFC_2—3.55 microhenries or approx. 25t #24 Formvar, 5/32" inner diam., close wound, self supporting.
Antenna Link—2t #26 insulated hook-up wire I.F.
Output Link—4t #24 insulated hook-up wire.
L_2-L_3 Link—1 turn on cold end of each coil.

Class A value to obtain good overload characteristics. A high *Q* tuned circuit is used in the plate circuit of the mixer, and is resonant at the i.f. frequency of 7 mc. This circuit offers a high impedance to the i.f. voltage and a low impedance to the signal and oscillator voltages, thus providing effective filter action permitting passage only of the i.f. signal. The r.f. choke ($r.f.c._2$), in the cathode circuit presents a high impedance at the r.f. frequency and a low impedance at the i.f. frequency. The value shown in fig. 1 is optimum for an i.f. frequency of 7-11 mc. The use of a single tube type such as the Nuvistor would simplify the spare tube problem, but the 12AT7 was more readily available in quantity, so this type was used.

The mixer efficiency is extremely dependent upon the proper oscillator injection voltage. Oscillator output voltage may be adjusted while listening to signals or with a noise generator. When the correct adjustment is obtained, good gain, low noise, and lack of distortion will be clearly apparent. Too much oscillator output will result in reduced gain and increased noise, while too little output will give relatively noise-free results with not enough mixing gain. The tube noise is a function of plate current and it is a matter of measurement that the use of the cathode coupled mixer results in a better signal-to-noise ratio, *if other factors remain equal.* The increase in linearity accompanying the decrease of gain is an advantage over simple attenuation. An important result is improved linearity over a larger range. In fact, it takes a signal of several volts to overload the converter at this point.

Oscillator

The oscillator uses a third overtone crystal in parallel resonance and oscillates at 43 mc[7]. The plate coil is parallel tuned for resonance at 43 mc. R.f. output is coupled to the mixer through a 100 mmf capacitor. A capacitive divider is used to provide a tap on the tank circuit so that the oscillator is loaded very lightly. If the tuned circuit is not tapped, the overtone crystal might show lower frequency energy (fundamental) or it might not oscillate at all.

Since this article is intended only as the presentation of our experiments, no construction details are given, although the circuit diagram is an excellent starting point for work along these lines. In our instance, it has been made to work and work well.

Some pointers are in order, however. Shielding of the r.f. stage, good grounding, and layout are of the utmost importance. All grounds for the r.f. stage must be returned to a shield partition separating the two Nuvistors in the r.f. stage. If ordinary care is taken in circuit layout, along with good shielding, a top performance converter will result that will be an object of pride.

This converter has a higher immunity to overload and cross-modulation than any other circuit configuration tried to date. Comparisons between the cascode, neutrode, and grounded-grid circuits show this cathode coupled circuitry to be superior. The overall immunity to overload, however, will be finally determined by the circuitry and quality of the receiver which is used as the tunable i.f.

There undoubtedly is much more room for experimentation on this subject and it is hoped that others will be stimulated to make similar investigations along these lines. ■

[7]Tilton, E., "Overtone Crystals and How to Use Them," *QST*, March 1955, page 16.

Thevenin's Theorem and Its Applications

BY DON E. OLSON,* K9EZG

FREQUENTLY, during the construction or design of ham gear, a certain voltage across some component is desired. Often, this can be a very tedious task using only Ohm's law and Kirchoff voltage laws. Thevenin's theorem is very useful when the voltage across a single component must be calculated, yet few electronic experimenters or hams are familiar with this type of simple circuit analysis.

To illustrate the principles of Thevenin's theorem, we can consider a closed box with two terminals *A* and *B* exposed. If we have a d.c. voltmeter and ammeter available, we may determine what the nature of the contents of the box is. With other equipment, we could determine if the elements within the box were reactive and the exact nature of the open circuit voltage. We will assume that the open circuit voltage is purely d.c. and that the sealed box contains no reactive components. The circuitry within the closed box is shown in fig. 1a.

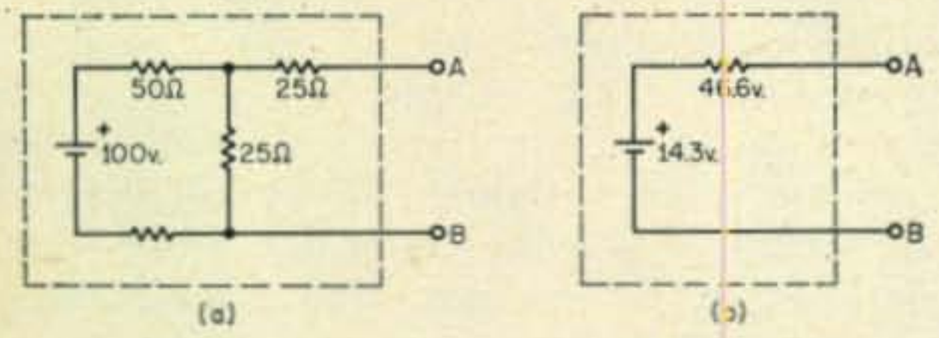

Fig. 1—The circuit in fig. 1a can be simplified to that of 1b by the method explained in the text.

If we connect a d.c. voltmeter having a high internal impedance across *A* and *B*, we would read 14.3 volts. Next we short-circuit terminals *A* and *B* through an ammeter with negligible internal resistance. We would read 0.307 amperes. This closed box then appears to behave as if it contained a d.c. voltage source of 14.3 volts and a circuit which permits 0.307 amperes to flow. The internal resistance of the voltage source must then be

$$R = E/I = 14.3/0.307 = 46.6 \text{ ohms.}$$

The internal circuitry of this sealed box may be very complex, but it can be represented by a voltage source of 14.3 volts with an internal resistance of 46.6 ohms. The Thevenin equivalent circuit is shown in fig. 1b.

Thevenin's theorem may be stated generally as follows: A two terminal network of fixed resistances and voltage sources may be replaced by a single voltage source equal to the open circuit voltage at the terminals with an internal resistance equal to the resistance looking back from the two terminals with the voltage sources replaced by their internal resistances.[1]

A simple application of Thevenin's theorem is illustrated in fig. 2. Resistor R_x passes 20 milliamperes in the circuit shown and it is desired to determine the value of R_x.

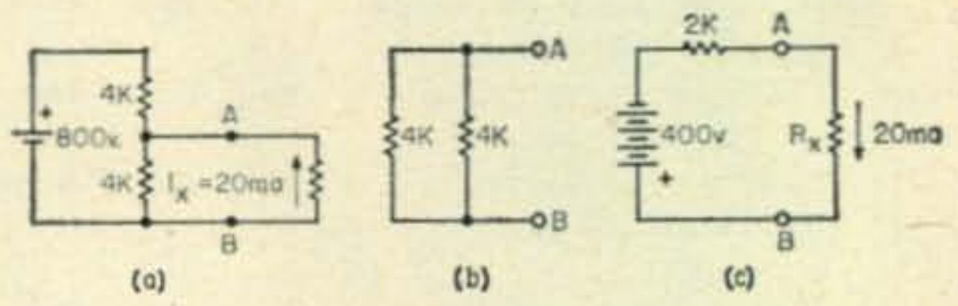

Fig. 2—Using Thevenin's theorem to determine the value of R_x is accomplished in three steps.

The first step is to remove the unknown resistance R_x from the circuit. The voltage source is replaced with its internal resistance which we will assume to be zero. The circuit then appears as in fig. 2b. The total resistance of two resistors in parallel is

$$R_t = R_1 \times R_2/R_1 + R_2 = 4K \times 4K/4K + 4K = 2K \text{ ohms}$$

With the unknown resistance R_x removed, we find that 800 volts is dropped across two 4K ohm resistors. Since voltage is directly proportional to resistance, we can calculate the open circuit voltage V_{ab} as follows:

$$\frac{V_t}{R_t} = \frac{V_{AB}}{R} \quad \frac{800}{8k} = \frac{V_{AB}}{4k} \quad V_{AB} = 400 \text{ volts}$$

The Thevenin equivalent circuit is shown in fig. 2c with the unknown resistance R_x reconnected. By Ohm's law, we find the total resistance of the circuit must equal

$$R_t = E/I = 400/0.02 = 20K \text{ ohms.}$$

$$R_x = 20K - 2K = 18K \text{ ohms}$$

Probably the most useful application of Thevenin's theorem is in the analysis of networks involving a number of resistors in series and parallel combination. Such a network is shown in fig. 3a. The open circuit voltage V_{AB} is desired. To solve this by writing Kirchoff voltage loop equations would be unnecessarily difficult. This circuit, though, can easily be solved by an application of Thevenin's theorem. By taking a

[*Continued on page 99*]

*R.F.D. 1, Box 30, Spring Valley, Wisc.

[1]Jackson, H. W., *"Introduction to Electric Circuits,"* Prentice Hall Inc.

AUTOMATIC CARRIAGE RETURN FOR THE MODEL 15

BY EDWIN BRUENING*, W8DTY AND BERNARD H. BETKE†, K8PSJ

If you would like to be able to walk away from your model 15 printer while it is operating and not have to worry about those little black squares at the end of the line . . . then this article is for you. Here is the easiest way yet to add automatic carriage return and line feed functions to your model 15.

WHILE several articles have been written about automating the carriage return and line feed functions of the model 15, most involved the description of many steel parts which had to be manufactured at home . . . and weren't particularly easy to install. Furthermore, most schemes involved dismantling the printer. This idea, in itself, was one that discouraged many hams from even trying to obtain the minor operating luxuries of automatic carriage return and line-feed functions.

The scheme described here uses only a minimum of home-brewed parts. Two small mounting brackets and two activating linkages or lever arms is the extent of the do-it-yourself construction. The parts can be made of steel, aluminum, or even fiber . . . whatever you have handy in the junkbox.

If you can measure accurately and place a few holes where required, you just can't go wrong. And this is the best part . . . no major disassembly-reassembly of the printer is necessary. The only holes required in the printer are for mounting the line-feed solenoid to the aluminum base. No further modifications or hole-drilling is required. The desired functions are obtained through the use of "ad-on" parts.

The line-feed solenoid, a carriage return solenoid, and a small switch are the only electrical parts needed. The switch can be a home-made one, a microswitch, or a discarded special switch from some RTTY apparatus. Almost anything will do the trick.

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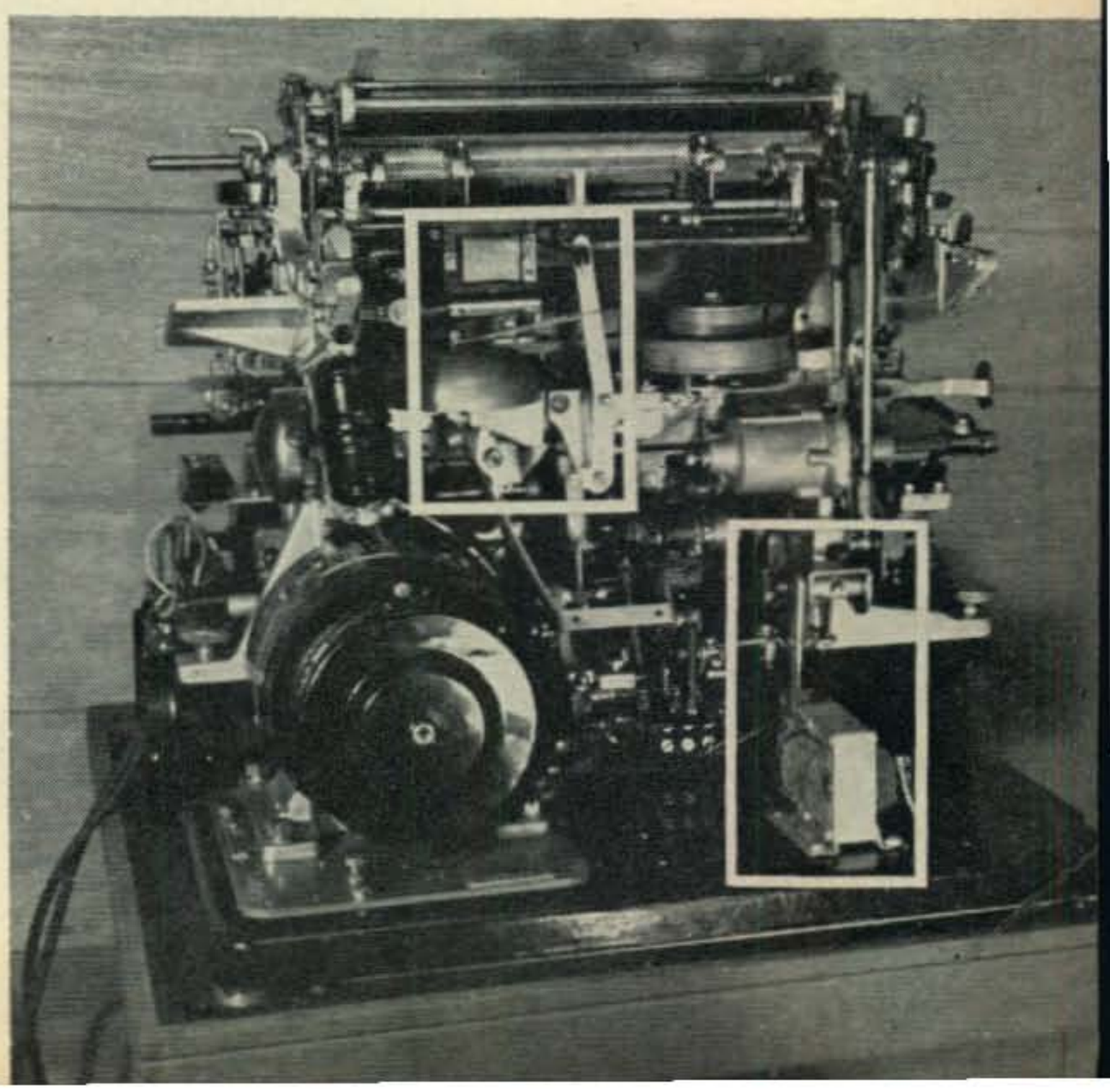
†1172 Share, Ypsilanti, Michigan.

Operation

In operation, the assembly works like this . . . The typing unit closes the switch when it reaches its end of travel. This point is usually after a line of 72 characters have been printed . . . or 72 spaces from the left margin. The switch applies 115 volts a.c. to the two solenoids. When the solenoids pull in, they move the two lever arms to perform the desired functions. The normal action of the springs within the machine provide a natural "re-set" condition.

The approximate dimensions and shapes of the lever arms are shown in fig. 1. A suggested shape for the carriage return solenoid mounting bracket is shown in fig. 2. This bracket must be shaped quite carefully since it will be in close proximity to moving parts of the printer. Pos-



Rear view of a printer with the lever arms and solenoids installed. The switch used to activate the solenoid circuits can be seen at about the 11 o'clock position above the motor. A flat plate acts as a mounting bracket and secures the switch onto the printer On/Off switch cover. The plug and socket above the motor carry power to the carriage-return solenoid. This is a convenient way to break the electrical connection when it is necessary to remove the typing unit from the base. The wire loop that restricts armature travel can be seen fastened to the bell retaining screw.

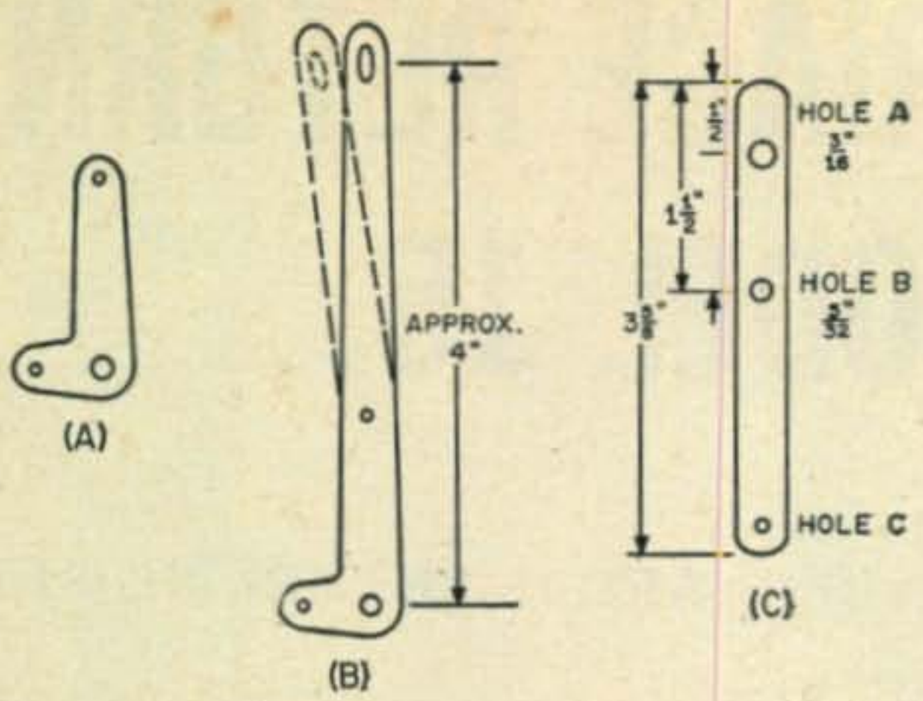


Fig. 1—Lever arm dimensions for (B) Carriage Return lever and (C) Line Feed lever arm. Both arms are fabricated from 1/16" stock (#16 gauge). The Latch Bell Crank (A), part #74121, is removed from the printer and used as a template for the bottom end of lever (B). The exact tilt of the upper portion of the Carriage Return lever may vary according to the solenoid used, as shown by the dotted portion.

sible switch locations are shown in fig. 3. Switch mounting-bracket details will vary, depending on the switch size, its mounting location, and how it will be mounted.

The shapes of the lever arms can vary slightly. Their exact dimensions will be determined by the types and sizes of the solenoids you decide to use. The solenoid for the line-feed function should have a minimum pull of 30 to 40 ounces. A solenoid with a minimum pull of 12 ounces will work to perform the carriage return function. A glance at a few catalogs will reveal several acceptable types. The carriage return solenoid should be as small as possible, consistent with the required pull, in order to clear the carriage and a full roll of paper. Figure 4 shows the lever arms and solenoids in place.

Construction

First, decide where you will mount the switch. Make the switch bracket and install the switch on the printer. Run wires with the regular harness below the base if the switch is base-mounted. If you install the switch on the typing unit, you're on your own to keep the wires clear of moving parts.

Work on one machine function at a time,

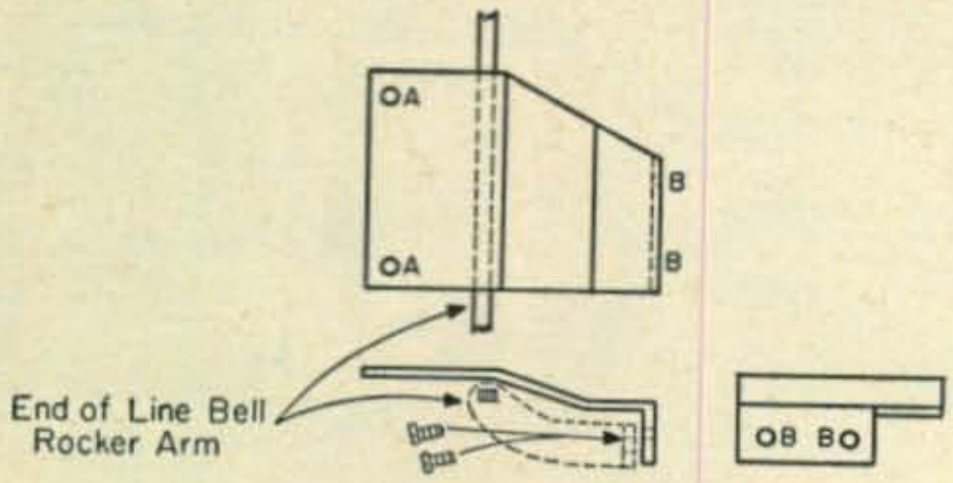


Fig. 2—Construction details for the solenoid mounting bracket. The solenoid is mounted with only 2 screws (holes A). Note the slight bend shown in the side view. This is necessary to clear the "End of Line Bell Rocker Arm" beneath the bracket. Holes B are located so that the bracket may be held by the same screws that hold the rocker arm bracket.

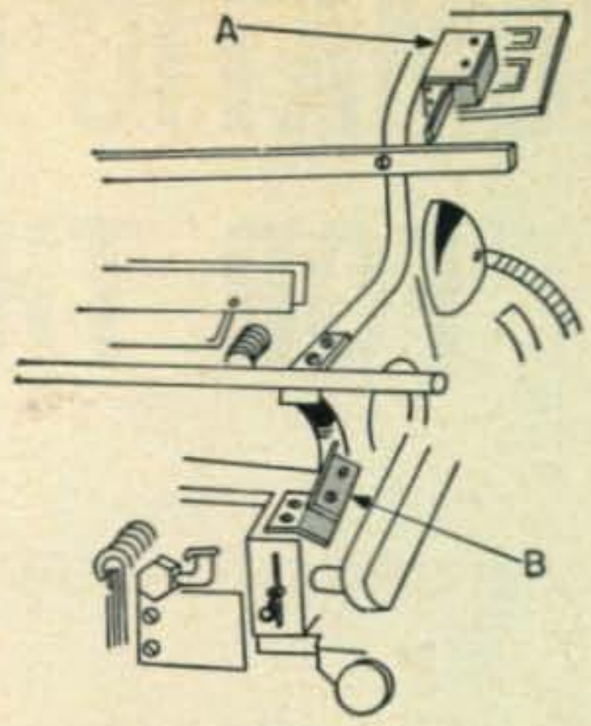


Fig. 3—Partial front view of the model 15 shows two alternate microswitch locations, A or B.

Make certain that one lever arm and its related solenoid are properly installed and working before tackling the other function assembly. Each lever arm will have to be made to mate to the solenoid you intend to use.

Carriage Return Function—Make the solenoid mounting bracket. Mount it, with the solenoid, on the machine. It will then be much easier to determine the correct shape of the lever arm that will connect to the solenoid. In most cases the lever arm will be straight or have a slight bend at the top towards the solenoid.

If you cannot locate a solenoid with a captive armature, then the travel of the armature must be limited. This is to prevent it from accidentally being jerked out of the solenoid frame during carriage return action. The limiting can be done with a stiff and narrow wire loop. Fasten one end of the loop under the screw that retains the large bell in position. See fig. 4.

Look at your printer from the rear and locate the Latch Bell Crank (part no. 74121 as shown in fig. 1). This part will serve as a template to lay out the lower portion of the new lever arm. Note the vertical plane in which it lies before removing it. The solenoid must be mounted in a position that will allow its armature to move horizontally back and forth at a right-angle to this plane. The new lever arm, when completed, may have to be bent very slightly to compensate for any misalignment.

Now remove the Latch Bell Crank and lay out the lower section of the arm. The correct length of the arm can be approximated by noting the hole spacing as indicated in fig. 1. Note that

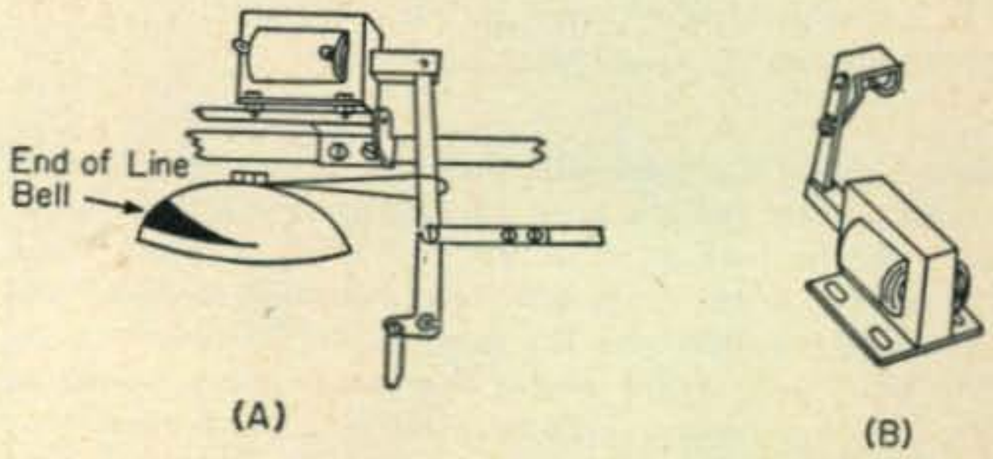


Fig. 4—Solenoids and lever arms as they should appear in place when viewed from the rear of the printer. The wire loop in (A) is necessary to limit the travel of the solenoid armature if it is not of the captive type.

the upper hole is really a slot filed parallel to the centerline of the arm.

Assemble the new lever arm to the solenoid armature and the printer frame. Temporarily wire up the solenoid and the switch to 115 volts a.c. Operate the printer with local loop current and look for the following: (1) The carriage closes the switch after 72 characters have been printed, (2) The carriage return linkages have a little play and can be moved smoothly and without binding. If binding does occur, it will almost always be due to the new lever arm.

Compare the lower portion of the arm with the removed Latch Bell Crank. Bend the new part slightly where indicated if necessary to make it agree mechanically with the original part. The Latch Bell Crank can then be discarded as it will no longer be needed.

Line Feed Function—The construction of the line-feed lever arm is quite easy. After forming this piece, first drill only holes A and B. Although the exact size of each hole can vary a little, the spacing between the holes is critical. Hole A should be held close to the specified size so that it will snugly fit the stud on the machine part to which it will be mounted.

Mount the lever arm on the printer. Viewing the machine from the rear, this lever arm is attached to the left (or inside) of the Line Feed Bail (Teletype Part No. 74079). Use the mounting screw and nut already part of the Bail assembly to hold the lever arm. Temporarily set the solenoid in place on the base. Manually operate the line-feed lever arm and note the swing of the bottom portion of the lever. Move the solenoid back and forth along the axis of the armature movement and locate a point where the travel of the solenoid arm will be correct with regard to pulling the lever arm the proper distance. Mark the lever arm for hole C at a point where the armature lines up with it. Mark the base of the printer for drilling and/or tapping the solenoid mounting holes.

Remove the lever arm, drill hole *C* and remount the arm. Drill the solenoid mounting holes and mount the solenoid to the base. Connect the armature of the solenoid to the new line-feed lever arm. Use a small bolt and nut or stiff loop of piano wire—whatever is necessary for a good flexible mechanical joint.

Momentarily apply 115 volts a.c. to the solenoid and check for proper line-feed action. This completes the installation and check of all parts. Install permanent wiring now for the two solenoids and the switch. The solenoids can be either series or parallel connected. Variations in solenoids and their reactions with applied voltage may dictate that one or the other methods of connection may be best in any given installation.

Conclusion

If the noise of the solenoids is objectionable, small pieces of hard rubber can be cemented to the solenoid cores or frames to act as buffers against the armatures when they are pulled in.

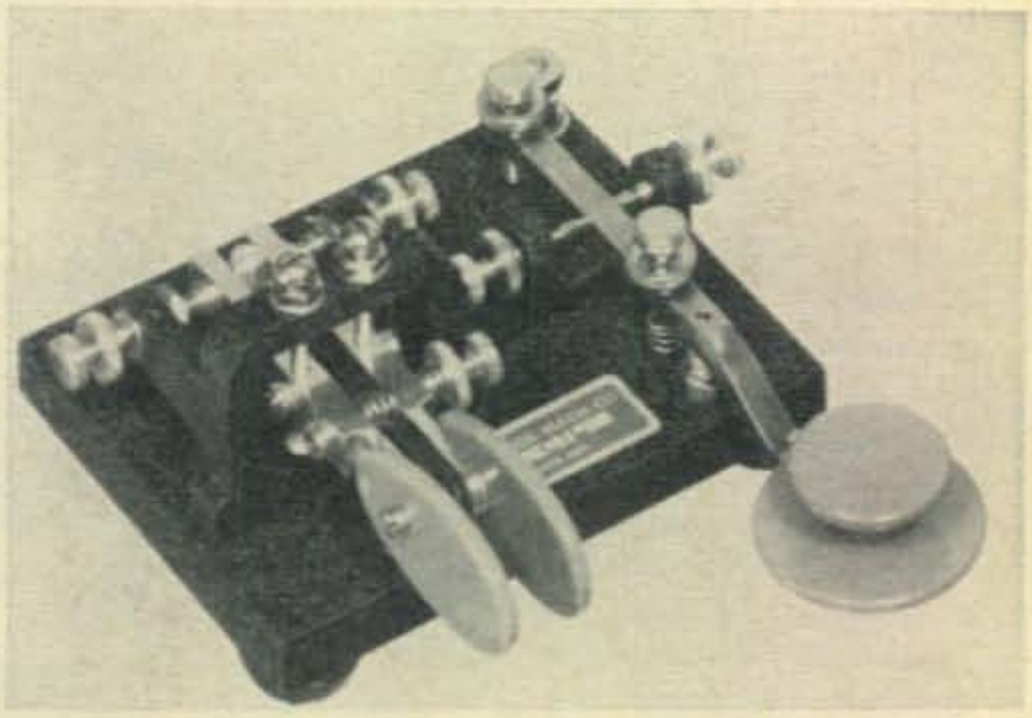
In some cases the typing unit may not always return to the same left margin. This is almost always due to slight misadjustments of the carriage return spring tension or a lack of proper buffer action within the dashpot. While this is an infrequent occurence, it has almost always been noted to occur on very old printers or on printers that have not been serviced or adjusted for quite some time.

There are doubtless other mechanical or electro-mechanical arrangements which will work to perform the functions of line-feed and carriage-return. It is intended here to merely point out one way that these functions can be had with a few basic electrical components and a minimum of effort. Further sophistication of these ideas presented here is left to your imagination. ■

New Amateur Products

Brown Bros. Telegraph Keys

AMONG a line of keys made by Brown Bros. Machine Co. is the model CTL. The Model CTL is a combination of a twin lever and a heavy duty straight key mounted on a 3½ × 4½ inch base. If your electronic keyer is so equipped, this combination will provide automatic, semi-automatic, and straight keying. A binding post is provided so that the straight key can be connected independent of the twin lever. The Model CTL sells for $18.95. Another variation is the model CSA which is a combination of the semi-automatic key (bug) and the straight key on the same base. Brown Bros. also manufactures, straight keys alone, twin lever keys mounted on a base and separate twin lever keys for building into your own keyer. Further descriptions and



prices can be obtained from Brown Bros. Machine Co., 5370 Southwest Ave., St. Louis 39, Mo.

CQ Reviews:

The Heathkit SB-400 Transmitter

BY WILFRED M. SCHERER,* W2AEF

THE Heathkit SB-400 is a versatile s.s.b./c.w. transmitter, in the 100-watt output class and supplied in kit form, which meets the standard of quality and performance set by the Heathkit SB-300 receiver.[1] It is designed as a matching counterpart for the receiver with the same type of professional styling. The SB-400 may be operated as an entirely separate unit with independent frequency control, or with frequency controlled by the SB-300 receiver for transceive-type operation. Additional features of advanced design are incorporated in the unit.

The SB-400 employs a pre-assembled and pre-aligned v.f.o. (linear master oscillator—l.m.o.) which tunes over a 500 kc range accurately calibrated in 1 kc increments. Complete frequency coverage is obtained over all the amateur bands from 3.5 to 30 mc (the 28 mc band is divided into four separate segments). Crystal-filter type s.s.b. generation is utilized with either upper or lower sideband instantaneously selectable. Power input on s.s.b. is 180 watts p.e.p., and on c.w., 170 watts.

A completely flexible vox system is included for s.s.b. use along with automatic level control (a.l.c.). Push-to-talk operation also is available. A special phone-patch input eliminates the need for removal of the mic plug to connect up the patch. C.w. keying works through the vox circuits for full c.w. break-in operation. A sidetone oscillator is also incorporated for automatic c.w. monitoring on either loudspeaker or headphones. In addition, when transceive operation is conducted on c.w., the transmitter and receiver are offset by 1 kc to provide a beat in the receiver for copying a c.w. signal, while the transmitter frequency is maintained at zero beat with the received signal. A built-in antenna-changeover relay is included. The power supply, using silicon rectifiers, is self contained. There are no extras to buy.

Other Features and Specifications

Other features and specifications are as follows:

Frequency Stability: Less than 100 c.p.s. change per hour after 20-minute warmup period and less than 100 c.p.s. for ±10% line voltage variation.

Dial System: Four revolutions of tuning knob required (using pinch drive mechanism) to rotate main dial one revolution, covering 100 kc (1 kc calibrations) with slide-rule scale indicating nearest 50 kc point. Hairline fiducial is adjustable for indexing.

Visual Dial Accuracy: Within 200 c.p.s. on all bands.

Electrical Dial Accuracy: Within 400 c.p.s. on all bands after calibration at nearest 100 kc point.

Backlash: No more than 50 c.p.s.

Power Output: 100 watts 3.5 through 21 mc, 80 watts at 28 mc—into 50-ohm load.

Output Impedance: 50 to 75 ohms at an s.w.r. less than 2:1.

Carrier Suppression: 55 db below maximum output.

Oscillator Feedthru or Mixer Products: 55 db below rated output, except at 3910 kc crossover which is —45 db.

Harmonic Radiation: 35 db below rated output.

Unwanted Sideband Suppression: —55 db at 1 kc and higher.

Third Order Intermodulation Distortion: 30 db

*Technical Director, *CQ*.

[1] *CQ* Reviews: The Heathkit SB-300 Receiver, *CQ* Sept 1964.

The Heathkit SB-400 Transmitter. It is professionally styled in a wrap-around type cabinet. The frequency tuning knob is at the center with a linearly calibrated dial which has 1 kc divisions. The slide rule scale is for the 50 kc reference points. The final tuning and load controls are concentrically arranged at the left of the dial. The panel is marked for rapidly setting these controls to the band used. The driver tune is at center left. Bottom row left to right are the function switch, bandswitch, mode switch and mic connector.

below rated p.e.p. output.
Noise Level: At least 40 db below rated carrier.
A.F. Response: 350 to 2450 c.p.s. ±3 db.
A.L.C. characteristics: 10 db nominal compression at 0.2 ma grid current.
A.F. Input: High impedance mic or phone patch.
Power Requirements: 105-125 v.a.c. 60 c.p.s., 80 watts on standby, 260 watts on c.w. key down.

Circuitry

Referring to the block diagram fig. 1: The filter system of s.s.b. generation is used with the audio signals from the mic amplifier, V_{1A}, and the cathode follower, V_{1B}, applied to the balanced modulator, consisting of diodes $CR_{1\text{-}4}$ where an r.f. carrier from either one of the carrier generators, V_{2A} or V_{2B}, is modulated and where the carrier is balanced out, leaving only the two sidebands at the modulator output. These signals are then applied to V_3 which serves as an isolation and matching device between the balanced modulator output and the sideband filter, FL_1. It also is used for a.l.c. as described later.

Only an upper or lower sideband, depending on the carrier generator frequency, appears at the output of the filter from which the s.s.b. signals are applied to V_4 where they are combined with the 5 to 5.5 mc output from the variable l.m.o. to produce sum-frequency signals in the 8395 to 8895 kc range. When sidebands are switched, the l.m.o. frequency also must be shifted. This is done by adding reactance by means of diode switch CR_5 when the lower sideband is used. A bandpass circuit, T_1, couples V_4 to the following mixer, V_5, for producing output in the desired amateur bands according to the appropriate heterodyning frequencies obtained from V_{8A}. T_1 passes only the frequencies between 8395 and 8895 kc and rejects the difference frequencies produced in V_4. The output of V_5 goes on to V_9 which drives the neutralized final amplifier consisting of a pair of parallel connected 6146's, V_{10} and V_{11}, with a pi-network for matching into low-impedance loads.

A.L.C.

A.l.c. is obtained from the grid of the final amplifier where an a.f. voltage is produced as soon as the amplifier starts to draw grid current. This a.f. voltage is rectified by the a.l.c. diodes and the resulting d.c. is applied as a bias to V_4 to limit the gain of this stage accordingly. The attack is fast, release is slow.

VOX and Sidetone Monitor

A conventional type of vox system is used for s.s.b. This employs vox amplifier V_{12A} which is fed from the output of the speech amplifier

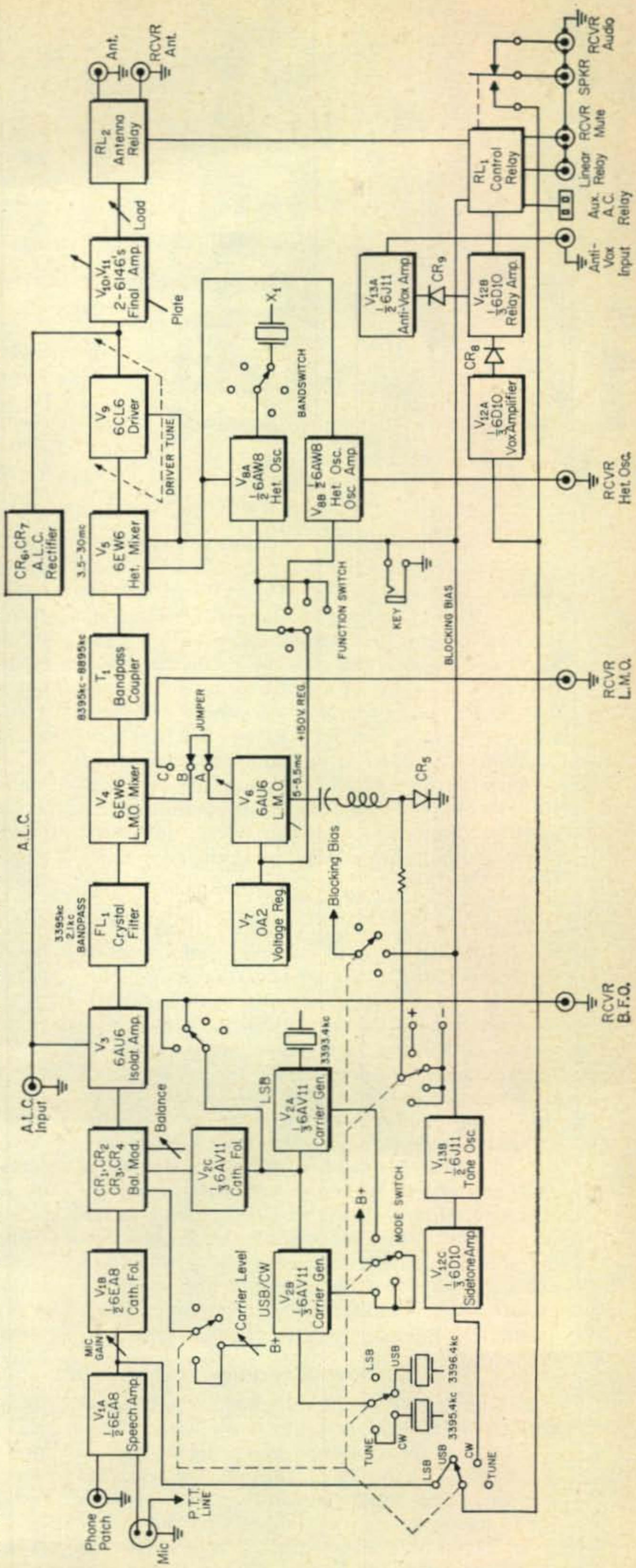
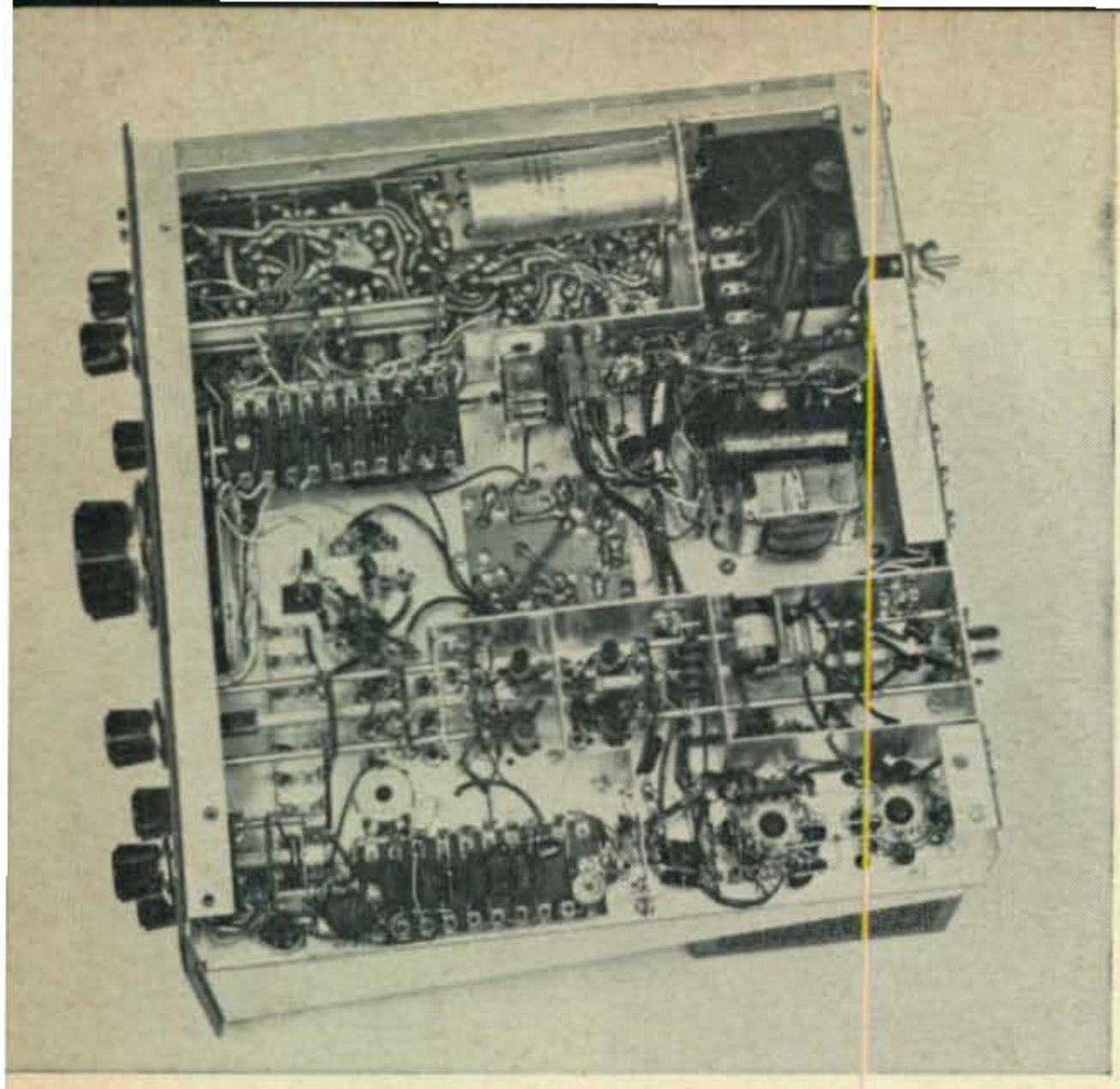


Fig. 1—Block diagram of the SB-400 transmitter. ➤ Crystals at X_1 are 8895 kc *plus* the frequency at the low end of each band.



Bottom view of SB-400. Right foreground shows final amplifier sockets. The bandswitch runs through the shielded compartments. Mixer-bandpass board is at center, carrier generator board is at top. The carrier generator crystals and the v.o.x. relay are mounted on the shield holding the tubular capacitor at top.

V_{1A}, relay amplifier V_{12B} and anti-vox amplifier V_{13A}. The relay amplifier is controlled by diode rectifiers from V_{12A} and V_{13A}. When c.w. is used, a 1000-cycle tone oscillator is keyed, using the blocked-grid bias method, along with V_5 and V_9. The output of the sidetone oscillator is amplified by V_{12C} and is applied to the vox amplifier, thereby actuating the vox system with control relays RL_1 and RL_2 to provide full c.w. break-in operation. At the same time one set of contacts on RL_1 switches the loudspeaker from the output of the receiver to the output of the sidetone amplifier, thus providing automatic sidetone monitoring of the c.w. keying.

C.W. Carrier

When c.w. is used, a small d.c. potential is applied to the balanced modulator which upsets the balance and permits r.f. carrier output, the level of which can be adjusted with a carrier-level control. At the same time, the c.w. carrier crystal is switched in at V_{2B}. The frequency of this crystal is 1 kc lower than that of the upper sideband crystal and thus places the carrier within the passband of the filter to allow the carrier to go on through to the rest of the system. The shift in frequency for the c.w. carrier serves another purpose in connection with transceive type operation with the SB-300 receiver as described later. The c.w. position also is used during tuneup. A frequency-spotting position enables the SB-400 frequency, for any mode, to be tuned to a receiver frequency without putting a signal on the air.

Transceive Operation

For transceive operation, shielded cables are connected from the heterodyne oscillator, l.m.o. and b.f.o. outputs of the receiver to the corresponding inputs on the transmitter. A shielded jumper, plugged in connectors *A* and *B* between the transmitter's l.m.o. output and V_4 mixer input, is removed and another jumper is plugged in between *A* and *C* so that the receiver's l.m.o. is connected through to V_4. All the oscillator frequencies needed for the transmitter to track with the receiver are obtained from the receiver for on-frequency transceive work when the mode switch is in the TRCV position.

When transceiving is used for c.w., the mode switch disconnects the receiver b.f.o. and substitutes the c.w. carrier generator which is 1 kc removed from the receiver b.f.o. frequency when the SB-300 receiver is set for the c.w. (or u.s.b.) mode. The result is that when the transmitter is on exactly the same frequency as that of a received signal, a 1 kc beatnote will be heard from the receiver. In this connection, the transmitter frequency is always 1 kc *higher* than the frequency indicated on the receiver dial when a 1 kc beatnote is obtained from the received signal. No diddling around with additional controls is required. Good forethought was used here inasmuch as c.w. operation usually is conducted at the low frequency end of each band, so in-band c.w. transmission is ensured near the band edge as long as a beatnote can be heard with the receiver tuned in the band, assuming the receiver is accurately calibrated. Operation at the high edge of a band would require the receiver to be set within at least 1 kc inside the band to prevent out-of-band transmitter operation.

Controls and Connectors

The metering arrangement is not shown, but five positions are available with a meter switch for indicating final grid or plate current, a.l.c. level, plate voltage and relative-power output. A function switch provides power off, standby, transceive operation (TRCV), transmitter frequency control (TRAN) or spot.

Internal screw-driver-adjust type controls are furnished for relative-power meter level set, bias, sideband amplitude balance, carrier null, a.l.c. level, anti-vox, vox delay and vox gain.

A two-terminal mic connector for accommodating a push-to-talk type microphone is located on the panel. Rear apron phono-type jacks are provided for receiver muting, operating a linear amplifier control relay, applying a.l.c. bias from a linear amplifier to the SB-400 isolation amplifier, connecting receiver l.m.o., heterodyne oscillator, b.f.o. and a.f. outputs, anti-vox, speaker, two spare jacks and a phone patch input. An SO-239 type antenna connector is used. A key jack also is located at the rear and a 117-volt receptacle is included for actuating an auxiliary a.c. relay directly from the vox relay.

The main a.c. receptacle is one which accepts a TV type detachable line cord. A heavy ground terminal also is included.

Assembly

The assembly manual contains 116 pages, 60 pages of which are devoted to the actual construction steps. The SB-400 is quite an elaborate affair, so it's assembly is consequently more involved than that of less complicated equipment; however, the work is made easier, and is subject to fewer wiring errors and improper lead dress, by the inclusion of two printed-circuit boards with complete identifications printed to indicate where specific components are to be installed. One of the boards is for the heterodyne mixer, bandpass coupler and the l.m.o. mixer; the other is for the s.s.b. generator along with the speech amplifier, the vox system, sidetone monitor and a.l.c. circuits. Also, four separate wiring harnesses are furnished to further simplify assembly. Their leads, including shielded cables, are color-coded for positive and easy identification. The l.m.o. is pre-assembled and aligned. A nut starter, allen wrenches, and small open-ended wrench are included in the kit for aiding in the mechanical work. An alignment tool is supplied, too. Alignment also requires the use of a 50-ohm dummy load, a v.t.v.m. with r.f. probe and a ham-band or general-coverage receiver.

No difficulties were experienced with assembling the SB-400. Alignment was easy and the transmitter functioned right off the bat without further ado.

Operation

The manual contains detailed data on the setting up and operation of the SB-400 for all modes. Tuneup involves setting the bandswitch as desired, the function switch for receiver (TRCV) or transmitter (TRAN) frequency control, the mode switch at TUNE, advancing the r.f. level control[2] and adjusting the driver, final plate and load controls for maximum power output indicated by the meter. The mode switch is then set for l.s.b., u.s.b. or c.w. work and you're ready to go. In the case of s.s.b., the mic gain is adjusted for proper a.l.c. level as indicated by the meter. When the unit is first set up, the vox gain, delay and anti-trip controls must be adjusted as needed. Later readjustment will seldom be required. In the case of c.w., only the vox delay will be involved, although this will probably amount to the same as that needed for s.s.b. A feature in this respect is that the vox delay holds in the control and antenna relays between c.w. characters, thereby eliminating continual relay clatter during a transmission; however, the delay can be made short enough to allow fast breakin between words.

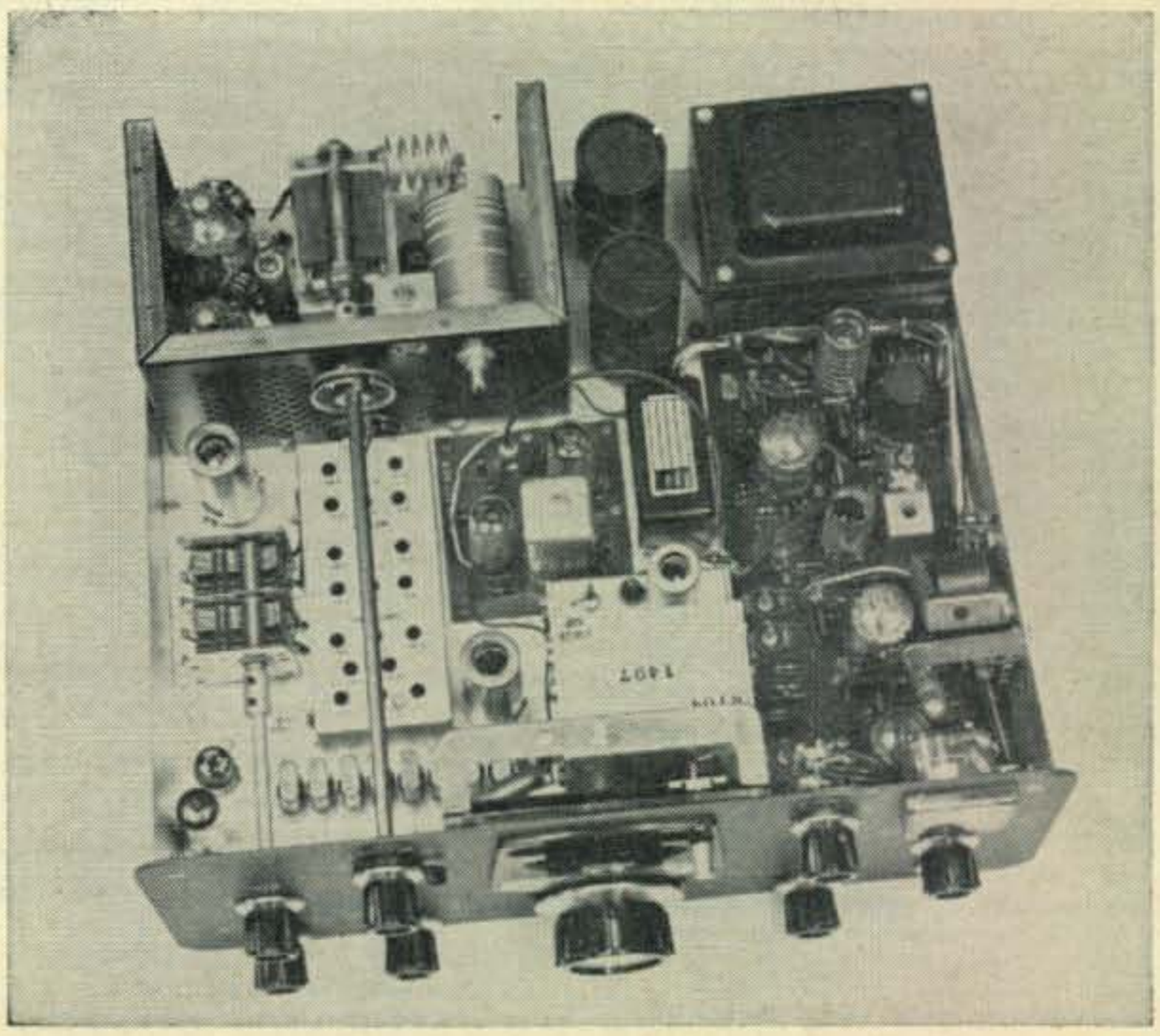
When the spotting position is used with independent operation for s.s.b. it is necessary to "talk yourself" on frequency at which time the mic gain must be adjusted for adequate level without feedback from the speaker.

A few operational difficulties arose which are being corrected in later models. One of these is that when the mode switch is in the C.W. position during transceive just prior to switching it to TUNE, the circuits are not actuated for tuneup and it requires swinging the mode switch first to USB and then going over to the TUNE position.

Another trouble with transceive operation is that if it is desired to go on standby with s.s.b. to eliminate the possibility of undesired VOX actuation by the microphone, a steady tone is produced in the receiver caused by a beat between the receiver b.f.o. and the transmitter carrier generator; however, this can be eliminated by turning the mode switch to C.W. during standby periods instead of employing the function switch (the c.w. key must be left open).

[*Continued on page 90*]

[2]Minimum carrier level might occur when the control is slightly advanced rather than when it is maximum counter-clockwise. This is due to a slight difference in inherent balance when the C.W. or TUNE position is used.



Top view of the SB-400. The carrier generator board is at the right, the mixer-bandpass one is at the center. The l.m.o. is at center foreground with the crystal filter behind it and between the circuit boards. The can with the round holes in top encloses the heterodyne oscillator, mixer and driver coils. The driver tuning capacitor is at left, final amplifier compartment is at left rear.

More On The '6BLZ Special

BY E. H. MARRINER,* W6BLZ

There has been much interest generated by the article describing the '6BLZ Special receiver.[1] Below are some of the problems encountered by those who have built it and some suggested remedies and improvements.

Now that the receiver is built and working, here are some thoughts on improvements, additions and answers to questions. As with most construction projects, someone always wants something changed and this receiver is no exception.

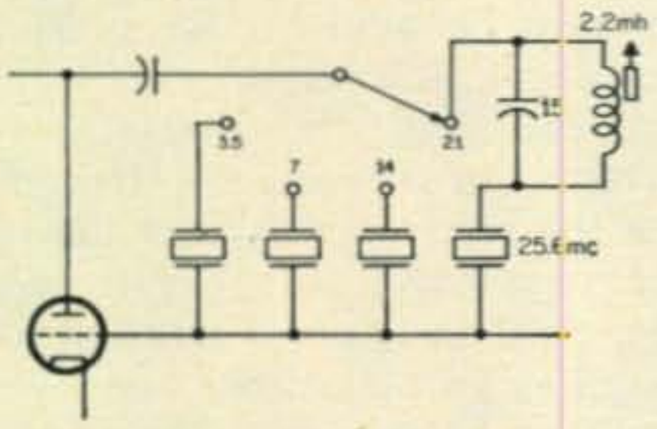


Fig. 1—Circuit showing how the crystal for 21 mc operation can be added to the 6BLZ. The adaptation of the other tuned circuits for 21 mc are described in the text.

21 Mc Band

The first mail concerned adding the 21 mc band. Someone wanted to know why that spare crystal socket was not used, so you might say we anticipated the question. The fourth position was also reserved to cut in a 25.6 mc International Crystal, type FA-5. To make it oscillate in this circuit, a J. W. Miller slug tuned coil was put in series with it. This was a 2.2 mhy, type 21A226RBI tuned with a 15 uufd silver mica capacitor. This is shown in fig. 1.

The same coil can be used in the mixer section without any capacitor across it. The antenna coil could be the same if a switch position is available, however by adjusting the coil to 14 mc with the tuning plates full mesh, the tuning will hit the 21 mc band about wide open.

HRO Dial

If it has been a struggle to understand how the HRO dial comes apart it's easy if you know the combination. Rotate the back plate until you see three screws holding the black knob. Take them out and the knob will come off. The spring holding the plate can now easily be unhooked. Just make sure when the knob is put back together, that the dial rotates the tuning capacitor the full range. Pick a zero spot and start calibrating the dial.

S.S.B. Reception

Improved reception can be obtained on s.s.b. by moving the audio volume control from the grid circuit of the 6AQ5 to the grid of the 12AT7 driver. This will mess up the S-meter but to some it might be worth it. The circuit change is shown in fig. 2. The audio gain and r.f. gain will both have an effect on the meter reading.

The value of the grid resistor in the product detector can be reduced to 10,000 ohms, along with increasing the value of the capacitors on each side of the 47K to .001 mf. The plate of the crystal oscillator b.f.o. can also be bypassed with a .001 mf. These changes will reduce both hiss and peak distortion.

[*Continued on page 98*]

*528 Colima Street, LaJolla, California.

[1]Marriner, E. H., The '6BLZ Special," *CQ*, July, 1964, p. 53.

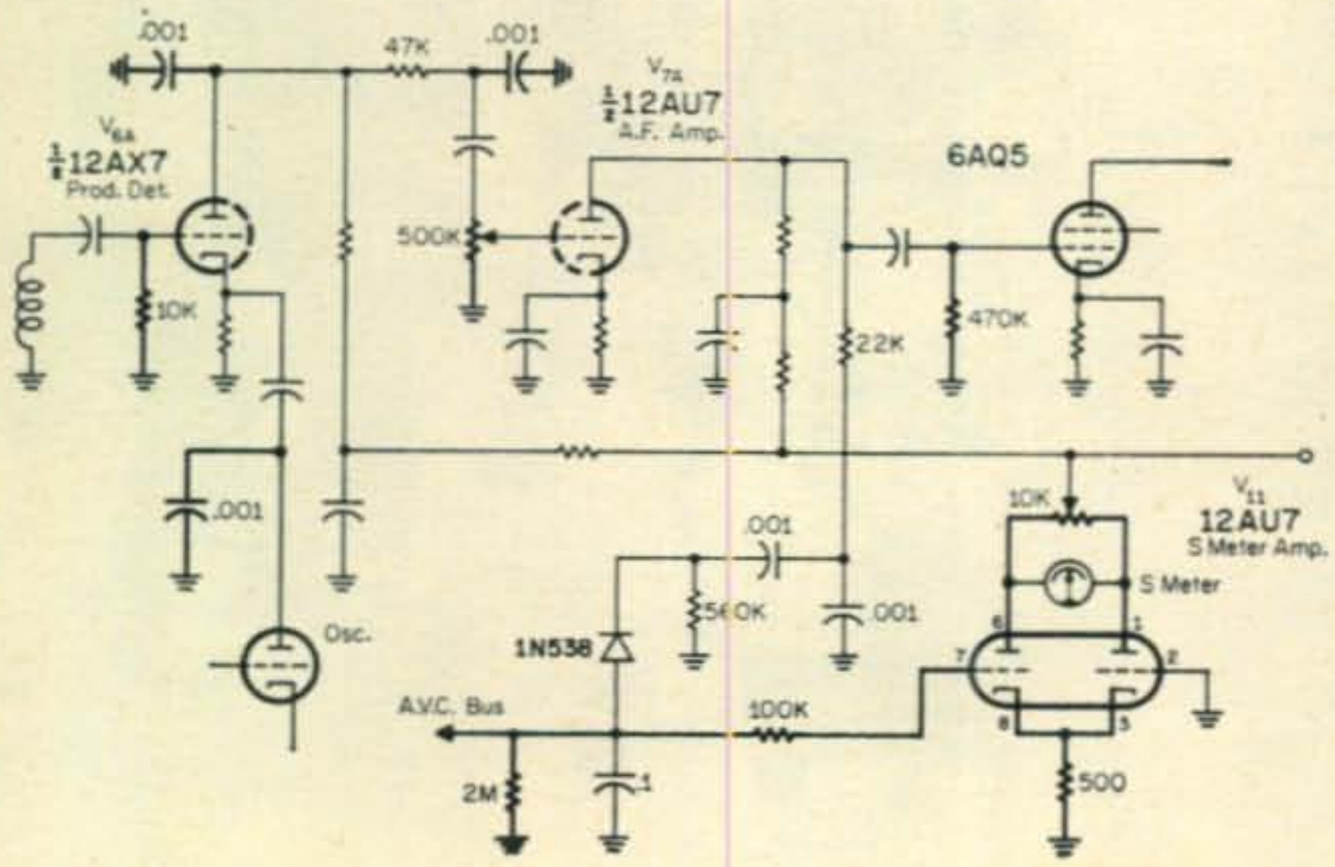


Fig. 2—The relocation of the audio gain control from the 6AQ5 grid to the a.f. voltage amp is shown above. Also shown is the addition of a balanced bridge S-meter circuit. The modifications are shown in bold.

CQ Awards Honor Roll

Worked All Zones. **The following is a list of the call-letters of top DXers throughout the world who have qualified for the Worked All Zones Award as of August 4, 1964. Calls are listed in alphabetical order by call area and country.**

RADIOTELEGRAPH

W1AB	K2BU	K2QXG	W3JW	W4GD	W5CE	W6BAM	WA6GFY	W6NZ	W6VFR	W7KWA	W8KZT	W9HTY	WØAJU
W1ACB	W2BVN	W2RA	W3JZY	W4GRP	W5CEW	W6BAX	K6GLC	W6OBD	W6VNJ	W7KWC	W8LOF	W9HUZ	WØANF
W1AJG	W2BXA	W2RDD	W3KA	K4GSS	W5CK	K6BHM	WA6GLD	W6OEG	W6VSS	W7LBP	K8LSG	W9IHN	WØAUB
W1AZY	W2BYP	W2REF	W3KBC	K4GSU	W5CKY	W6BIF	K6GMA	W6OES	W6VUW	W7LYL	W8LY	W9INN	WØAZT
W1BFT	K2BZT	W2RGV	W3KDF	W4GXB	W5DA	W6BIL	W6GMC	W6OF	K6VVA	W7LZF	W8MCC	W9IRH	WØBCI
W1BGA	K2CD	W2SAW	W3KDP	W4HA	K5DGI	W6BPD	W6GMF	K6OHJ	W6VVR	W7MCT	W8MPW	W9IU	WØBFB
W1BGW	W2CNT	WA2SFP	W3KFQ	K4HFS	W5DML	K6BPR	W6GPB	WA6OHJ	W6WB	W7MGT	W8MTQ	W9IVZ	KØBIT
W1BIH	K2CPR	W2SHC	W3KPI	K4HJJ	W5DRU	W6BSY	W6GRL	W6OMC	W6WGC	W7NRB	W8NBK	W9IWX	WØBSK
W1BIL	W2CWK	W2SHZ	W3KT	W4HUE	W5EGK	W6BUD	W6GSL	W6OME	W6WJM	W7OY	W8NJC	K9IYW	WØBTD
W1BLO	W2CZO	W2SSC	W3KVQ	K4HYL	W5EJT	W6BUO	W6GUI	W6OMR	W6WKU	W7PB	K8OHG	W9JIP	WØCDP
W1BPW	K2DCA	W2SUC	W3KZQ	K4ICK	W5EJV	W6BUY	W6GWW	W6ONK	W6WO	W7PHO	W8ONA	W9JUV	WØCPM
W1CKA	W2DEC	WA2TAG	W3LE	W4IFN	W5FFW	W6BVM	W6HDF	W6ONZ	W6WQT	W7PQE	K8ONV	W9KA	WØCTW
W1CKU	W2DEO	W2TP	W3LMA	K4IIC	W5FNA	K6BWX	W6HJT	K6OPI	W6WTH	W7QGF	W8OYP	W9KMN	WØDEI
W1CTW	W2DGW	W2TQC	W3LMM	W4IMI	W5FXN	W6BYB	K6HOR	W6OSU	W6WWQ	W7QNI	W8PHZ	W9KOK	WØDMA
W1CUX	W2DOD	W2TQR	W3LMO	W4IUO	W5GEL	W6BYH	WA6HRS	W6OUN	W6WX	W7QON	W8PQQ	W9KXK	KØDMY
W1CV	W2DS	W2TVR	W3LOE	W4JAT	W5GNG	W6BZ	W6HVN	K6OWQ	W6YK	W7QY	K8PUU	W9KXZ	KØDQI
W1DGT	W2DSU	W2TWC	W3LUD	W4JDR	W5HDS	W6BZE	W6HX	K6OXU	W6YMD	W7RT	W8QFR	W9LIL	WØDU
W1DHO	K2DSW	W2TXB	W3MFJ	K4JEY	W5HJA	W6CAE	W6IBD	W6OYD	W6YMH	W7SGN	K8QJH	W9LJU	WØDVZ
K1DMG	W2EHN	W2UFT	W3MFW	W4JII	W5IAH	W6CBE	W6ID	K6OYD	W6YMV	W7STC	W8QNW	W9LNM	WØELA
W1DQH	WA2ELS	K2UKQ	W3MJF	W4JJL	W5JUF	W6CEM	W6IDZ	W6PB	W6YY	W7UVR	W8QQH	W9LQF	WØEWH
W1EIO	W2EQS	K2UPD	W3MSR	W4JNE	K5JZY	W6CG	K6IEC	W6PBI	W6YZU	W7UZA	W8QWI	W9LSV	KØEZH
W1EOB	W2ESO	W2UTH	W3MVQ	W4JV	K5KBH	W6CGP	W6IFW	W6PCS	W6ZCY	W7VY	W8QZA	W9MBF	WØFFV
W1EQ	W2FBS	W2UVE	W3MWC	K4JVE	W5KC	W6CHV	W6IPH	W6PDB	W6ZEN	W7WVE	W8RSW	W9MQK	WØFLK
W1FFO	K2FC	W2UZF	W3NCF	K4KFC	K5KES	K6CQM	W6ISQ	W6PFD	K6ZMB	W7YGN	W8RQ	W9MUJ	WØFNN
W1FH	W2FCQ	W2VCZ	W3NKM	K4KOY	W5KF	W6CTL	W6ITA	W6PH	W6ZMW	W7ZAS	W8SDR	W9MZP	WØFRX
W1FQA	W2FSN	W2VND	K3NMY	W4KWC	W5KLB	W6CTO	W6JH	W6PHF	W6ZMX	W7ZOH	W8SYC	W9NDA	WØFUH
W1FZ	W2FXA	W2VUF	W3OCU	K4LNM	W5KUC	K6CTV	W6JHV	W6PHN	W6ZUI		W8SZS	W9NLJ	WØGNG
W1GKK	W2FXN	K2VUI	W3OP	K4LPW	W5LBI	W6CUF	K6JIC	W6PKO	W6ZVQ	W8AE	W8TJM	W9NRB	WØGUV
W1GVZ	W2FZY	W2VYX	W3PGB	W4LRN	W5LCI	W6CUL	W6JK	W6PLK	W6ZZ	K8AJK	W8TLL	W9NZZ	KØGXR
W1GYE	W2GDX	W2WMG	W3PN	W4LVV	W5LEF	W6CUQ	W6JKJ	W6PQT		W8AJW	W8TMA	W9OD	KØHGB
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K1JDN	W2HMJ	W2ZXL	W3RUT	W4MS	W5MCO	W6CZQ	W6KG	W6RAN	W7AHX	W8BSH	K8VDV	W9PVA	WØLBB
W1JYH	W2HO	W2ZY	W3RZL	W4NBV	W5MMD	W6DAX	K6KII	W6RBQ	W7AJS	W8CDT	W8VLK	W9QGR	WØLFY
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W1KXU	W2HTI	W3AEL	W3SWV	W4NNH	W5NOT	K6DDO	K6KJR	W6REH	W7AQB	W8CLR	W8WT	W9QIY	WØLVA
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W1LQ	K2HXL	W3ALB	W3UXX	W4OM	W5NW	W6DI	W6KRI	W6RLN	W7AUS	W8CQ	W8YCP	W9QNO	WØMCX
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W1MQV	W2IOP	W3AS	W3WPG	W4PAA	W5OLG	W6DLY	W6KYG	W6RM	W7BGH	W8CWY	W9ABA	W9RDI	WØNLY
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W1NLM	W2JAE	W3AYS		W4QCW	W5PSB	W6DUC	K6LAE	K6RWO	W7CAB	W8DFQ	K9ALP	W9ROU	WØOQK
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W1OOS	K2KCE	W3BQA	W4AIT	K4RID	W5QKZ	W6EAK	W6LEE	WA6SBO	W7CMO	W8DSZ	W9BZB	W9TKD	WØPNQ
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W1QJR	W2LAX	W3DBX	W4AZK	W4SHX	K5STL	W6EFR	W6LGZ	W6SN	W7DAA	W8EVZ	K9CUY	W9UXS	WØQYE
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W1RAN	W2LPE	BOC	W4BJ	W4SXE	W5TPC	W6EHV	W6LRU	W6SR	W7DIS	W8EYE	W9DUY	W9UZS	WØRBA
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W2AZS	K2PFC	K3HQJ	W4DQH	W5AI	W6AOA	W6FOZ	W6NHA	W6UDR	W7GXA	W8JXY	W9FVU	W9YT	
W2BAC	K2PIC	W3IMV	W4DQS	W5ARJ	W6AOD	W6FSJ	W6NIF	W6UHA	W7HDL	K8KAE	W9GDI	W9ZB	CE3AG
W2BBS	K2PKT	W3IPO	W4EEE	W5AWT	W6AQP	W6FUF	W6NJU	W6UJ	W7HIA	W8KBT	W9GFF	W9ZRG	CE3AX
W2BHM	W2PTD	W3IXN	W4EJN	K5BGB	W6ATO	W6FWQ	W6NKR	W6UNP	W7HKT	W8KIA	W9GHK		CE3DZ
W2BHU	W2PTI	W3IYE	W4EO	K5BGT	W6AUT	W6FZL	W6NNV	W6UOV	W7HXG	W8KIT	W9GIL	WØAGO	CE3HL
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W2BRV	W2QJM	W3JTK	W4FZO	W5BZT	W6BAF	W6GFE	W6NXP	W6VE	W7KTN	W8KSR	K9HOL	WØAIW	CN8IF

CN8JX
CO2SW
CR6BX
CR7IZ
CR7LU
CR9AH
CX1BZ
CX1FY
CX2CO

DJ1BZ
DJ1DF
DJ1JW
DJ1KR
DJ1VP
DJ1VS
DJ2AE
DJ2BW
DJ2CM
DJ2EO
DJ2HI
DJ2KS
DJ2LK
DJ2LM
DJ2MN
DJ2VK
DJ2WN
DJ2YA
DJ2YL
DJ2ZX
DJ3BB
DJ3JZ
DJ3KR
DJ3XK
DJ4DN
DJ4HR
DJ4OP
DJ4SP
DJ4TZ
DJ5IM
DJ5MX
DJ5VQ
DJØIK
DL1AM
DL1AU
DL1BO
DL1BS
DL1CF
DL1DC
DL1DX
DL1EE
DL1ES
DL1FF
DL1FK
DL1FZ
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DL1HH
DL1IA
DL1IB
DL1IN
DL1IP
DL1IT

DL1KB
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DL1LZ
DL1ME
DL1MF
DL1QT
DL1SF
DL1TA
DL1XS
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DL3BL
DL3CM
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DL3LB
DL3LL
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DL3TW
DL3WV
DL3ZA
DL3ZI
DL4BS
DL6DE
DL6EN
DL6EQ
DL6FF
DL6GB
DL6GP
DL6MK
DL6OS
DL6QW
DL6TW
DL6YK
DL7AA
DL7AB
DL7AD
DL7AH
DL7CS
DL7CW
DL7EN
DL7HU
DL8CH
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DL9KP
DL9OH
DL9PF
DL9PX
DL9RK
DL9TJ
DL9YX
DM2AEJ
DU7SV

EA1BC
EA1GZ
EA3CY
EA4CR
EI3R
EI4Q
EI9U
EI9Y

F2BS
F2NB
F2PO
F3AT
F3CB
F3DM
F3FA
F3YP
F3YR
F3ZU
F8BS
F8IH
F8KJ
F8TM
F8VQ
F8WK
F8XT
F9EJ
F9ER
F9IL
F9MS
F9RS
F9TX
FA8RJ

G2AGR
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G2AOL
G2BOZ
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G2CNW
G2FFO
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G2FYT
G2GM
G2IO
G2LB
G2MI
G2PL
G2VD
G2WQ
G2YS
G3AAE
G3AAM
G3AGN
G3AIZ
G3AJP
G3ASG
G3ATU
G3AZ
G3BHW
G3BI
G3BKF
G3CEG
G3CSL

G3CQE
G3DO
G3DOG
G3DQC
G3DQO
G3ESY
G3EYN
G3FKM
G3FPI
G3FPK
G3FUR
G3FXB
G3GCD
G3GFG
G3GGS
G3GSZ
G3GYH
G3HCL
G3HCT
G3HDA
G3HFJ
G3HLY
G3ID
G3IMV
G3IOR
G3JAF
G3JHZ
G3JLB
G3JUL
G3JZK
G3KHE
G3KKP
G3KZI
G3LET
G3LHJ
G3LP
G3LPS
G3OZU
G3TK
G3VA
G3VW
G3YF
G4CP
G4FN
G4MJ
G4TM
G5BJ
G5DV
G5GK
G5LP
G5RP
G5VU
G5YV
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G6QB
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G6RH
G6UT
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G6VQ
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G6XL
G6YQ
G6ZO

G8FW
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G8IP
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G8TD
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GB2SM
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GI3OQR
GI4RY
GI6TK
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GM3CIX
GM3DHD
GM3EST
GM3LYS
GM5RH
GM6MD
GW3BNQ

HA5AM
HA5BI
HA5BU
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HA5KFR
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HB9EU
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HB9HZ
HB9IM
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HB9JG
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HB9KC
HB9KU
HB9LB
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HB9MU
HB9NL
HB9PA
HB9TL
HB9TT
HB9UE
HB9UL
HB9X

I1ALU
I1AY
I1BNU
I1CHJ
I1ER
I1FO
I1IR
I1KN
I1NU
I1SM
I1UA
I1UB
I1XK
I1ZL
I1ZN
IT1AGA
IT1TAI
IT1ZGY

JA1AA
JA1AB
JA1AG
JA1BF
JA1BK
JA1BLC
JA1BNK
JA1BRK
JA1BTM
JA1BWA
JA1CC
JA1CR
JA1DM
JA1FHK
JA1GC
JA1GV
JA1MJ
JA2AIR
JA2AT
JA2BL
JA2DN
JA2JW
JA2KG
JA3AA
JA3BP
JA3DY
JA3FT
JA3UI
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JA5FQ
JA6AD
JA6AK
JA6AO
JA6MW
JA7AD
JA8AA
JA8AQ
JA9AA
JAØAC
JT1CA

KA2AB
KA2DE
KA2NY
KG6AL
KG6GD
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KH6AYG
KH6BA
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KH6BTX
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KH6DLD
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KH6MG
KH6MI
KH6PM
KH6PY
KH6QH
KH6VP
KL7BHE
KL7MF
KL7PI
KL7PIV
KL7PJ
KL7UM
KP4KD
KP4RK
KP4YT
KP6AA
KR6LJ
KV4AA
KW6DF
KW6DG

LA1K
LA2B
LA3DB
LA3UF
LA4DD
LA5HE
LA6U
LA7Y
LA7Z
LA8LF
LU5AQ
LU6DJX
LU7AS
LU8BAJ
LU8EN
LZ1KPZ

OD5LX

OE1BH
OE1CD
OE1FF
OE1FT
OE1RZ
OE3HY
OE3NH
OE3RE
OE3WB
OE5JK
OE5LX
OE8KI
OE8SH
OH1QE
OH1SN
OH1ST
OH1PI
OH1TM
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OH2BZ
OH2HK
DH2HW
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OH2NB
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OH5RH
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OH6OA
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OH9PF
OH9RD
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OK1LM
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OK1MP
OK1PD
OK1RW

OK1SV
OK1TW
OK1VB
OK1WX
OK1XQ
OK1ZL
OK2AG
OK2NN
OK2OV
OK2QR
OK2SO
OK2UD
OK3AL
OK3DG
OK3EA
OK3EE
OK3HM
OK3KMS
OK3MM
OK4DM
ON4FQ
ON4FU
ON4IX
ON4JW
ON4LB
ON4MN
ON4QF
ON4QJ
ON4QX
ON4SB
ON4TA
ON4TX
OY7ML
OZ3GW
OZ4H
OZ4RT
OZ5JT
OZ7BG
OZ7KV
OZ7SN
OZ8SS
OZ9N

PAØFAB
PAØFX
PAØHG
PAØLOU
PAØLY
PAØOI
PAØPN
PAØRLF
PAØTAU
PAØVB
PAØVDV
PAØVO
PAØWOR
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PK6HA
PY1ADA
PY1AHL
PY1AJ
PY1BG
PY1DH
PY1GJ
PY1HQ
PY1HX
PY2CK
PY3QX
PY4AO
PY4OD

SM2BCS
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SM3AKW
SM3ATY
SM3BHT
SM3BIZ
SM3EP
SM4AEQ
SM5AHK
SM5AJR
SM5AJU
SM5AQB
SM5AQV
SM5ARR
SM5ATK
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SM5BEU
SM5BFE
SM5BPJ
SM5BRO
SM5BVF
SM5BZ
SM5CCE
SM5CO
SM5CXF
SM5DW
SM5EC
SM5KP
SM5KV
SM5KX
SM5LL
SM5LN
SM5WI
SM5WZ
SM5YG
SM6AMR
SM6APH
SM6VY
SM7AIA
SM7ID
SM7MS
SM7QY
SM7TQ
SM7TV
SM7YO
SP1JV
SP2AP
SP3DG
SP4JF
SP5AA
SP6AAT
SP6FZ
SP6RT
SP7HX
SP8CK
SP8HT
SP9DT
SP9KJ
SP9TA
ST2AR
SVØWP
SVØWZ

TI2LA

UA1CB
UA1CK
UA2AO
UA2KAA
UA3AN
UA3AW
UA3BN
UA3CA
UA3CT
UA3FT
UA3GM
UA3HI
UA3KND
UA4HC
UA4HP
UA4IF
UA4KHA
UA4KHW
UA4PA
UA4PW
UA6FD
UA9CL
UA9CR
UA9DN
UA9DT
UA9VB
UAØGF
UAØOM
UB5AQ
UB5CG
UB5CI
UB5FJ
UB5KAB
UB5MZ
UB5ZV
UC2AA
UC2AD
UC2AR
UC2CB
UD6AM
UF6FB
UH8DA
UI8AG
UQ2AN
UR2AR
UR2BU

VE1EP
VE1PQ
VE1WL
VE2AIO
VE2NV
VE2WW
VE2YU
VE3BMO
VE3BWY
VE3CFG
VE3CIO
VE3DEB
VE3DIF
VE3DKY
VE3ES
VE3EU
VE3IR
VE3JZ
VE3KE
VE3QD
VE3RE
VE3TB
VE4OX
VE4RO
VE4TJ
VE4XO
VE5JV
VE5KG
VE5TK
VE5VL
VE6AO
VE6BY
VE6GD
VE6JR
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VE6NX
VE6TP
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VE7BW
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VE7CQ
VE7GI
VE7HC
VE7JB
VE7KC
VE7KJ
VE7MD
VE7PU
VE7QL
VE7SB
VE7VC
VE7VO
VE7ZK
VE7ZM
VE8AW
VE8PB
VE8RG
VK2ACX
VK2AM
VK2APK
VK2DI
VK2HZ
VK2JZ
VK2NS
VK2PV
VK2QL
VK2RA
VK2XU
VK3AHQ

VK3AX
VK3BZ
VK3CN
VK3CX
VK3EK
VK3HL
VK3JE
VK3KB
VK3NC
VK3KS
VK3RJ
VK3RP
VK3TL
VK3XB
VK3YD
VK3YL
VK4AL
VK4DO
VK4EL
VK4FJ
VK4HR
VK4SD
VK4TY
VK5BS
VK5JS
VK5KO
VK5MF
VK5NQ
VK5QR
VK5RX
VK6DX
VK6KW
VK6RU
VK6SA
VK7CH
VK7LZ
VK9XK
VO1DX
VQ2GW
VQ2W
VQ2WR
VQ4ERR
VR2BZ
VS1FZ
VS1JF
VS4RS
VS6AE
VU2MD

XE1AE
XE1CV
XE1PJ

YO2BU
YO2CD
YO3RD
YO8CF
YU1AG
YU1EH
YU1KC
YU3OV
YV5FK

ZC1CL
ZC4IP
ZE3JO
ZE4JS
ZE6JY
ZE8JJ
ZK1AK
ZL1AH
ZL1AJU
ZL1AMO
ZL1AV
ZL1BY
ZL1GX
ZL1HY
ZL1PV
ZL1RD
ZL2AFZ
ZL2AI
ZL2CU
ZL2GX
ZL2HP
ZL2JO
ZL3AB
ZL3DX
ZL3GU
ZL3IS
ZL4AW
ZL4BO
ZL4CK
ZP5LS
ZS1OU
ZS1RM
ZS2AT
ZS2CR
ZS2CV
ZS2EC
ZS2U
ZS2X
ZS4MG
ZS6A
ZS6AJQ
ZS6ATA
ZS6CT
ZS6DW
ZS6EU
ZS6FN
ZS6IF
ZS6IW
ZS6LW

3V8AB

4X4CJ
4X4FQ
4X4JN
4X4KK
4X4RE

5A1TW
5A5TE
5A5TH
5A5TO

9S4AX

RADIOTELEPHONE

W1BAN
W1BHP
W1BIH
K1IXG
W1ORV
W1UOP

W2APF
W2BOK
W2BXA
K2DCA
W2DEC
WA2ELS
W2FXN
W2GNQ
W2HTI
K2JGG
W2JT
W2OKM
W2RGV

WA2SFP
WA2TAG
W2TP
W2TVR
W2UTH
W2VCZ
W2ZX

W3AYD
W3DJZ/BOC
W3GHD
W3LE
W3LMA
W3NKM
W3WGH

W4AZD
W4DQH
W4EEE
K4HYL
W4JGO
W4MS
W4PAA
W4PDL
W4TDW

W5IYU
K5JEA
W5JWM
W5KBU
W5KGX
W5LBI
K5MDX
W5PQA
W5PSB

W6AM
W6BAF
K6CYG
W6EKZ
W6GT
W6GVM
W6HYG
W6ITH
K6LAS
W6MBD
K6MLS
W6NGA
W6OBH
W6RCD
W6RKP
K6RWO
W6TXL
W6TZD
W6USG
W6VFR
W6VUW
K6VVA

W6WWQ
W6YK
W6YMV
W6YY
WA6ZIQ

W7AQB
W7AUS
W7BPS
W7BTH
W7CMO
W7DLR
K7GCM
W7LBP
W7MGT
W7PHO
W7UZA
W7ZAS

W8BF

K8CFU
W8CUO
W8EWS
W8JIN
W8KIA
W8KML
W8MPW
W8PQQ
W8WT
W8ZET

K9EAB
W9EXY
W9JJF
W9NDA
W9RBI
W9UZA
W9WHM
W9YSQ
W9YSX

WØAIW
WØBFB
WØCPM
KØCTL
WØJYW
WØLIL
WØMAF
WØQVZ
WØTJ

CN8MM
CX2AX
CX2CO

DJ2AA
DJ2YI
DL1FK
DL1IN
DL1KB
DL3EA

DL3LL
DL7AA
DL7AB
DL7AD
DL7BA
DL7HU
DL9CT
DL9OH

F2MO
F3DJ
F8DC
F8SK
FA8RJ

G2BOZ
G3AAE
G3AIZ

G3BYM
G3DO
G3FKM
G3FPK
G3FPQ
G3FXB
G3HDA
G3HLS
G3NUG
G8GP
G8IG
G8KS
GI3CDF
GI3IVJ
GI3JIM
GI3KVQ
GI6TK
GW3AHN

HB9DS

HB9ET
HB9J
HB9KU
HB9MX
HK3LX

I1AOF
I1RB
I1RIF
I1SM
I1UA

JA1ACB
JA1BK
JA1BWA
JA6CY
JT1CA

KG6AJB
KH6DLF
KH6OR

LA5HE
LA5LG
LA8LF
LU1DAB
LU4DMG
LU6AJ

MP4BBW

MP4BCC

OE1FF
OE2YL

OK1MB
OK2AG
ON4DM
ON4RC
OZ7FG

PAØFX
PAØHBO
PAØWWP
PAØZD
PY2CK
PY2JU
PY4CB
PZ1AX

SM3AZI
SM3BIZ
SM3EP
SM5RY
SM5TR
SP7HX
SP9KJ

UB5UN
UC2AA
UQ2AN
UR2BU

VE1WL
VE2YU
VE4XO
VE5JV
VE5RU
VE6BY
VE6NX
VE6SF
VE6TF
VE6TP
VE6VK
VE7CE
VE7GI
VE7IT
VE7MD
VE7PU
VE7ZM
VE8AW
VE8PB
VE8RG
VK2JZ
VK4FJ
VK4RQ
VK5QR
VK6RU
VQ4ERR

XE1AE
XE1CV
XZ2SY

ZL1ACI
ZL1AIX
ZL1HY
ZL1KG
ZL2GX
ZL4BO
ZS6LW
ZS6Q
ZS6VX
ZS6YQ

4X4DK
9K2AZ

ALL SINGLE SIDEBAND

W1AOL
W1BAN
W1BHP
W1BIH
W1DCE
W1ICV
K1IXG
K1JMV

W1LLF
W1OOS
W1UOP
W1YDO

W2BXA
K2DCA
W2DGW

WA2ELS
W2FXN
W2GNQ
WA2IZS
K2JFV
W2JXH
W2LV
W2MES

W2PTM
W2RGV
WA2SFP
WA2TAG
W2TP
W2TVR
W2UTH
W2UZF

W2VCZ
W2ZX

W3CGS
K3COW
W3GHD
W3JTC
W3KT

W3LMA
W3MAC
W3NKM
W3YZI

K4AJ
W4ANE
K4HEF

W4HKJ
K4HYL
W4INL
W4LZT
W4QCW
W4RBZ
W4SSU
K4TJL

W4WDI

W5AFX
W5IYU
K5JEA
W5KGX
W5MMD
W5PQA

W5PSB
W5QVE

WA6EYP

WA6HOH
W6HYG
K6LGF
K6MLS
W6NWZ
W6RKP
K6RWO
K6SOK

W6USG
W6VUW

W6BAF
K6CYG
W6EKZ
K6EXO

W6WWQ
W6YMV
K6YRA
WA6ZIQ
K6ZJY

K6ZXW

W7AQB
W7BPS
W7BTH
W7CMO
W7DLR
K7GCM

W7LBP
W7PHO
W7UPF
W7UZA
W7ZAS

W8BF
W8BKO

K8CFU
W8EAP
W8EWS
K8GLH
W8JIN
W8MPW
K8NZD
W8PQQ

K8RTW	WØBMQ	DJ3KR	DL6EN	G2BOZ	G8KS	I1RB	KP4CL	OE1RZ	SM2BCS	UA3CG	VE6TF	VK4FJ	ZL1AIX
W8TMA	KØCTL	DL1AU	DL7HU	G2BVN	G13CDF	I1UA	KR6HL	OH2HN	SM3BIZ	UA3CR	VE6TP	VK6RU	ZL2GX
W8YBZ	WØCVU	DL1IFK	DL9OH	G3AIZ	GI3IVJ		LA5HE	OH2NB	SM5IC	UA3DR	VE6VK	VQ2AT	ZL3AB
	WØKFA	DL1IN	DL9OV	G3AWZ	GI6TK	JA1DM		OK1MP	SM5LL	UA3FG	VE7CE	VQ4ERR	ZL3IA
K9EAB	WØMLY	DL1JV		G3DO	GM3CIX	JA2JW	LA5LG	ON4DM	SM5MC	UB5KAB	VE7GI		ZS5DW
W9EXY	WØNFA	DL1UX	EI4Q	G3FKM	GM3JDR	JA3UI	LA8LF	ON4QX	SM5UF	UR2AR	VE7IT	XE1AE	ZS5JM
W9JJF	WØQVZ	DL1VR	EP2AG	G3FPK		JT1CA	LU1DAB	OY7ML	SM6SA		VE7MD	XE1IL	ZS6BBP
W9JYJ	KØRAL	DL3DW		G3HDA	HB9TL		MP4BBW	OZ7FG	SP9FR	VE3BQP	VE7PU	XE2WH	ZS6LW
W9SFR	KØRDP	DL3IR		G3NMR	HB9ZY	KG6AJB			TI2HP	VE4XO	VE7ZM	XW8AS	ZS6YQ
W9UZC	WØTJ	DL3RK	F8DC	G3NUG		KH6DLF	OD5CT	PAØHBO		VE6BY	VE8RG		
KØBJK	WØUUV	DL5AO	F8SK	G6LX	I1AMU	KP4CK	OE1ME	PZ1AX	UA1CK	VE6NX	VK3AHO	YO3GK	4X4DK

USA-CA **The United States of America Counties Certificate is awarded in six levels for working different numbers of United States counties beginning at the 500 county level. The following list, in alphabetical order, indicates those who have received the USA-CA Certificate and additional endorsements. Complete rules for the Program will be found on page 100, November 1963 *CQ*.**

2500	W5EHY	WØKZZ	W2ETS	W3TKQ	W4UF/	W5PQA	K6SXA	WA8EOZ	WA9AJF	W9SZR	KØRTH	PJ2AE
K9EAB	W5NXF	WØMCX	W2EWZ	W3YRN	W4ZKD	W5PSB	K6UHI	K8EUX	K9AMD	K9UCG	WØTFQ	PJ2AF
K8CIR	K5SBN	VE3BKL	W2FLD	K4ADU	K4VOF	W5RIT	W6UBP	WA8EZW	K9AZX	K9UTI	KØTKQ	PJ3AO
2000	K5SGJ	VE2-9301	W2FXA	W4AKI	K4VQP	K5SBN	WA6UQS	K8GKF	W9BJH	W9WUQ	WØVFE	PZ1AX
W5EHY	K5SGK	**500**	WB2HKZ	K4AUL	K4VRI	K5SGJ	K6UTO	W8HWX	K9CHD	K9YND	KØWEM	SM5CCE
K8CIR	K5UYF	K1BUR	W2JMF	K4BAI	W4VWW	K5SGK	W6YC	W8IBX	W9CLH	W9YT	KØWEN	SM5WI
K9EAB	K6BX	K1CXP	W2KIR	K4BVD	W4WLM	K5SHQ	K6YMZ	W8IEC	W9CMC	K9ZXG	CO8JK	SM7ID
K9UTI	W6KG	W1DMD	WB2MFX	W4BWR	K4WVX	K5UYF	K6YVV	K8IQB	W9DGA	WAØAAD	CR6CA	TG9AD
WØMCX	K6SXA	W1EIO	K2MYW	K4CDZ	K4ZNK	W5WZQ	K7AGJ	K8IWI	K9DWG	WAØAQN	CR7IZ	TG9SC
1500	W6YC	W1EQ	K2PBU	K4CEF	K5ABE	W5ZBC	K7CPC	W8JAQ	K9EAB	WØARO	CT1PK	VE1AE
K4BAI	K6YMZ	W1FAB	K2PFC	WA4CLR	WA5AIB	WA6AJF	K7CRL	K8JIC	K9EGQ	WØBBS	DL1IB	VE3BKL
K4KWQ	W7KOI	W1FPS	WA2PMW	W4EEE	W5AKR	WA6ATY	W7DZB	W8JXY	K9GDF	WØCUC	DL1QT	VE3EUH
K4VOF	K7NHG	W1GF	WA2PWI	WN4EBE	K5ANE	KH6BIH	W7GAO/6	K8KOM	W9GFF	KØDEQ	DL9PF	VE3LZ
W5EHY	K8CIR	W1GKJ	WA2SAZ	W4EJP	W5AWT	W6BIL	W7GBL	W8KPL	W9GML	KØDEW	F9BB	VE3RN
W5NXF	W8CYB/2	W1HGT	W2SNI	W4EJQ	K5BQS/	K6BX	K7GTK	K8KPM	K9GOE	KØEJW	G2FFO	VE6ABP
K5SGJ	WA8EZW	W1HOY	K2UKQ	WA4FJF	W5KPO	K6CJF	K7KHA	W8LAU	W9HAT	WØEXD/5	G3DO	VE7HJ
K5SGK	K8KOM	K1IIK	K2UPD	K4GLA	WA5BSV	WA6CRN	W7KOI	W8NAN	W9HGP	KØFIK	G4CP	VE6UP
W6KG	W8NAN	K1INO	WA2WEE	K4GMR	K5BTM	W6DIX	K7KPM	W8NXN	W9HUF	KØGIC	G6VQ	VE7CE
K8CIR	W8NXN	K1KPS	WA2WGS	W4GYP	W5BUK	WA6DWH	K7MPQ	K8OHS	K9IHU	KØGSV	G8PL	VE7HJ
W8UPH	W8RQ	K1MBM	WA2WKU	W4HOS	W5CME	WA6ECF	K7NHG	W8OQV	K9IIQ	KØGVA	GB2SM	VK3AXK
K8VSL	K8TNE	W1MRQ	K2ZKU	K4IEX	W5CRF	K6EIE	W7NNH	K8PFX	W9IRH	WØGWT	GI6TK	VK3RJ
WA9AJF	W8UMR	K1NLE	W3AIZ	K4IKF	K5DGI	W6ETR	W7NPV	K8QYG	W9IXF	WØHSC	HK1QQ	VK3XB
K9EAB	W8UPH	W1PLJ	W3AYS	W4IZR	W5DJB	W6FGJ	W7OEB	W8RQ	W9JC/4	KØHUU	HK3LX	VK7SM
K9UTI	K8VSL	K1PMY	W3BNU	K4JIG	W5DQK	WA6GWM	W7RZY	W8RSW	W9JCV	KØIDV	HK3RQ	VP9AK
KØHUU	W8WT	K1QZV	K3BTT	W4JUJ	W5EHY	K6HOR	W7VJI	K8TBR	W9JQE	WØIJN	HK3VV	XE1AE
WØMCX	W8WUT	W1RWP	W3BVL	WA4KUM/	W5FPN	W6JNX	W7ZKL	K8TNE	W9KA	WØIUB	HK7ZT	XE2DS
1000	WA9AJF	W1SSX	W3DKT	W1AFA	K5FTH	W6KG	W8AL	W8UMR	W9KSE	KØJPL	HV1CN	YV5ACP
W1GF	K9AZX	W1UOP	W3EFY	K4KWQ	K5IKL	WA6KNE	W8APN	W8UPH	K9LLX	WØJWD	I1ER	ZL1TB
W1GKJ	W9CMC	W1UOT	K3FFJ	K4KZF	K5IML/Ø	WA6MIE	K8BHG	W8VII	W9LXW	WØKZZ	IT1AGA	ZL4CK
K2PFC	K9EAB	W1YPH	K3GEO	WN4LSU	W5KKL	WA6MWG	WA8BIC	K8VSL	K9MAU	WØMCX	KH6BLX	**SWL**
WA2PWI	W9HUF	K2BFU	K3HNF	W4LYV	W5LEF	W6NAT	K8CIR	W8WT	K9MMA	KØMLM	KH6DKA	VE2-8679
K3HNF	W9KA	K2CJN	K3JHG	WA4MGC	K5IWL	W6NUQ	WA8CNN	W8WUT	W9NZS	WØMLY	KL7MF	VE2-9301
K3LXN	K9LLX	K2CPR/	K3JYZ	K4MPE	K5MID	WA6OET	W8CSK	K8YBU	W9OIJ	KØORB/	KP4CC	W2-6893
K4BAI	W9QWM	W3BXE	K3KDP	K4MYO	K5MWV	W6OJW	W8CXS	K8YGU	K9PZD	KØVRB	KZ5JW	VE3-7554
K4KWQ	K9UTI	W2EAF	K3LXN	W4NOK	W5NXF	W6PCA	W8CYB/2	K8ZCG	K9QBV	WØPLN	LU1DAB	WØ-10646
W4UF	KØDEQ	W2EBW	K3QVV	K4PXY	K5OCX	K6PQY	W8DCH	K8ZNI	W9QGR	KØQJG	OK2QR	WPE2HEA
K4VOF	KØHUU	W2EMW	K3QVV	K4RNS	W5ONK	W6QIL	W8DCR	W9ACU	K9QGR	WØQWS	OK3EA	
	KØIDV	K2ETC	K3QVV	K4TVE	K5OPT	WA6RXM	WA8EOH	WA9AIB	W9QWM	KØRGU	PAØVB	

WPX The following list indicates the amateurs who have qualified for the Worked Prefix award as of September 4, 1964 and their relative standing. A prefix is defined as the first one- or two-letters of the call sign and its accompanying numeral; *i.e.*, W1, K1, WA1, WV1, KN1; G2, G3; etc. Amateurs are encouraged to work as many different prefixes as possible and apply for the award directly to the WPX Certificate Committee, 14 Vanderventer Ave., Port Washington, L.I., N.Y. Application forms may be obtained from the above address or from the DX Editor, W2DEC. See the DX section in this issue for more information.

CW WPX													
W2HMJ	694	K2CPR	550	DL7CS	502	VE4OX	461	W3BQA	437	K2PFC	415	VE6VK	403	WØQYE	377
W8KPL	664	W1EQ	549	W9SFR	501	JA2JW	461	LA5HE	437	W1DGT	415	G2FFO	403	DL1IP	377
W5KC	656	W1IJB	546	W2EMW	500	W9WIO	460	WA6SBO	435	W5AWT	412	W2FLD	402	CE3AG	375
W2EQS	641	W9YSX	544	W2FXA	500	W9WCE	458	G3HIW	433	W5DA	412	G8PL	402	G8KU	374
W2AIW	617	KP4CC	542	W2MUM	495	W3BCY	457	VE3ES	433	WA2DIG	411	K9BVR	401	HA5BI	373
W6KG	606	G2GM	538	W1WLW	494	W7HDL	457	W4CKD	431	W2PTD	411	WØBVQ	401	ZE3JO	371
ON4QX	603	W9GFF	538	LA3DB	491	F9MS	457	WØAUB	429	K5LZO	411	IT1TAI	401	VK3RJ	370
W4OPM	600	SM7MS	534	PY4OD	491	OE1FF	457	W2RA	428	W4DKP	410	VE3JZ	401	DJ5VQ	369
W9UXO	582	W3GJY	526	OK3DG	488	W8KSR	456	K5LIA	428	W1CKU	408	W6ISQ	401	UA3AN	368
DL1QT	573	K9AGB	515	SM5CCE	488	OK3EA	456	OK1MB	428	K4JEX	408	SP4JF	400	DL6MK	366
W2NUT	571	W6WO	511	W4BYU	487	UC2AR	456	W5EJT	428	K4JVE	407	VE1AE	400	VU2MD	366
W8LY	570	DJ2KS	511	W8PQQ	481	W7ABO	452	W3CGS	426	W5AFX	407	VK3KB	400	DL1BO	366
K6CQM	565	K9EAB	510	W4HYW	478	SM5BPJ	452	W1EIO	425	SM5AJR	406	K6VVA	400	JA5FQ	366
W5OLG	564	W2GT	510	W8IBX	476	WA2CBB	451	OE3WB	425	W4YWX	404	W4BHG	400	W3GRS	365
W2HO	563	DL3RK	509	W5BUK	473	K4TEA	451	KL7MF	424	GI3QR	404	PY4AYO	400	W4AZK	365
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W9DWQ	556	W9UZS	505	K4HPR	470	DL9KP	450	WØPGI	420	ZS4MG	404	W8TTN	387	MP4BBE	364
W2KIR	555	PAØLOU	505	W3OCU	466	SP6FZ	450	HB9TT	419	DJ5GG	404	ZL2GS	385	K8LSG	363
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K2ZKU	552	YU1AG	503	SM3TW	463	W3AYD	443	UA4IF	417	W9DYG	403	SP2AP	383	W9ZB	360
		W6YY	502	VK3XB	462	W6UNP	442	SP8HR	416	W9IHN	403	W4BJ	377	WØMLY	360

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LA2MA 300

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Mixed WPX

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K2ZKU 555
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PY4AYO 400
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VE3PV 400
ZS4MG 400

DX

BY URB LE JEUNE,* W2DEC

A RECIPROCAL Operating Agreement, one of the first, has been signed between the USA and Costa Rica. Several others should be signed by the time you read this.

"Leicester Hemingway, who is trying to establish a new nation, New Atlantis, on a tiny island off Jamaica, hopes to have a government organized there this fall. He vows it will be truly democratic—elections by show of hands, with a camera recording the vote . . . Hemingway expects attention from the State Dept. because the first stamps he's printed for New Atlantis bear a salute to the State Dept.'s boss, Lyndon Baines Johnson." This notice appeared in the New York *Post*. Anyone for a DXpedition?

Here and There

CR4 Cape Verde Islands: CR4BA, Jose may be found occasionally on 21130 a.m. fone using a Geloso 212 with 45 watts to a quad. QSL Box 90, Sao Vicente. *(Tnx WGDXC)*

EA9 Spanish Morocco: EA9EO 14325 kc s.s.b. from 1300 GMT. QSL via EA4GZ. *(Tnx WGDXC)*

FB8 Crozet Island: FB8WW, Marcel has been reported active on various frequencies from 14 mc to 14168 kc and at various times from 0500 until 1400 GMT and via long path and short path and a consensus of this data indicates the best procedure is when he is heard (very distinctive T-7 note) and it is known that he is actually on the air and listening, (which he does sometimes for as long as 5 or 10 minutes) pick out a clear spot not closer than 5 kc from his frequency and stay there, calling short calls, and often, until you get him, or give up, to repeat, etc. Marcel will QRT in January and may be reached in France shortly thereafter. His home QTH is Blaise Marcel, Cite Waron, Les Capucines Nr 2 A Le Point Du Jour, Saint Brieuc, Cotes Du Nord, France. *(Tnx WGDXC)*

GC Channel Islands (Jersey): GC2FMV, Eric 14020 kc from 1230 GMT occasionally. *(Tnx WGDXC)*

HC8 Galapagos: HC8FN, Forrest, 14120 kc s.s.b. 21-2200 GMT occasionally, QSL via WA2-WUV. *(Tnx WGDXC)*

KB6 Canton Islands: Clive Preece, KB6EPN, has been very active and those who are still in need of a phone contact with this country are advised to look for him between 0700 and 0800 GMT 14 mc high end s.s.b. His QSL address is c/o PM, USPO, Canton Island, South Pacific. *(Tnx VERON)*

KS6 American Samoa: KS6BN 14012 kc 0300 GMT, QSL Box 8, Pago Pago. KS6BA s.s.b. 14285 kc 0630 GMT and KS6BL 14240 kc 0830 GMT occasionally. *(Tnx WGDXC)*

LU Deception Island (S. Shetlands): LU1ZC and LU8ZI are usually about the middle of the c.w. section of 14 mc (14050) the former 22-2300 GMT and the latter 1200 GMT. *(Tnx WGDXC)*

VK9 Norfolk Island: VK3TL will DXpedition to Norfolk and sign VK9TL during the month of January, s.s.b. and c.w. will be used on 15, 20, 40 and 80 meters. QSL via the home station or VK QSL Bureau.

VP8 South Shetlands: VP8HU is reported active on 7023 kc c.w. QSL via RSGB. *(Tnx Fla. DX Rpt.)*

VU Andaman Islands: VU2NR, Raju is reported in *DXpress* as going to this rare spot in November for a stay of several months as radio engineer and will take along his s.s.b. gear.

VU Nicobar: 9M4LX reports that the Nicobar DXpedition is still pending and they need only to receive permission from the Indian Government. WA2WUV will act as QSL Manager. *(Tnx NCDXC)*

XE Mexico: The following letter from XE1NE needs no explanation.

"It was with amazing surprise to read in this month's *CQ*, pg. 58, your information and the letter from Mr. Pita, to the effect of misleading the U.S. amateurs about obtaining an operating license for mobiling while touring Mexico.

"Our Government had been issuing licenses to visitors up until a couple of months ago or more, but has denied further licenses to all visitors, due to the fact that your country denied to me, a license to operate while on a projected trip to the U. S.

"There is an agreement of reciprocity, and it

Tommy, CN8AW, who is probably the most active CN8 and also a frequent contributor to this column, is shown in his neat shack.

*Box 35, Hazlet, New Jersey 07730.

The following certificates were issued between the period from September 6th to and including October 5th, 1964:

CW-PHONE WAZ

2052	K2JYH	Alan M. Steger
2053	OK1YD	Jara Blahna
2054	EA2CR	Jose Maria Duran Almenara
2055	DJ2RE	Dr. Walter Eichenauer
2056	WA6PMK	Alan Highie
2057	MP4BBE	J. A. St. Legger
2058	SM4AD	Stan Soderberg

ALL-PHONE WAZ

265	W4NJF	Cdr. Gay F. Milius
266	SM5WJ	Ivar Westerlund
267	W8IJZ	John H. Bricker
268	W1ZW	Philip K. Baldwin
269	G3NWT	E. G. Harrison

TWO-WAY SSB WAZ

261	W4NJF	Cdr. Gay E. Milius
262	F2MO	Michel Dort
263	DJØIK	Bill Nielsen
264	W1GOX	H. Archambault
265	SM5WJ	Ivar Westerlund

CW WPX

575	OK2QX	Jiri Pecek
576	DL3AR	A. Stirba
577	SP5AFL	Leon Kossobaudzki
578	W7VRO	Richard Moen
579	OH5UQ	Paavo Miettinen
580	LA1H	Harstadgruppen Av Nrrl
581	I1ZQ	Elvio Pizzo
582	JA2DO	R. Takasu
583	SM5BHW	Hakan Ekdahl
584	DJ2GG	Herbert Vierkotten
585	WA6MWG	John P. Billon
586	K5DGI	Wes Attaway

SSB WPX

199	DL6EQ	Rudi Brumm

MIXED WPX

102	MP4BBE	J. A. St. Leger
103	4X4FU	Halfon Isaac
104	DJ2GG	Herbert Vierkotten

200 TWO-WAY SSB

124	K6CYG	S. C. Shallon

100 TWO-WAY SSB

466	K6CYG	S. C. Shallon
467	W2PDB	Edward H. Nadolny
468	VE6ABP	Margaret Tettelaar
469	TG9SC	Cesar A. Siu

has been passed by your Senate and the President of the U. S., and it was sent to me by Barry Goldwater, K7UGA, but that does not mean that we can obtain a license yet. And until we do, there will not be anymore licenses to foreigners here.

"So your information was and is misleading. The Government has turned down 38 applications from your countrymen, and they have been returned by the Liga here to the applicants.

"Thanking you for your kind attention and hoping that you will publish the real facts, I remain, Sincerely yours, 73, Alberto H. Calleja, XE1NE."

XW8 Laos: XW8AV 14260 kc around 1200 GMT occasionally via short path. XW8AX, Bill, is also s.s.b. 12-1300 GMT. *(Tnx WGDXC)*

YA Afghanistan: Ali, YA1AN, is very active again. S.s.b. on the high end of 20 is preferred. Usual time is between 1600 and 1800 GMT. *(Tnx VERON)*

ZD8 Ascension Island: "Once again I send you greetings from ZD8 land, but this time with good news. For almost two years I have been on this rock called Ascension Island of the South Atlantic Ocean and for this time I have been trying to get a ham ticket, but with no luck. Now it is a different story, as not only I, but at least six other Americans at this time have licenses and should be on the air shortly, or as soon as equipment arrives. Just recently there was a change of the British administrator on the island, and between him and our Base Commander, Capt. Roy Dixon, they now have an agreement whereby any US licensed ham working on the base will be granted a ticket.

"Well, to give you a rundown about what I know. Presently, ZD8GK, George Knickerbocker, has a Gonset transceiver on the air. Soon to go on is ZD8CH, Chuck Hewitt, ex-VP5CH from Grand Turk Is. and Chuck will be using the Heathkit 20 meter s.s.b. rig. ZD8FP should

My thanks to G8NY and K2HLB for the use of this card. I'm sure it will bring a smile to many DXers. This card dates back to 1948 when "Sir Gus" was the hunter not the hunted. Among other things, Gus had a 49 (that's right, forty-nine) tube receiver, a Freq. Standard Monitor, and "Lots of other Gadgets." In the last line, Gus asked Les to "tell some Zone 23 station to work me!"

Tom Yantis, W5SQY, shown visiting Alberto, XE1NE, in Mexico City recently.

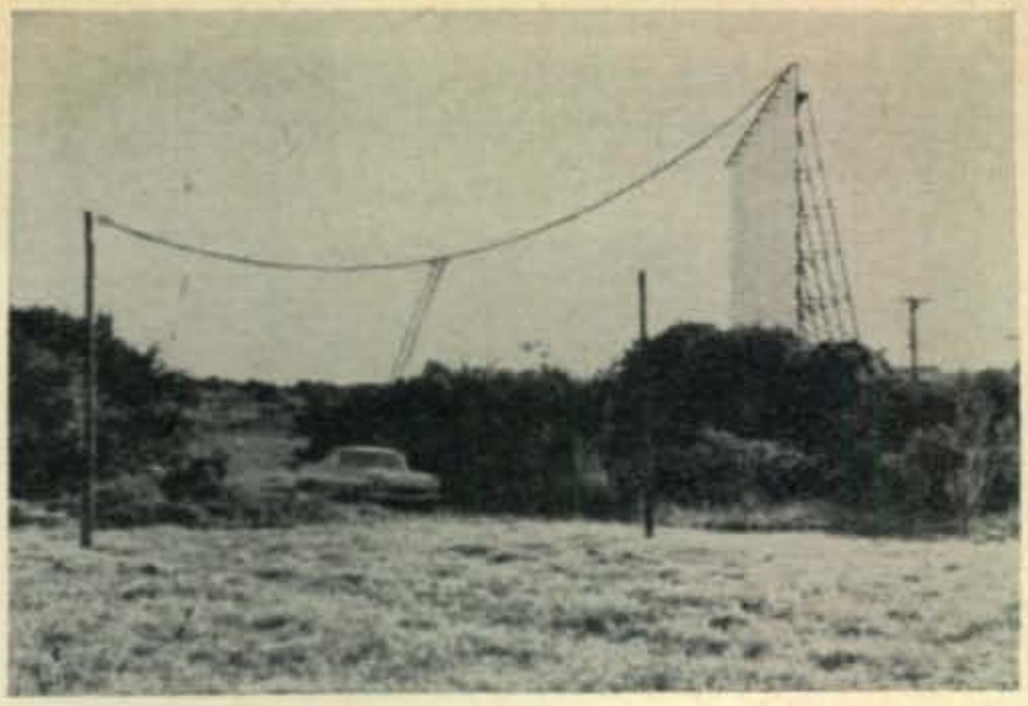
return from vacation soon and he has some equipment to fire up when he returns. Fred is an old hand at being DX as he was a c.w. man on St. Lucia and then VP5FP in '58 from Grand Turk and possibly a few others. ZD8JB, John Bunker, will also be returning from vacation soon and will be on the air as soon as he can, as I believe he was going to buy and bring some equipment back with him. My call is ZD8RH, and I should be known to many as VP7BP from San Salvador during 1960-62 and maybe as VP5RH from Grand Turk during 1960. I'm going to try my hand at c.w. with a DX-60 and the Drake 2B and as before my cards will be handled by Jack or that familiar sound of QSL via W2CTN for ZD8RH. The others here all have the same address—their name, Ascension AAFB, c/o GMRD, PO Box 4187, Patrick AFB, Fla. 32925.

"Well, maybe I've given a little welcome news to the boys back in the states. I don't plan to be as active as I was from the Bahamas and am now mainly interested in getting a few rag-chewers and improve my c.w. I also have a lot of other things to do down here so I won't have the time on the air as before, but there will be enough activity to keep a lot of beams headed this way and keep those noisy pile ups on the band when conditions are favorable. The Bahamas gave me my clue of what I'll be in for down here and I'll do my best to get a ZD8 for as many as I can before I leave here. DX ES 73, Ralph, ZD8RH"

Thanks for the above good news Ralph. We'll be looking for you on 20.

ZS2MI Marion Island: Following is extracted from VK5BB's DX column in the Australian Amateur Radio Magazine—"Marion Island was discovered by Capt. Cook in 1772. The island is 12 miles by 8 miles and was annexed and occupied on 29 Dec. 1947. The present weather station, consisting of four weather men, a medical officer, a radio technician, and an operator, was established in Jan. 1948. ZS2MI runs 150 watts into a rhombic beamed on Pretoria, So. Africa. He is active on 14250-60 kc s.s.b. between 1230 and 1330 GMT. Marion Island is continually swept by gales; surf spray reaches up to 200 feet and it rains an average of 295 days out of 365. The central peak on the island rises to 3,890 feet a.s.l. There is no soil on the island; the rock top is covered by soggy peat. All buildings stand on poles which are down 15 feet into solid rock and are linked by catwalks. Seals, sea lions, and 50 varieties of birds inhabit the island."

Stuart Meyer, W2GHK, Founder-Director of the "DX-pedition of the Month" accepts honorary membership in the British Columbia DX Club from Vic Clark, VE7ALR at the Pacific Northwest DX Convention in Vancouver, British Columbia August 1, 1964. Stu is the first non-Canadian to become a member of this organization.



Congratulations to ZS2FM, Mike Bosch, East London, South Africa, who does the unusual on 160 by erecting antenna from top of outdoor movie screen, out in the country away from the city's noise, and operating portable from the back seat of his car during 160 meter DX periods. Working in conjunction with Rhodes University he also uses this spot and car for his successful emission recordings from the planet Jupiter on 18 and 22 mc from midnight to sunrise daily using "broadside array" and, incidentally, not getting much sleep. He made two contacts with W1BB during a series of summer 160 meter tests, using his 6v6 final, 75A-4 receiver and dipole antenna as shown. He heard W1BB many times during the summer before successful contact. Mike is looking for any and all DX on 160 and will be happy to arrange schedules. Much credit to him also for getting 160 recognized in South Africa and being editor of *Feedback* magazine. The first ZS ham to successfully build equipment for 10,000 mc band and establish two way QSO, Mike is a real active, persevering, 1.8 mc-10,000 mc ham. W1BB used new Hammarlund noise blanker which was a real help through the summer QRN. *(Tnx W1BB).*

ZL Chatham Island: Ted, ZL2AWJ, should be now active from Chatham. *(Tnx Fla. DX Rpt.)*

5W1 Western Samoa: Our thanks to George, ex-ZK1BV, for the following info:

"I packed up my ZK1BV operation from Aitutaki Island in the Southern Cook Islands Group in early February of this year. Have just caught up on replying to inward QSLs received and those without s.a.s.e. have gone thru the ZL Bureau so still might take a month or two to reach their destinations.

"Still have a few ZK1BV QSL cards left and anyone overlooked can still obtain a QSL from me via my new QTH. S.a.s.e. will obtain quick results otherwise all cards through ZL Bureau.

"Regret delay in QSLing the long-held cards but had short spells in VR2 and ZL before coming to this QTH and just plain QRL.

I think this is one of the cleverest gadgets for the DX man that I have seen in a long time. By the use of six numbered spinwheels, your DX accomplishments are displayed. It also explains DX chasing for the visitors thusly "The Operator of this Amateur Radio Station is a DX Chaser, deriving great pleasure in communicating with other amateur radio stations throughout the world. The DX Chaser often spends hours seeking out and contacting a rare new country. As proof of these contacts, QSL confirmation cards are then exchanged. Unless a new country is being contacted right now, the DX record of this station is correct as shown." It is available directly from W1HOZ at 196 South Main St., Orange, Mass. The cost is $2.50.

"New call sign is 5W1AZ and expect to be up and going shortly. Mainly on 14 mc c.w. My new QTH is Faleolo Airport, Private Bag, Apia, Western Samoa. 73, George W. Ashton."

7Q7 Malawi: Lowell, W5UBW, informs us that he will be the QSL manager for 7Q7GB in the Western Hemisphere or anyone who cares to QSL through him. 7Q7GB will also QSL from his QTH where it is more convenient to mail from Africa than from the USA. Lowell requests all US amateurs to send a self-addressed, stamped envelope (a must for a QSL request).

7Q7GB's stateside call is W5VIH from Amarillo, Texas. He is a teacher at a mission school just outside of Zomba. His equipment is a Drake 2-B, Viking Invader 200 with 100 watts input. This is the limit in Malawi. At this writing he is in the process of putting up a rhombic. He plans to be there for two or maybe three years.

Operations will be on 20 meters and 15 and 10 as conditions permit on s.s.b. and c.w." *(Tnx W5UBW)*

7Z Saudi Arabia: The new prefixes for Saudi Arabia are 7Z1 (West), 7Z2 (East), and 7Z3 (Riyadh). *(Tnx RSGB)*

9M4 Malaysia: Mike, 9M4LU, has been active on 40 meters. Look for him on 7010 around 1200 GMT *(Tnx WGDXC)*

9Q5 Republic of Congo: 9Q5AB, Harry, usually working contest style starting 2200 GMT daily. He likes 14033/35 and listens 5 up. *(Tnx WGDXC)*

QTHs and QSL Managers

KØRWL	Offers his services as a QSL Manager for any DX station.
CM5GG	Box 67, Matanzas, Cuba.
CR7GF	Box 812, Lorenco Marques, Mozambique.
DJ4EK/TA	Via DL3RK.
EA9EO	Via EA4GZ.
EP2NO	S/Sgt. Nick Olguin, c/o QSL Mgr., U.S. Embassy, APO 205, N.Y., N.Y.
FB8YY	Via 5R8BC.
FH8CD	Via 5R8BC.
FK8BC	Box 97, Noumea, New Caledonia.
FP8CA	Via K2OJD.
GB2LS	Via G3MCW.
GC3SEE	Via G3SEE.
GD2HFD	Via G2HFD.
HBØAFM	Via HB9GJ.
HBØGJ	Via HB9GJ.
HKØQA	Via K9ECE.
HM5BF	Box 4N, Pusan, Korea.
HS1X	Carl Anderson, via U. S. Embassy, Bangkok, Thailand.
KG6IF	Harry Train, Jr., RM1 USCG, LOR STAT APO 315, San Francisco, Cal.
KG6SZ	Via WA6ZIQ.
KM6BI	Navy 3080, Box 23, c/o FPO, San Francisco, Cal.
KW6CV	Box 68, Wake Island.
LX3TA	Via DL1TA.
M1FT	Via DL7FT.
MP4BDC	F. S. Peacock, 4 Kent Gardens, Braintree, Essex, England.
OD5AX	Via W9YFV.
ex-OQØPD/ 9U5PD	Now ON5PD.
TA2BK	Via DJ2PJ.
TI2KQX	American Embassy, San Jose, Costa Rica.
TJ1AC	Via F. Bucher, c/o Electricity Corp., Victoria, West Cameroons.
TJ8AC	Box 26, Garoua, Cameroon.
TR8AD	Box 1025, Libreville, Gabon Republic.
VE1AJR/SU	UNEF B ASE, P.O. Beirut, Lebanon.
VE6TM/SU	Via VE7ZM.
VS4RB	Via K8LBQ.
VS9PGM (ex-6O2GM)	Don Bushe, D. W. S. (F.O.) Aden/Perim, POB 5153 Maala, Aden.
W5VWU/KJ6	Box 1072, Tijeras, New Mexico.
W9WNV/XV	Via K6EVR.
W9WNV/3W	Via K6EVR.
YA1AN	Via DL3AR.
YU7LAJ (OZ5SQ)	Klaus Dwinger, Box 35, Korcula, Yugoslavia.
YV5BIG	Via K3SLP.
YV8AS	Box 146, Maturin, Venezuela.
XW8AV	C. Jones, USAID/BPR APO 152, c/o PM, San Francisco, Cal.
ZB2B	Via RSGB.
ZD8RH	Via W2CTN
4W1D	Via W2CTN or HB9AAW.
4W1E	Via HB9ZN.
5N2RSB	S. Sgt. R. Briggs, 5 Gough Rd., Catterick Camp, Yorkshire, England.
5W1AZ	George W. Ashton, Private Bag, Faleolo Airport, W. Samoa.
5Z4IV	Via W2CTN.
7G1L	c/o Hammarlund, GPO POB 7388, N.Y., N.Y.
7Q7GB	Via W5UBW or G.B. Shelburne, Box 104, Zomba, Malawi, Africa.
7Q7OL	Via G3JUL.
7Z3AB	Box 2486, Dhahran, Saudi Arabia.
9L1HX	Via VE4OX.
9M4LS	Via K7UCH.
9M4LX	Via WA2WUV.
9U5BB	Via ON5KY.
9X5GG	7th Day Adventist Mission, Nyanzar, Ruanda, Africa.

73, Urb, W2DEC

Joyëux Noel

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

On October 12, the Soviet Union rocketed a space ship into orbit carrying a pilot-engineer, a scientist and a medical doctor. The space ship named "Voskhod," which means "Sunrise" in English, was the first space craft to carry more than one person. Aboard were Col. Vladimir Komarov, the pilot-engineer; Konstantine Feoktistov, the scientist; and Dr. Boris Yegorov.

Voskhod orbited the earth every 90 minutes for approximately 24 hours before returning to earth safely on October 13. While in orbit, its altitude ranged between 110 and 255 miles.

Beacon and telemetry signals were received loudly and clearly from the 3-man Russian space craft on 19.994 and 20.005 mc, while voice communications from the space craft were heard on 17.865 mc (in the International Broadcast band!), 18.035 and 143.625 mc.

Echo II Experiments

Word has been received from Raphael Soifer, K2QBW, Director of the Office for Satellite Scatter Coordination (OSSC), summarizing the results of attempts by radio amateurs to communicate by bouncing 2 meter signals off the surface of the Echo II satellite.

Ray reports that although hundreds of radio amateurs and observers throughout the world participated in the OSSC project, all attempts at communicating via the passive satellite ended in failure. Despite the negative results, however, the project aided in the development of 2 meter equipment and operating techniques that should prove useful in other radio amateur space communication experiments such as OSCAR and Moonbounce.

Ray points out that original theoretical calculations predicted that marginal 2 meter c.w. contact would be possible over a 1200 mile path using a kw and antennas of 18 db gain at both ends of the circuit. Although communications were attempted with these, and somewhat higher levels of radiated power, they were not successful. Ray attributes the failure to a higher noise level observed on 2 meters than originally anticipated in the theoretical calculations. It now appears that a 13 db increase in signal level would be required for successful satellite-bounce communications. This would bring the antenna gain requirement per station to approximately 25 db, which is substantially beyond the gain of the antennas available for the project. More complete information on OSSC can be obtained directly from Raphael Soifer, K2QBW, whose address is P.O. Box 308, New York, New York 10003.

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

Beacon Explorer-B

As this is being written (mid-October), NASA is making final arrangements for the launching of a windmill-shaped scientific satellite called "Beacon Explorer-B". The satellite is designed to make a comprehensive survey of the Earth's ionosphere and to evaluate laser techniques for deriving orbital and geodetic information. The Beacon Explorer-B (BE-B, for short) was formerly called S-66, and was originally scheduled for launch last year.

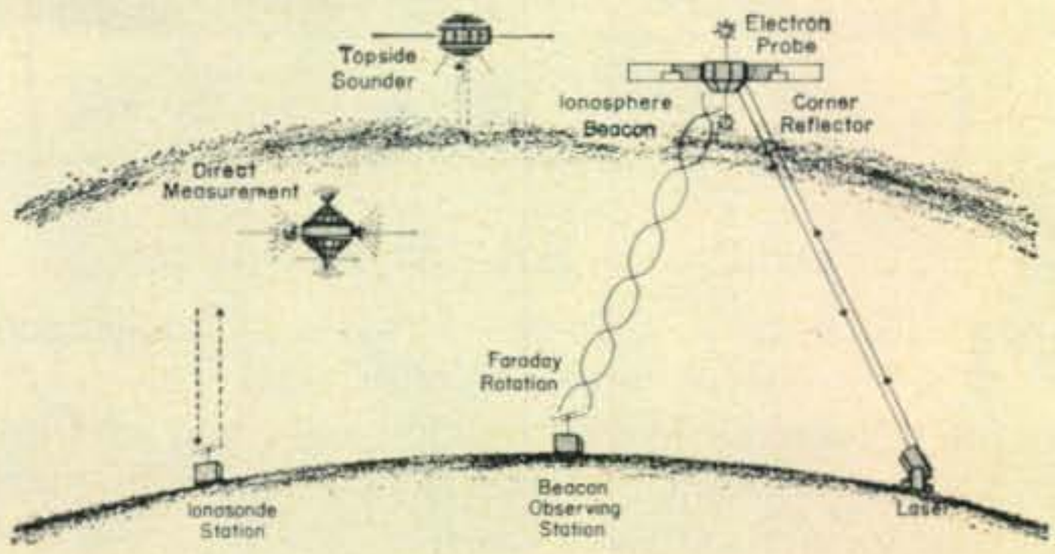
It is the ionosphere, a region of electrically-charged gases, beginning about 35 miles above the Earth, which makes possible long-range radio communications. The ionosphere changes as rapidly as does the Earth's weather. A global survey of this enormous electrified mirror will be as important to predicting communications frequency variations and blackouts as the TIROS weather satellite pictures of global cloud cover have been in predicting the weather.

The 116 pound satellite will transmit a continuous series of radio signals to a network of more than 80 ground stations operated by some 50 scientific groups in 32 countries. This international scientific effort is the most extensive yet in a US space project.

The Beacon Explorer radio signals are transmitted at wavelengths that cause changes in the characteristics of the signals as they pass through the ionosphere. Scientists can get information on the ionosphere by studying the nature of the satellite's radio signals as they are received on the ground.

In addition to the ionosphere studies, the Beacon Explorer will serve as a test bed for optical and radio tracking experiments related to geodesy—the study of the size and shape of the Earth.

In one experiment, laser (light-beam) devices near NASA's Wallops Station, Va., and near



NASA has developed three types of satellites for exploring the ionosphere. The above sketch shows how topside sounders (TOPSI), beacon sounders (BE-B) and direct measurement satellites (ARIEL) probe the ionosphere, along with ground-based ionosondes.

the Goddard Center, will direct beams of light toward fused silica reflectors on the satellite as it passes within range of the station. If the beam strikes the reflectors, part of it will be returned to a receiver near its source. This will enable precise measurements to be made of the satellite's position in space.

Secondly, the Beacon Explorer will transmit on two frequencies which will permit precision tracking by ground stations.

BE-B in one of three types of satellites launched by NASA to explore the ionosphere.

The first type, called direct-measurement Explorers, were designed to measure in detail the characteristics of the ionosphere in the immediate vicinity of the satellite. Two such satellites were launched successfully by NASA: The U.S. Explorer VIII, Nov. 3, 1960, and the U.S.-United Kingdom Ariel I, April 26, 1962.

The second type, called topside sounders, transmits radio signals of varying wavelengths which are reflected from the topside of the ionosphere with the echo being received back at the satellite. Topside sounder satellites, by such radar-like technique, permit the study of electron structure as a function of altitude but only on the topside of the ionosphere.

NASA has two topside sounder satellites: the Canadian-built Alouette, launched Sept. 29, 1962, and the Ionosphere Explorer—Explorer XX—which was successfully launched Aug. 25, 1964.

The Beacon Explorer represents the third type of ionosphere satellite. Its radio transmissions are made at wavelengths which penetrate through the ionosphere to the ground. Thus, it will transmit "raw" cross-section data on the structure of both the top and bottomside of the ionosphere directly to ground stations. This worldwide network of stations forms a nucleus for the data collection that will make possible a long-sought global survey of the ionosphere.

Expected operating lifetime of the satellite is about two years.

BE-B Frequencies

Four c.w. signals will be transmitted from the satellite (by ground control) at power levels over 100 milliwatts to insure good signal-to-noise ratios for ionospheric experiments. The following frequencies will be used for this purpose: *20.005, 40.010, 41.010* and *360.090* mc.

Two other signals will be transmitted for Doppler tracking experiments on *162.000* and *324.000 mc*, while a c.w. beacon and command telemetry transmitter will operate on *136.170 mc*.

OSCAR III News

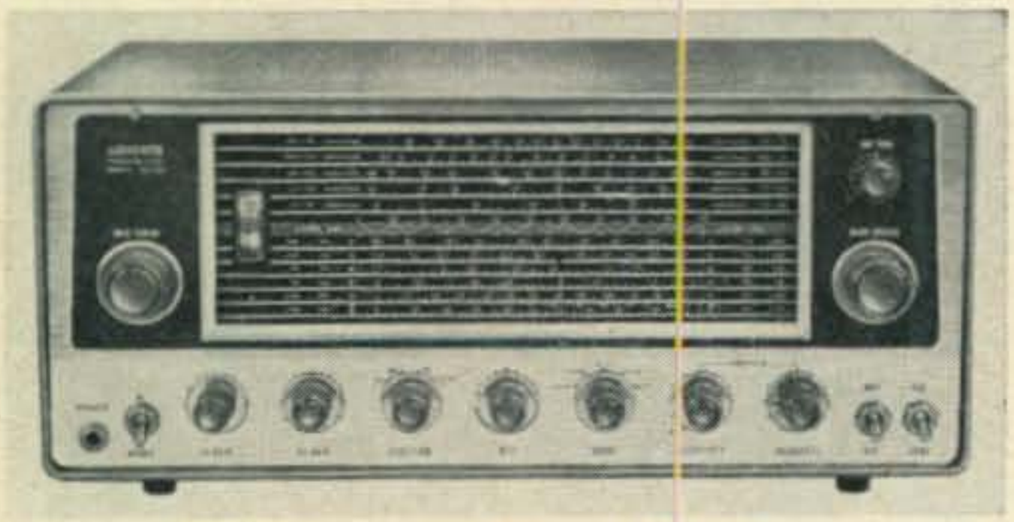
The OSCAR III satellite has been ground tested successfully during late October, and is now ready for assignment to a launch vehicle. Since it must ride as a hitch-hiker, assignment to a vehicle is expected to take some time. The latest estimate from Project OSCAR Headquarters is still for a late winter launch date. Part II of "OSCAR III, An Active Communication Satellite for Radio Amateurs" is expected to appear in next month's issue of *CQ*. It will discuss how the satellite will be used for communications and other experiments. Part I, which described the OSCAR III satellite in detail, appeared in October, 1964's issue of *CQ*.

Season's Greetings

From the limits of outer space to the depths of our planet Earth, let greetings ring for a Merry Christmas and a Happy New Year to all.

73, George, W3ASK

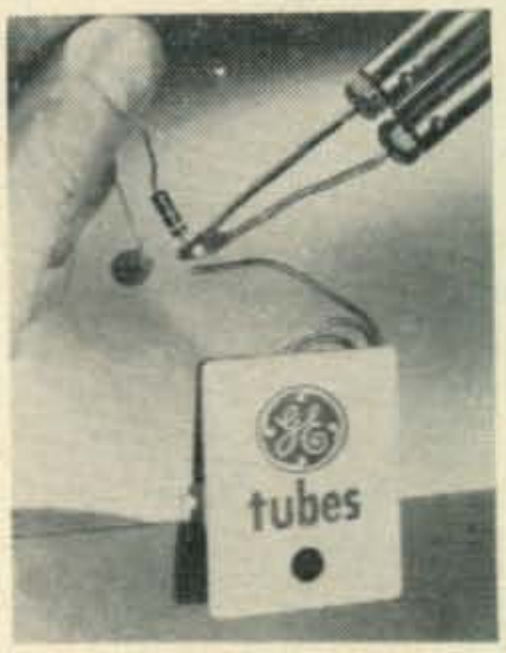
New Amateur Products



Lafayette HA-225 Receiver

LAFAYETTE Radio's HA-225 is a 14 tube superheterodyne receiver with dual conversion on 6 meters. The frequency coverage is from 150 kc to 54 mc in 5 bands. A separate filament transformer provides constant heater voltage to the mixer and oscillator tubes, for increased frequency stability. The sensitivity is 0.5 microvolts for 10 db S/N ratio. Other features include product detector, crystal calibrator (crystal is optional at extra cost), separate b.f.o. and Q multiplier, plus automatic noise limiter and S meter. It is 17" × 7½" × 10". The price is $139.50. More information can be had by writing to Lafayette Radio, 111 Jericho Turnpike, Syosset, L.I., N.Y.

G.E.'s "Third Hand"



A "THIRD HAND" for radio and television service technicians that might be useful to the ham too, now is available through franchised distributors of G.E. electric components.

Essentially a large enameled steel clip, the device will hold either small parts or solder. In effect, this gives the worker a "third hand."

This service aid can be either screwed to the edge of the work bench, or used self-supporting —positioned on any flat surface. The price is only $.35.

Propagation

BY GEORGE JACOBS,* W3ASK

TWENTY meters is expected to continue to be the best band for DX propagation conditions during the month of December. Although the band will close considerably earlier in the day than it did during the summer months, good openings are forecast to most areas of the world from dawn through the late afternoon hours. A seasonal improvement in daytime propagation conditions on 15 meters is also expected during the month, with good openings predicted to many areas of the world. Not many DX openings are expected on 10 meters until the sunspot cycle begins to climb again, but an occasional daytime opening may be possible during December on paths to tropical or southern areas.

With static levels at seasonally low values, and the hours of darkness at a maximum in the northern hemisphere during December, a considerable improvement in DX propagation conditions is predicted for 40, 80 and 160 meters. Forty meters is expected to open for DX during the early afternoon hours, and remain open to one area of the world or another during the hours of darkness and the early daylight hours. Frequent 80 meter openings, often with exceptionally strong signals, are forecast to many areas of the world during the hours of darkness. DX propagation conditions on 160 meters are expected to be optimum this winter, as the sunspot cycle nears its minimum. Openings on this band are expected to many areas of the world during the hours of darkness, with signals peaking when it is dark at one end of a path, and sunset or sunrise at the other.

160 Meter Tests

The following information has been received from W1BB concerning the annual 160 meter trans-Atlantic and Worldwide DX Tests:

Continuing with an operating activity established in 1932 and held every year since, except War years, the annual trans-Atlantic and Worldwide "Top-Band" DX Tests will be held during the 1964/1965 season on the following *Sunday* mornings from *0500-0730* GMT; *December 6 and 20; January 3 and 17; February 7 and 21.* Be sure to set clocks accurately. During these Test periods special efforts will be made to establish new DX records on 160 meters, and to obtain propagation data for use during the International Quiet Sun Year (IQSY). During the Test periods, U.S. and Canadian stations should call *CQ DX Test* the *first* five minute period of the hour, and then the *third, fifth,* etc., periods, listening in-between. DX stations will call *CQ DX Test* the *second, fourth, sixth* five minute periods, etc., listening in-between. U.S. and Canadian stations will use 1800-1825 kc and 1975-2000 kc, depending upon location. European stations will generally use 1825-1830 kc., ZL stations 1875-1900 kc, VK stations 1800-1860 kc, JA's 1880 kc, and most other DX stations will be between 1800 and 1830 kc.

The Test periods *are not* Contests. They are held primarily to obtain propagation data for use during the IQSY and to generate DX activity on 160 meters. Although not competitive in nature, working DX during the Tets periods can be challenging and extremely interesting. Conditions such as QRN, BC harmonics, QRM, Loran, QSB, low-power limitations, etc., make it necessary to demonstrate extreme patience as well as a top-notch station and operating techniques.

U.S. and Canadian stations are requested to send their Test periods observations to W1BB, Stewart S. Perry,

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for December

	Forecast Rating and Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **5, 11, 17, 31**	A	A-B	B-C	C
Normal: **2-4, 6-7, 9-10, 12, 14-16, 18, 21-22, 24, 29-30**	A-B	B-C	C-D	D-E
Below Normal: **1, 8, 13, 19, 23, 25, 27-28**	C	C-D	D	E
Disturbed: **20, 26**	D	D-E	E	E

How To Use These Charts

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

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

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

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

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

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

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

6—These Propagation Charts are valid through January 31, 1965. These Charts are prepared from basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

36 Pleasant Street, Winthrop, Mass. Stations in the U.K. should send their reports to L. H. Thomas, DX Editor, Short Wave Magazine, 49 Winchelsea Lane, Hastings, Sussex, England. All other DX stations may submit logs and observations to either of the above addresses. With 160 meter propagation conditions expected to be optimum this season, the results of this year's Test periods may be greater than during any previous year.

VHF Openings

Geminids, a major meteor shower, is scheduled to take place during the second week of December. It is possible that short-skip v.h.f. openings up to distances of approximately 1000 miles may take place during this period as a result of increased ionization produced by the meteor shower.

V.h.f. ionospheric openings over several hundred miles are also likely to occur during periods of auroral displays or ionospheric storminess. Check the "Last Minute Forecast" appearing at the beginning of this column for those days that are expected to be "disturbed" or "below normal."

A minor seasonal peak in sporadic-E propagation often occurs during December (the major peak occurs during the early summer months). This may result in a number of short-skip openings, between distances of approximately 1000 and 1400 miles, on 10 and sometimes, 6 meters.

Sunspot Cycle

The present sunspot cycle continues to decline slowly towards a minimum value. A monthly mean sunspot number of 4 was reported by the Zurich Observatory for September, 1964. This results in a smoothed sunspot number, upon which the cycle is based, of 15 centered on March, 1964. A smoothed sunspot number of 9 is forecast for December, 1964. The end of the present cycle is expected to occur during the late spring of the New Year. For a more detailed account of the present state of the sunspot cycle see, "A Look At The Remainder Of The Sunspot Cycle," by W3ASK, appearing in the March, 1964 issue of *CQ* (Pages 26-27).

Season's Greetings

If the amount of mail received by a column Editor is any indication of the number of people reading his column, more people have read this column during 1964 than during any previous year. As a result of the record number of letters I have received, many often requesting a great deal of information, it has not been possible for me to reply as rapidly as I have in the past. As the year draws to a close, I would like to take this opportunity to thank all of you who have taken the time to drop me a line, and to assure you that each letter received will be answered in time. At this time I would also like to extend to each reader of this column my warmest wishes for the Holiday season and for the New Year.

73, George, W3ASK

CQ DX Propagation Charts

DECEMBER 1964 & JANUARY 1965

Time Zone: EST (24-hour Time)

Eastern USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (4) 12-13 (3) 13-15 (1)	15-17 (1) 17-18 (2) 18-23 (3) 23-01 (2) 01-03 (1) 03-04 (2) 04-05 (1)	18-20 (1) 20-23 (2) 23-03 (3) 03-04 (1) 20-00 (1)† 00-02 (2)† 02-03 (1)†
Northern Europe & Eastern USSR	08-11 (1)	06-07 (1) 07-10 (2) 10-13 (1)	17-03 (1)	19-02 (1) 21-01 (1)†
East & West Africa	10-12 (1)* 07-09 (1) 09-11 (2) 11-13 (3) 13-15 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-16 (3) 16-18 (1)	18-19 (1) 19-21 (2) 21-00 (1)	19-22 (1) 19-22 (1)†
Central & South Africa	10-13 (1)* 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	01-03 (1) 07-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-19 (1) 19-21 (2) 21-00 (1)	19-22 (1) 19-22 (1)†
Eastern Mediterranean	08-09 (1) 09-11 (2) 11-12 (1)	00-03 (1) 07-08 (1) 08-11 (2) 11-15 (1)	18-19 (1) 19-21 (2) 21-00 (1)	20-23 (1) 19-22 (1)†
Central Asia	*Nil*	07-09 (1) 19-22 (1)	06-08 (1) 19-22 (1)	*Nil*
Southeast Asia	*Nil*	06-09 (1) 15-17 (1)	06-08 (1) 17-20 (1)	*Nil*
Far East	*Nil*	06-09 (1) 14-16 (1) 16-18 (2) 18-19 (1)	05-08 (1)	05-07 (1)
Pacific Islands & New Zealand	12-13 (1) 13-15 (2) 15-17 (1)	05-07 (1) 07-10 (2) 10-18 (1) 18-19 (2) 19-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1)	04-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)†
Australasia	12-13 (1) 13-15 (2) 15-16 (1)	04-07 (1) 07-09 (2) 09-15 (1) 19-21 (1)	04-06 (1) 06-08 (2) 08-09 (1)	05-08 (1) 05-07 (1)†
Northern & Central South America	13-16 (1)* 06-08 (1) 08-14 (2) 14-16 (4) 16-17 (2) 17-19 (1)	03-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-20 (2) 20-00 (1) 00-03 (2)	18-20 (1) 20-22 (2) 22-00 (3) 00-04 (2) 04-07 (1)	19-21 (1) 21-02 (2) 02-05 (1) 21-04 (1)†
Southern Brazil, Argentina, Chile & Uruguay	13-15 (1)* 07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-03 (2) 03-07 (1)	21-05 (1) 02-04 (1)†

*Predicted 10 meter openings, all others in column are 15 meter openings.

†Predicted 160 meter openings, all others in column are 80 meter openings.

Mc-Murdo Sound, Antarctica	08-10 (1) 15-17 (1)	06-07 (1) 07-08 (2) 08-12 (1) 16-17 (1) 17-20 (2) 20-02 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

Time Zones: CST & MST (24-hour Time)

CENTRAL USA To:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	07-08 (1) 08-10 (2) 10-12 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	15-17 (1) 17-23 (2) 23-03 (1)	17-19 (1) 19-21 (2) 21-02 (1) 20-01 (1)†
Northern Europe & Eastern USSR	07-10 (1)	07-08 (1) 08-10 (2) 10-12 (1)	18-01 (1)	20-00 (1) 21-23 (1)†
East & West Africa	09-11 (1)* 07-09 (1) 09-11 (2) 11-13 (3) 13-15 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-16 (3) 16-18 (1) 22-02 (1)	18-19 (1) 19-21 (2) 21-23 (1)	19-21 (1) 19-21 (1)†
Central & South Africa	09-12 (1)* 07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	08-12 (1) 12-14 (2) 14-16 (3) 16-18 (1)	18-20 (1) 20-22 (2) 22-00 (1)	19-22 (1) 19-22 (1)†
Eastern Mediterranean	07-11 (1)	07-09 (1) 09-11 (2) 11-14 (1) 22-02 (1)	18-23 (1)	20-22 (1)
Central Asia	07-10 (1) 17-19 (1)	07-09 (1) 19-21 (1)	06-08 (1) 19-21 (1)	*Nil*
Southeast Asia	09-12 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 17-19 (1)	06-08 (1) 17-19 (1)	*Nil*
Far East	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-20 (1)	01-03 (1) 03-06 (2) 06-09 (1)	04-07 (1)
Pacific Islands & New Zealand	11-14 (1) 14-16 (2) 16-18 (1)	05-07 (1) 07-10 (2) 10-18 (1) 18-19 (3) 19-21 (1)	23-01 (1) 01-06 (3) 06-07 (2) 07-09 (1)	00-01 (1) 01-06 (2) 06-08 (1) 03-07 (1)†
Australasia	11-14 (1) 14-17 (2) 17-19 (1)	05-07 (1) 07-11 (2) 11-19 (1) 19-21 (3) 21-22 (1)	01-03 (1) 03-07 (3) 07-08 (2) 08-09 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)†
Northern & Central South America	11-15 (1)* 06-08 (1) 08-12 (2) 12-15 (4) 15-16 (2) 16-18 (1)	02-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-00 (1) 00-02 (2)	18-20 (1) 20-22 (2) 22-01 (3) 01-03 (2) 03-06 (1)	19-21 (1) 21-02 (2) 02-05 (1) 23-04 (1)†
Southern Brazil, Argentina, Chile & Uruguay	11-14 (1)* 07-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (2) 18-20 (1) 00-02 (1)	19-21 (1) 21-02 (2) 02-06 (1)	21-05 (1) 01-03 (1)†
Mc-Murdo Sound, Antarctica	07-09 (1) 15-17 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-20 (2) 20-02 (1)	22-00 (1) 00-02 (2) 02-06 (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	08-10 (1)	23-01 (1) 06-07 (1) 07-10 (2) 10-12 (1)	16-18 (1) 18-22 (2) 22-00 (1)	18-23 (1) 19-22 (1)†
Northern Europe & European USSR	*Nil*	23-01 (1) 07-10 (1)	17-23 (1)	19-22 (1)
West & Central Africa	08-09 (1) 09-11 (2) 11-12 (1)	06-10 (1) 10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	18-22 (1)	19-21 (1)
Eastern Mediterranean & East Africa	*Nil*	07-10 (1)	18-22 (1)	*Nil*
South Africa	08-10 (1) 10-12 (2) 12-14 (1)	09-13 (1) 13-15 (2) 15-17 (1) 00-02 (1)	18-21 (1)	18-20 (1)
Central Asia	17-19 (1)	07-10 (1) 17-20 (1)	05-07 (1) 18-20 (1)	*Nil*
Southeast Asia	14-15 (1) 15-17 (2) 17-19 (1)	08-09 (1) 09-11 (2) 11-12 (1) 15-17 (1) 17-19 (2) 19-20 (1)	01-04 (1) 04-07 (2) 07-09 (1)	04-07 (1)
Far East	14-15 (1) 15-17 (2) 17-19 (1)	08-10 (1) 13-14 (1) 14-16 (3) 16-18 (2) 18-19 (1)	22-00 (1) 00-06 (3) 06-08 (2) 08-10 (1)	00-01 (1) 01-05 (2) 05-08 (1) 01-06 (1)†
Pacific Islands & New Zealand	15-17 (1)* 12-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	07-08 (1) 08-10 (2) 10-16 (1) 16-18 (4) 18-20 (1)	20-22 (1) 22-00 (2) 00-05 (3) 05-07 (2) 07-09 (1)	00-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)†
Australasia	14-16 (1)* 11-15 (1) 15-17 (3) 17-18 (1)	07-08 (1) 08-10 (2) 10-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-22 (1)	01-03 (1) 03-05 (2) 05-07 (3) 07-09 (1)	03-05 (1) 05-06 (2) 06-08 (1) 04-07 (1)†
Northern & Central South America	10-14 (1)* 06-08 (1) 08-12 (2) 12-14 (4) 14-16 (2) 16-17 (1)	13-15 (2) 15-17 (4) 17-20 (2) 20-05 (1) 05-07 (2) 07-13 (1)	18-20 (1) 20-00 (3) 00-02 (2) 02-04 (1)	20-22 (1) 22-01 (2) 01-03 (1) 22-01 (1)†
Southern Brazil, Argentina, Chile & Uruguay	11-14 (1)* 07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (4) 16-18 (2) 18-20 (1)	20-22 (1) 22-01 (2) 01-04 (1)	22-06 (1) 00-02 (1)†
Mc-Murdo Sound, Antarctica	07-09 (1) 14-16 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-21 (2) 21-02 (1)	21-00 (1) 00-02 (2) 02-05 (1)	*Nil*

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

SELDOM does a batch of mail come into HAM CLINIC which does not contain these questions: what can I do to "soup up" my "XYZ" receiver; how can I increase the power of my little "ABC" transmitter; how do I use the SB-10 with my brand "X" transmitter and how do I add an additional band to my transceiver?

The *proper* answers to all of these questions would certainly take more space than is allotted to us for 8 columns! However, we will attempt to give you some information that will be helpful. This month we will deal with the first question and in subsequent columns deal with the others.

Receiver Modifications

Because radio-electronic engineers are human, their design work (no matter how good) can be improved on *if* time, money and proper laboratory facilities are available.

What many hams do not understand is that manufacturers always try to give them the best equipment possible within a specific price range. Make no mistake about it, to design and produce ham equipment embodying *all* the technical features that hams want costs money. Saving a few cents by eliminating a part here and a part there—without degradation of quality—takes some doing; and of course the savings are passed on to the ham.

We have good ham equipment in the U.S. because of the healthy and vigorous competition that exists between manufacturers. However, we would like to make one thing clear: the ham who owns a $90 receiver cannot expect to make it competitive with a receiver in the $300 price class by simply making a few modifications. Generally, a ham gets exactly what he pays for.

"Souping up" a receiver that lacks sensitivity and selectivity is no little task. No two different receivers require exactly the same "treatment." This is so, because of the basic design factors around which the receiver was constructed. What with differences in the number of tuned circuits involved, tubes used, i.f. and conversion frequency selection and so on, a modification that may pep up one receiver may make no noticeable difference on another.

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

Some hams have the mistaken idea that they can replace the usual receiver r.f. stage tube with a Nuvistor and make a worthwhile noise reduction at high frequencies with increased gain. Depending on the tube the Nuvistor replaces, this may work. At v.h.f. there will be a very noticeable difference and a worthwhile one —especially when an outboard converter is used for the 144, 220 or 50 mc bands.

What many young hams do not realize is that when a receiver's sensitivity is increased, so is its ability to pick up noise which is amplified along with the signal.

I tried a Nuvistaplug in a number of inexpensive receivers and found that it did pep up these sets without cutting or soldering a wire. The Nuvistaplug is of course a Nuvistorized amplifier which is simply plugged into the r.f. stage tube socket. It will replace most 7 pin miniature pentodes. Using a Nuvistaplug is the easy way to improve receiver or converter performance. But it is not a cure-all and works better in some sets than others. What makes the amplifier unique is that it uses a 6CW4 and a 6DS4 in a cascode circuit which of course works much better than a single Nuvistor. It is worth the price (considering the electrical and mechanical design envolved) and should be tried before tearing into a set to improve the r.f. amplifier section.

If you have the know-how, the 6BZ6 is an effective tube that can be used to replace older tubes in r.f. stages with a resultant improvement in signal-to-noise ratio. If properly installed it will give a sensitivity of less than 1 μv at 10 to 15 db signal plus noise-to-noise ratio on the high frequencies.

For those who want maximum sensitivity without butchering up a set, a pre-selector-amplifier is suggested. I recommend the Lafayette Model HE-73 pre-selector-converter.

Adding more i.f. stages to the average amateur receiver will not make it too much better, but an improvement in selectivity can be realized by doing so.

For s.s.b., frequency stability is a must. Simply adding a product detector without stabilizing the oscillator stages is like adding a Q multiplier to a crystal set. Zener diodes are now available which can be used to stabilize oscillator voltages instead of VR tubes. Heat of course affects stability, and such measures as replacing tube rectifiers with seleniums, the use of heat dissipating tube shields (instead of the old heat creating JAN types), and using heat deflecting baffles should be taken.

Good selectivity in a receiver is now mandatory on our crowded ham bands. A broadly tuned set can be used on s.s.b. signals but one having a voice passband and/or variable selectivity will work better. Crystal or mechanical filters can be added to set circuitry to give desired selectivity. The easiest approach (especially with the inexpensive sets) is of course to use a Q multiplier. Incidentally, I tried out the Q multiplier described in the current issue

of the ARRL Handbook and find that it is a good one.

Noise limiters (NL) *that work* are desirable—especially on 10, 15 and 20 meters, but the choice of one depends on the receiver. I still like the old series NL with all of its faults. On the other hand, the i.f. limiter (shunt type) is an effective one and can be used to good advantage with a product detector.

The S meter is a proportional device and I have yet to see one that is "accurate." Judging from the letters received from a number of young hams it is apparent they do not realize that the S meter does not always "tell the truth." An S-9+60db signal on one set may be only S-8 on another.

Installing an S meter on the average a.m. set is no problem. However, adding one for c.w. and s.s.b. signal strength indication is a different matter, and requires a little more circuitry.

Squelch circuits can be added to existing receivers, but unless one is monitoring a specific frequency (usually on 10 meters), squelch is superfluous.

Adding electrical band-spread to the receiver that has none requires not only additional space but also some ingenuity. The calibration of a new dial is a formidable problem for the ham newcomer.

If your set has no r.f. gain (as many inexpensive receivers do not), one can usually be added simply by inserting a 5k to 10k pot in series with the cathode of the r.f. stage to ground.

Contrary to what some hams think, the product detection (PD) does not aid selectivity. Actually, the PD is nothing more than a mixer-rectifier. Adding a PD is not a difficult job. I generally recommend that when one is added that it be made an outboard job and be switched between the existing detector.

If frequency drift is a problem in an old receiver, I suggest that the oscillators first be stabilized with zener diodes. I also suggest that the filament circuits of the oscillators be connected to a separate transformer which is always connected to the power line. You can cut your drift as much as 80% or more by taking these measures.

Some receivers do not contain an antenna trimmer. This is nothing more than a small variable capacitor in the input (antenna) circuit which enables one to tune out the reflected reactance of the transmission line and provides a better "match" of impedance. For those using all-band antennas it is a must. I have wondered why most transceivers available today do not have them. Some trimmers are connected from the top of the secondary of the antenna coil to ground, and some are connected between the primary (bottom end) winding and ground. The capacity of the variable will usually be around 25 mmf.

Yes, a receiver can be improved by making modifications or circuit additions, but the scope of these depend on how much time one is willing to spend and whether or not they are worth while. In many cases (if there is no sentimental attachment to a receiver indicated in a communication to us) we recommend buying a new set, because *we know* that too much is expected of an older set and there is a lot of disappointment around the corner.

Some hams are happy with small improvements, while others are not. We are happy to help with the small modifications but we simply do not have the time to devote to general redesign of a whole set!

Recently we received a letter from a ham asking us to take the diagram of his set and indicate on it how he could make his ancient set into an NC-303! Of course we had to turn him down.

If we receive *more* than 50 cards or letters on one specific set requesting us to modify it for improved operation we will publish the results here.

Questions

Second Hand Assurance—"I, like many other hams, have only so much money to spend so I must try to obtain second-hand bargains in ham equipment. However, when visiting the New York area I usually have no time to spend to do a thorough shopping job. If I do pick out an item I have no assurance that it has been checked out. Can you recommend someone in the New York area who can shop to *my* specifications and price and personally check out the equipment before shipment to me?"

Sure. Try Amatronics Inc. 91-46 Lefferts Blvd. Richmond Hill 18, N.Y. These boys are ham equipment experts and they now provide the service you seek. Write to them.

For your information however, those who advertise in *CQ* offering second-hand ham equipment will generally let you know that the equipment you buy has been checked out and is guaranteed. "As is" equipment is advertised as such. Those dealers advertising in *CQ* want you to be satisfied and will not risk their reputations by sending you bad equipment.

Solar Cell and Photocell Handbook—Most hams are not only interested in new ham gadgets but are also interested in electronic experimentation. One of the areas that interests me (and I know, many other hams) is the one pertaining to solar and photo cells.

If you want the latest information on and the applications of solar and photocells obtain a copy of the *International Rectifier Solar Cell and Photocell Handbook* ($2.00 from International Rect. Corp. El Segundo, Calif.). This book contains over 75 practical light operated projects. In its 16 chapters it covers everything from basic concepts to "Conversion Efficiency and Calibration of Silicon Solar Cells." It is a fine book, well written and useful. Of more than passing interest to me is Chapter 11 that covers light beam communications. You are shown how to construct a light beam transmitter and receiver. This would be a fine project for a young ham in-

[*Continued on page 100*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

December	5-6	New England Party
December	5-6	RSGB 21/28 Phone
December	5-6	OK DX C.W.
December	12-13	Virginia QSO Party
January	9-10	ARRL VHF SS
January	**30-31**	**CQ WW 160 DX**
February	6-7	QCWA Party

New England QSO Party

Three operating periods (EST)
7:00 to 11:00 P.M. Saturday, December 5
7:00 to 11:00 A.M. Sunday, December 6
7:00 to 11:00 P.M. Sunday, December 6

Sponsored by the Connecticut Wireless Association, and popularly known as the Seven/Eleven Party because of the operating times, this is an activity limited to the six New England states only.

Eligibility: All New England amateurs are eligible. Only single operator entries will be considered for awards. However CWA members will not be competing for awards. Portables and mobiles to "rare" counties are welcome and they may compete from more than one county.

Exchange: QSO number, signal report, name of county and state. Your log must show time of contact and underline each new county and state as they are worked.

Scoring: One point per completed QSO. Multiply total QSOs by number of New England counties and then again by the states. (Maximum of 67 counties and 6 states.)

Frequencies: All bands may be used and it is suggested that operation be confined to the 25 kc on the low end of each band and sub-band. A station may be worked twice per band; once on c.w. and once on phone.

Awards: A handsome engraved plaque to the highest scoring station in New England. Certificates to the 1st and 2nd place scorers in each state and to the top Novice and top Technician. CWA members are not eligible for awards.

Include a summary sheet with each entry, your call, name and address in BLOCK LETTERS, final score calculation and classification.

Logs go to: Connecticut Wireless Association, c/o Gary Foskett, W1ECH, 1 Marlon Place, Cromwell, Conn. 06416. Mailing deadline is January 11, 1965.

*14 Sherwood Road, Stamford, Conn. 06905.

RSGB 21/28 mc Phone

Starts: 0700 GMT Saturday, December 5
Ends: 1900 GMT Sunday, December 6

With the sun spot cycle just about at its low the success of this contest is debatable. However its worth a try and how are we going to determine if conditions are favorable unless we have some signals on the air. Check last month's CALENDAR for the rules and other information.

Mailing deadline is December 21st and your logs go to: R.S.G.B. Contest Committee, 28 Little Russell Street, London, W.C.1, England.

OK DX C.W.

Starts: 0000 GMT Sunday, December 6
Ends: 2400 GMT Sunday, December 6

This is a world wide type contest, each contact counts 1 point, but 3 points if its with a Czech station. The multiplier is determined by the number of prefixes worked.

Certificates are awarded for contest activity and also for the "100 OK" (worked 100 Czech stations) and the "S6S" (worked all continents).

Complete rules in last month's CALENDAR.

Logs go to: Central Radio Club, Post Box 69, Prague 1, Czechoslovakia. Mailing deadline is January 15, 1965.

Virginia QSO Party

Starts: 1800 GMT Saturday, December 12
Ends: 0200 GMT Monday, December 14

The Virginia QSO Party is sponsored by the Roanoke Valley Amateur Radio Club and offers all participants an opportunity to compete for certificates and also earn credits for the Old Dominion County Award, the Virginia Civil War Centennial Award and Virginia counties for the USA-CA.

Rules: (1) There is no power or time limit. (2) The same station may be worked and counted on different bands. (3) C.W. and phone will be considered as separate contests and separate logs must be used.

Exchange: Virginia stations will send QSO number, RS/RST report and county. All others; QSO number, RS/RST and state, province or country.

Scoring: Each contact counts one point. Virginia stations multiply their contact total by the number of states, provinces, countries and Virginia counties worked. All others multiply their contact total by the number of Virginia counties worked.

CALENDAR OF EVENTS – SPRING 1965

	Established Dates[1]		*Suggested Dates*	
			International[2]	*Domestic*[3]
January	2-3	Open Date	—	—
January	9-10	ARRL VHF SS	—	VE1 QSO Party
January	16-17	ARRL CD C.W.	—	—
January	23-24	ARRL CD Phone	—	New Mexico Party
January	**30-31**	**CQ WW DX 160**	—	—
February	6-7	QCWA Party	—	NYC/LI Party
February	13-14	ARRL DX Phone	—	—
February	20-21	YL/OM Phone	—	Vermont Party
February	20-21	RSGB BERU	—	—
February	27-28	ARRL DX C.W.	—	—
March	6-7	YL/OM C.W.	REF Phone	—
March	13-14	ARRL DX Phone	—	—
March	20-21	YL Int. SSB	REF C.W	—
March	23	Pakistan DX	—	—
March	27-28	ARRL DX C.W.	—	—
April	3-4	—	SP DX C.W.	Ohio QSO Party
April	**10-11**	**CQ WW DX SSB**	—	—
April	10-11	ARRL CD C.W.	—	—
April	17-18	ARRL CD Phone	—	—
April	24-25	—	Helvetia 22	Missouri Party
May	**1-2**	**CQ Spring VHF**	PAAC C.W./Phone	Tennessee Party
May	8-9	USSR DX C.W.	—	—
May	15-16	—	OZ CCA C.W.	Georgia QSO Party
May	22-23	—	OZ CCA Phone	Bermuda QSO Party
May	29-30	—	QRP Party	Connecticut Party
June	5-6	—	CHC/HTH Party	—
June	12-13	National Field Day	—	—
June	12-13	ARRL VHF Party	—	—
June	19-20	Open Date	—	—
June	26-27	ARRL Field Day	—	—

Awards: Certificates will be awarded to the highest scoring station in each state, province and country. Virginia station will compete for 1st, 2nd, 3rd, 4th and 5th place certificates.

Suggested Frequencies: 3575, 3830, 3930, 7030, 7205, 7235, 14075, 14250 and 14340 kc. (What about 21 and 28 mc?)

Use a summary sheet for scoring and other pertinent information, sign the usual declaration, and your name and address in BLOCK LETTERS.

Mailing deadline is January 15, 1965 and logs go to: Roanoke Valley Amateur Radio Club, Box 2002, Roanoke, Virginia.

CQ WW 160 DX

Starts: 0200 GMT Saturday, January 30
9 p.m. EST Friday, January 29
Ends: 1400 GMT Sunday, January 31
9 a.m. EST Sunday, January 31

This, without a doubt, is the biggest "Little Contest" in the world. If you were in that madhouse last year, in the lowest 25 kc in the ham spectrum (no one used the other available 25 kc) you will know what we mean. See the August *CQ* for the results.

It's asking too much to expect another weekend with the conditions we had last year, but with the sun spot cycle in our favor, who knows.

Rules are the same as in the last two years.

1. This is a c.w. contest *only*.
2. For W/VE/VO stations: Contacts with other W/VE/VO stations, 2 points per QSO. Contacts with other countries, 10 points per QSO.
3. For all other countries: 2 points per QSO with stations in the same country, 5 points per QSO with stations in other countries. Except for contacts with W/VE/VO stations, which will count 10 points.
4. For all stations: A multiplier of one (1) for each state, Canadian province or foreign country worked.
5. Final score: Total points, times the total multiplier.
6. Serial number; RST report plus a progressive contact number starting with 001 for the first contact, followed by your state or province. (It will not be necessary for DX stations to send their country, that's quite obvious. (*i.e.:* W2EQS 579001 NJ))

Hawaii and Alaska will be considered as "foreign countries" for QSO and multiplier credit. The District of Columbia will count same as Maryland. And don't forget, VE1 is divided into three provinces, Nova Scotia, New Brunswick and Prince Edward Island.

Certificates to the Top station in each State, Canadian province and foreign country. In the

[*Continued on page 90*]

[1]The established dates above are those that have already been officially announced or established by previous activity in past years.
[2]The International suggested dates are based on previous years wherever possible.
[3]Most of the domestic state parties follow previously established dates, but with some slight changes to avoid conflict with major activities.

1964 Helvetia 22 Results

North America

VP7CC	36	W1WY	1581	W3MCG	147
		W4HKJ	1350	WØGNX	100
VE3BWY	1035	W1CKA	1242	W3MSR	12
VE1TG	243	WA2DIG	855	W6ISQ	3
VE3EVK	240	W8RQ	840		
VE2IL	12	W5WZQ	810	**Top 3 Swiss**	
		W4KJL	540		
W2HTI	4032	K8NMG	468	HB9PF/p	342,300
W3ADO	3078	W4HOS	396	HB9ACX/p	291,808
W4SNU	1920	W9QM	180	HB9IV/p	247,008

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
and ALLEN KATZ, K2UJYH*

A NEW method for studying the ionosphere and exosphere (the portion of the upper atmosphere extending beyond the ionosphere, to its boundary with the interplanetary medium) is based on an extremely weak, incoherent scattering of radio waves which is proportional to the electron density. In this method, a powerful beam of v.h.f. radio waves is directed toward the ionosphere. When the waves strike free electrons in the ionosphere and beyond, a small amount of energy is re-radiated or scattered back, and can be picked up by a ground receiver. Known as scatter radar, the method, using ground-based equipment, offers a practical means of measuring electron densities and other atmospheric variables out to a distance of many hundreds of miles.

This work is currently being done at the Jicamarca Observatory on the geomagnetic equator near Lima, Peru. The equipment comprises a 6 million watt peak power pulse transmitter and a broadside antenna containing 9216 crossed-dipolex elements, which are placed 1.8 meters above a reflecting ground-screen. The antenna transmits a radio wave lasting between 50 and 1500 microseconds and then, switching back to the receiving state, detects the faint re-radiation from free electrons in the upper atmosphere. We are currently attempting to get a photograph of this astonishing installation for a future column.

DSB Transmitter for 6 Meters

About 4 or 5 years ago d.s.b. was the rage on the lower frequencies. A few fellows tried double sideband on the v.h.f.'s, but their effort was pretty much in vain, for v.h.f. had not yet begun to accept s.s.b., let alone d.s.b. Since then the situation has changed considerably. Double sideband has just about died out on the lower frequencies, where the emphasis is on the conservation of frequency space, and single sideband has become quite the vogue on v.h.f. It is used on v.h.f. primarily because of its ability to be more copyable under weak signal situations than phone. D.s.b. has much these same advantages but to a 3 db lesser extent. Steve, K1VUE, is one of the stations who has been using this mode on six meters with great success, and has sent in the schematic shown in fig. 1 of his d.s.b. generator/final amplifier. As can be seen, the unit should be easy to build and can be used as an amplifier for a low power six meter rig. It is certainly an ideal answer for those amateurs wishing to communicate with six meter s.s.b. stations, but not desiring to build or buy a low band s.s.b. exciter. On two meters, 6146's or 6360's could be used in a similar circuit to accomplish the same trick. On 144 mc, however, a heterodyne v.f.o. would certainly be desirable to provide the stability necessary for reception in the narrow 3 kc receiver bandpass used for sideband reception.

*c/o *CQ*, 14 Vanderventer Avenue, Port Washington, Long Island, N.Y. 11050.

Antenna Contests

Two months ago this column lost nearly a page due to one of those unpredictable coincidences where a fine article by W6HPH on antenna contests covered pretty much the same material as an excellent letter to us from Loren Parks, K7AAD. However, we don't want to let the subject just drop, at least not without getting our two cents worth. We think that antenna contests are a terrific idea, so much so that we literally prodded Loren to write us a letter on the subject. It would truly be a shame if this practice stays confined to the West Coast next spring. And if we have anything to do with it, it won't. What say, East Coast V.H.F. Association?

One part of Loren's letter not covered by Fred's (W6HPH) article was the results of the last contest. They are rather shocking, although it must be remembered that these results are for 432 mc and do not reflect the performance of

Here's a shot of Les Johnson, WA2WCE, hard at work hamming it up from his converted Navy bus. Les and WA2GHN frequently operated portable from Howard Hill, near Mayville, New York with a homebrew 4-125A final at 300 watts, excited by a homebrew "Lil Lulu." Receiver is an HQ-110 with Ameco converter. Antenna—and remember this is a portable job—is a stacked 6 over 6 wide-spaced Telrex configuration at 50 feet for six meters.

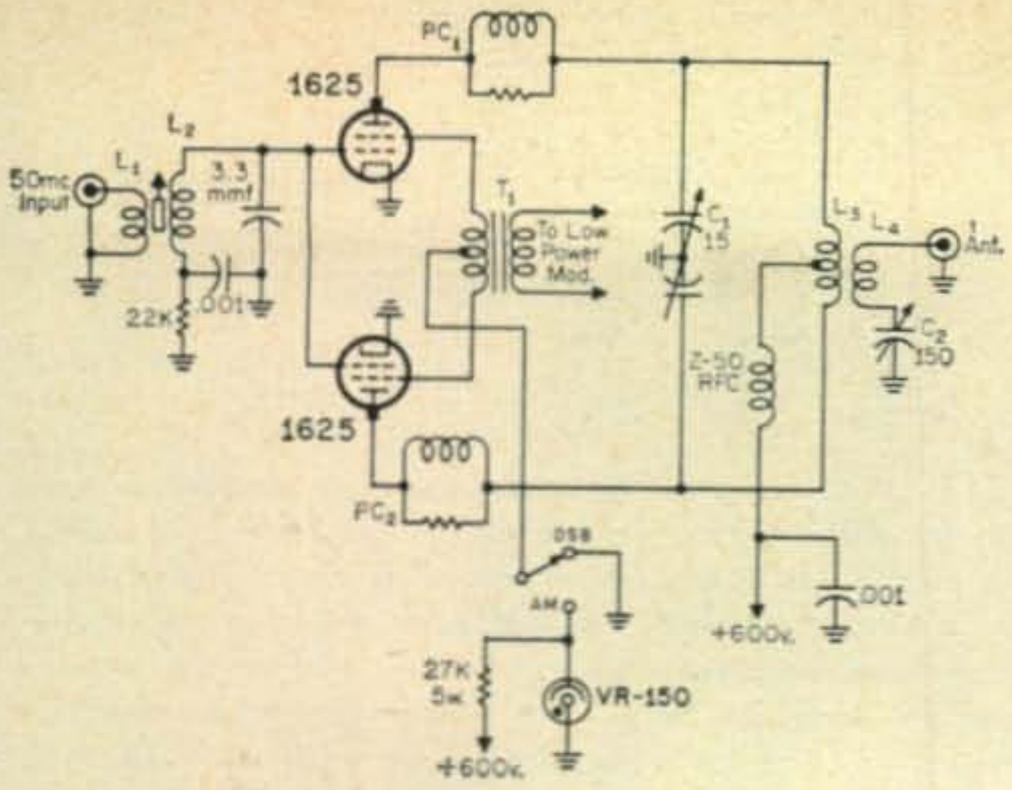


Fig. 1—K1VUE's 6 meter double sideband generator/amplifier can be built on an old ARC-5 chassis or from scratch. In the latter case 807's may be substituted for the 1625's. Audio was supplied to T_1 by a pair of 6L6's in a standard modulator circuit

C_1—15 mmf per section split stator variable capacitor.
C_2—150 mmf variable capacitor.
L_1—2t. link around bottom of L_2.
L_2—12t. #20 e. ¾" long on ½" dia. slug-tuned coil form.
L_3—8t. #14 e., 1" dia., and 2" long with ½" space at center for L_4.
L_4—2t. #14 insulated wire, 1" dia.
PC_1, PC_2—2½t. #18 e. wound around 100 ohm 2 watt resistor as shown in diagram.
T_1—Modulation transformer. 4550 ohm primary for push-pull 6L6 modulator, 10K secondary.

similar antennas for the low v.h.f. bands. Strange things happen once you pass the 300 mc mark.

"Here are the results of the last contest, held in Porterville, California in May of 1964. No antennas were entered that were real duds. Two previous contests weeded out some very bad ones. W6VSV, 16 element collinear, 15.5 db; K7AAD, 15 element Gibson yagi on 7 foot boom, 12.5 db; K6HCP, matched Cushcraft 16 element collinear, 11.5 db; K6LEW/K6HCP, 21 el. Telrex yagi, 16 foot boom, 11.3 db; K6LEW/K6HCP, same as above but with 6 elements removed, 11.3 db; K6LEW/K6HCP, first third of above antenna removed, 7.1 db; K6LEW/K6HCP, 8 over 8 slot (J beam), 10.9 db; W6HPH, 2-wave length 7 el. yagi, 10.5 db; K6LEW, Cushcraft 44 element quad. yagi, 10.1 db; W6FZA, Cushcraft 16 el. collinear, 9.7 db; W6PBC, corner reflector, 9.0 db; K7ICW, Cushcraft 11 el. yagi, 9.0 db; WB6JZA, 300-3,000 mc log periodic, 8.9 db; WA6MGZ, 10 turn helix, 8.1 db." Loren had some other good suggestions in his letter. One idea was to have converter noise-figure measuring contests, or at least get someone with the proper gear to come down to hamfests and take readings. He feels this type of contest would also be a real eye-opener. We agree.

From the Mailbag

Alan Goodacre, VE3BZS: "Up here the summer has just flown by without warning. I have done very little hamming and am leaving for the Great Lakes tomorrow for a month and a half. I was not on 144 mc during the June v.h.f. contest when KP4BPZ was on, but from what I have read in *CQ* and *QST*, it must have been pretty thrilling." *(It was!)* "I imagine this event will stimulate more efforts at moonbounce, although I hope the fellows won't be too optimistic when a 1000 foot dish is not available.

"I thought I would just mention an article in September *QST*, 'An I.F. Tracking Filter for Weak Signal Reception', by W8FCK. It seems like a really good article, and as far as I can see represents the correct approach to weak signal reception."

(It is an excellent article and is very similar to Bill Ashby's "flying lock" system described in our column several months back except for the "poly lock"—an operation we do not understand. Possibly this will be explained in the footnoted material which we have sent for. We were surprised to see that none of Bill's earlier work was mentioned. We still believe that integration is the best approach to weak-signal detection. Our own efforts have concentrated on a means of preserving the Gaussian distribution of noise, obtaining extreme gain stability, and maintaining complete control over the bandwidth. A cross correlation system (shown in fig. 2) followed by the integration scheme described last year seems to come the closest to these requirements. The two receivers are fed from different power supplies so that the gain variations are independent in both receivers and cancel in the phase detector, while the receivers are controlled by the same oscillators in such a way that the signal information is in phase and will combine. The voltage output from the phase detector should be proportional to the amplified noise and signal and can be separated efficiently by integration and an effect known as autocorrelation, which simply means integrating at the rate that information is being sent.)

Jack Woodruff, W8PT: "The big tropospheric opening of September 1-3 was quite interesting. K9UIF picked up W5JWL in Arkansas for his number 41. In other words, it took another Indiana station to catch up with W9KLR after all these years. Now look for the top standings to move west as it becomes harder for the Eastern stations to pick up new states. WØBFB looks like a good choice to be the first 42 stater.

"Here at W8PT we worked some W2's, W4's and WØ's under 400 miles and also K4QIF, W5JWL and W5RCI. The W5RCI (Marks, Miss.) contact was continued on 432 mc and he was S8 here in Michigan! However, a try with W5JWL was unsuccessful. That gives me 9 states in six call areas on 432 mc with no more than 75 watts input." *(Boy; too bad that opening didn't get further East, we sure would have liked to have given you a try for New Jersey.)* "I want to work a W6 (for all call areas) on two meters. What do you suggest for an antenna? Maybe a duplicate of W6DNG's antenna would do it." *(We kind of agree with this idea—October column. Efficiency seems to be the real problem.*

I only wish we practiced what we preach. We built up four 24-foot cross-yagis and now have two of them mounted on a 200 foot tower. A third one is mounted on top of our 65 foot tower with only the horizontal elements in the boom. We just could not keep them working that high in the air. At least now we can get our hands on them.) "I could put up a pretty good sized antenna, but rotating it is a different thing. What do you know about aperature synthesis?" *(Only what I read about it in the "Proceedings of I.E.E.E." The September issue has a paper on the subject. However, like in most EE, the mathematics is based on the ideal case. Things get really sticky when you talk about real antennas and you will certainly be in a bigger mess than us and our cross yagis. But don't let me discourage you, for making things work that you know shouldn't is part of amateur radio. You know what an antenna engineer will tell you your chances of making a parabolic antenna work are!)*

"Would like to see you guys set up some competition on the u.h.f. bands by running call area, state and counties boxes. These boxes to cover 220, 432, 1296 and higher only. If all the guys who say they are going to get on 432 ever make it, the QRM will sound like 20 meters. Maybe the boxes would stimulate some business." *(We would like to do something like that Jack, but to be frank we don't have sufficient data to keep such standings accurate. If the fellows would send the information we would be glad to provide the service—maybe even get some certificates printed up.)*

"One of my pet peeves has been the printing of two meter routine contacts as 'news.' Maybe they make good reading for newcomers, but in my opinion no contact under 400 miles is worth reporting. Well equipped stations can work over 300 miles 365 days a year. Six is a little different because we still don't know enough about Sporacic-*E* skip. The space could well be filled with data on big antennas, dishes, triplers to 432 and 1296, amplifiers for the same, parametric amplifiers, etc." *(You'll notice that we haven't done much of this lately. We do feel, however, that the fellows should know what is on and where to look for certain stations. A 300-mile contact does point up this information. One of our own pet peeves is that the fellows don't include the frequencies of the stations that they have worked. If they did, everyone would know where to look for a particular station next time the band opened up. We usually stay just about 144.110 just for that reason.)*

"Would also like to see the c.w.—only portion of the two meter band put at 144.000-144.100, where it was originally intended and belongs. However, most of the guys are observing it voluntarily." *(Most, but not all! Many thanks for your letter; it's a great help. Keep the comments and criticism if there be any, coming.)*

Arnie, K1WHT, and Dave, K1WHS: "Where have you been keeping yourself? I haven't heard you on 144 mc in many months. Since the last time I worked you, Dave and I have been doing much work around the shack in preparation for the September V.H.F. party. It looks like time has just about run out leaving us without a 50 mc antenna. The halo will have to do it or we are sunk, hi. We planned to have a 7 el. birdcage yagi of the K6EDX variety, but did not get it started soon enough. We have a homebrew kw on six with p.p. 4E27's in the final with a lot of air on them. We have been on 144 mc s.s.b. for about a year now and have recently added a p.p. 4X150 final that runs 500 watts s.s.b. It's fine on sideband, but does not take the gaff on a.m. with plate modulation. The disc capacitors are a little too close, and arc. A modification was made and we hope it pans out so good a.m. can be run. The modulator is a pair of 803's driven by a 6080WA and a broadcast station limiter and h.b. with RIAA (?) curve." *(What's next—A Limpander and Power-Max so you can work 150 percent modulation positive peaks and keep 100 percent negative peaks as the FCC requires?)*

"On 50 mc s.s.b. we are running only a 5763 mixer followed by a 2E26 at 25 watts to the 4E27's. The 6 meter converter is homebrew of course using 6DS4, 7895, 6BZ7, 6U8A. The arrangement gives a good showing of itself. In the works right now is equipment for use on 144 mc. The antenna will be four homebrew 15 el. 28 foot boom yagi's of Telrex design in the familiar quad arrangement. A real high quality receiver is being built here and should be ready to roll before Jan. or Feb. It is of my own design and incorporates everything I've wanted from a receiver: stability better than 10 c.p.s./hour, frequency readout to 100 c.p.s., xtal filter 400 c.p.s. sharp or more, audio filter for meteor scatter with selectivity of 60 c.p.s. or better, i.f.n.l. truly accurate S meter calibrated in db above the noise. After the work is completed I would be glad to write it up." *(If the receiver lives up to your expectations, I am sure CQ will be interested; we certainly will be. I will say you certainly do have your work cut out for you. Bet you have other types of propagation in mind besides m.s.)*

"The last couple of days have been excellent for 144 mc tropo. On Aug. 27 we worked W4JFU in Va.; on Sept. 4 we worked K1IED/4

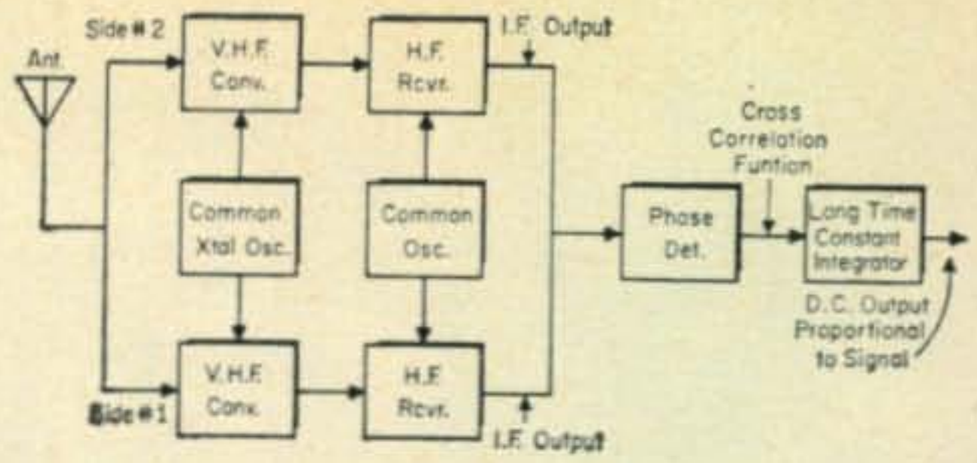


Fig. 2—Weak signal detection scheme experimented with by K2UYH. Gain instabilities generated in sides #1 and 2 are independent of each other and cancel out in phase detector. Signal plus antenna noise, in phase because of common oscillator, add at the phase detector. Antenna noise and signal are separated by integration and auto-correlation as explained in the u.h.f. column for December 1963.

in S. Va.; and then on the 8th we raised W4FDO/4 in Durham, North Carolina. He was only using a Gonset III transmitter. We heard many other DX stations, but were unable to contact them because of our frequency—145.02 (VE3BPR, VE1ER, VE2SH, VE2BLZ, K4YYJ, and WA4DKN are among the most notable.) Dave and I have learned one very important thing from this opening on 144 mc! By next summer's DX season, we will have to go down there." *(You fellows have a valid gripe. When you have a receiver with readout only to the kc, you can get awfully tired turning that knob by the time 144.300 is reached. I guess we are as guilty as anyone else. At any rate it isn't right; possibly if other fellows like you wrote more letters and even griped a little more often, it would help. Although if the rule is what gives you the extra push to get the General, your justifying it yourselves. We will try to keep an eye on 145 mc more often.)*

Tom Neuhaus, WB2CLN: "I found conditions on two meters excellent from Maine to North Carolina on Sept. 8. That night on two meters I worked a new state for myself: North Carolina. The station was W4FSO in Raleigh with 56 signals both ways." *(Tom also worked K1IED the same day.)*

"On 1¼ meters I have heard K1IED in Maine plus W1QXX, Mass; W1AJR, R.I. as well as a couple of W3's. I tried calling all of them but no go with my 20 watts." *(What freq. do you operate Tom? We will give a listen.)* "I have however worked W2HVL in Little Neck, L.I. with an excellent signal.

"This will be my last piece of news for a while. I am starting college and will not have much free time. I will be on next summer with a new rig and should do better." *(We understand; don't let ham radio interfere with your college work. Especially that first semester—it is the most important one. We will be looking forward to hearing from you come summer.)*

Payne Sorenson, WAØETL: "I haven't seen any comments in your v.h.f. column from Minnesota, so I thought I'd drop you a few lines on the happenings around our shack. On August 3rd, we worked WAØCVA in Burlington, Iowa; and WA9GBP in Moline, Ill., via aurora on 6 meters c.w. Signals were Q5 here. We all hung around for about 3 hours (between 12 midnight and 3 A.M.). We have not been the best c.w. listener in the past, but we are sure going to start learning. A guy can have a lot of fun with aurora on 6." *(Right you are, Payne; there's nothing else like the sound of the buzz in those cans. Aurora openings have been rather scarce this year, it is especially nice to hear of one.)*

"I agree about the Century Club award. Don't let anyone talk you into making it easier. It wouldn't make a very good piece of wallpaper if you did." *(Don't worry; if anything, we are going to make it harder!)*

Jon Groth, K8AFN: "I just finished reading the September 1963 u.h.f. column. Of particular interest was the 2C39A 1296 mc cavity amplifier.

Meet Ken Bourne, K9GHR, at his new v.h.f. equipped QTH in Lombard, Illinois. Ken puts out a mean signal on 50 mc and did a bang-up job in taking the Illinois certificate in the August CQ V.H.F. Contest.

Mention was made of a 1296 transmitter of your design. I am very interested in this also. Not being able to find the price of *CQ* reprints, I was hoping you might have additional information. Several of us are planning 1296 mc experiments for the fall and winter months. Your article was a great help. I hope to hear more." *(A CQ reprint will not help you, since the amplifier you refer to was an up-dated version of a 1296 mc amplifier appearing in The VHF Amateur magazine, which is out of print. The main difference is the addition of a grid cavity. We use the original version of the amplifier both as a tripler from 432 and as an amplifier on 1296. Strip lines are used in the cathodes of both units. A 2½ by ½" copper strap for the tripler and a ¾ by ½" job for the amplifier. Soup on 432 is provided by a TDZ tripler driven by our two meter rig.)*

Sign Off—For 1964

Traditionally, here on the East Coast amateurs on practically all bands have made it a point to get on the air on December 25th to wish a "Merry Christmas" to their friends and acquaintances. On the bands above 50 mc your columnists have noted through the years the almost contest-like activity that exists on that date in addition to the pleasant air of friendliness pervading the spectrum. For at least one day a year, the amateur populace stops its DX-chasing long enough to wish the best to the ham across town.

Like many, my first QSO on two meters was made on Christmas many years ago. The memory of that contact has endured through many thousands of hours of hamming ever since. Amateur radio is more than a modern scientific pastime for experimenters; it is also a vital link in the old-fashioned art of brotherhood. Let's make a pre-New Year's resolution now to pause every so often and try to remember why we originally became amateurs. Although your own private answer to that question may seem out-of-sync with your endeavors today, bear in mind that it is the same fundamental objective that we all sought at the outset; to communicate with others.

73, Bob, K2ZSQ and Allen, K2UYH

NOVICE

WALTER G. BURDINE,* W8ZCV

I AM wondering how many of you entered the ranks of amateur radio by the Short Wave Listener route and how many of you were introduced to the magic of short wave radio by the citizens radio service route. I know that many of the amateurs hold in contempt these followers of either hobby, I claim that we get many of our converts by this method. I think that those of the s.w.l. hobby make better hams than those who just started out to get an amateur license without having any s.w.l. experience. I know many who will differ with my theory, let's see.

The s.w.l. quickly learns the lingo used by amateurs and he is able to use the "hams language" correctly when that cherished ticket arrives. He has learned how to evaluate the reports given him when he gets on the air and how to give reports to those he talks to. This is a fit subject for a column in itself, it is grossly abused.

The s.w.l. has learned that the antenna is one of his most important accessories in the search for elusive signals and that the best antenna for one frequency is not always the best for another. He has learned that a matched antenna puts the best signal into the receiver and that he is well repaid for any time spent on his skywire.

The s.w.l. learns *how* to listen, *when* to listen and *where* to listen. Believe me, this is very important. He knows what frequency to use for the type of communication he desires. He will know how important it is to listen rather than those long CQs put forth into a dead band.

He has already learned the International prefixes in use on the bands. I was an s.w.l. for many years before getting my ham ticket. I learned many useful things as an s.w.l. You can read these letters and see that short wave listening is another form of relaxation using radio as the motivating force. Much information is available by radio. Some countries require an amateur radio aspirant to serve a term as an s.w.l. as part of his training for the amateur license.

I believe that too many of our new amateur licensees are getting their license and missing many fine points by not spending some time listening to the bands before taking the test and getting on the air. Recruits from the Citizens Radio Service bring their own jargon to the ham bands, they can be spotted within a very short time.

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

By the way it is against the rule to rebroadcast communication from one radio service to the ham bands to effect cross band communication. This type of communication could result in citations for both parties.

ERRATA

Through errors in making notes, misinformation creeps into the pages of the column once in a while. Any inconvenience caused by this, causes all of us trouble. I apologize for my part in the inconvenience it has caused you. On page 69 of the July *CQ* the address of the supplier of TM's and TO's should be: *The Propagation Products Company, P.O. Box 242, Jacksonville 1, Florida.* On page 79, September *CQ*, the address of *The Poly Packs Company* should be P.O. BOX 942, *South Lynnfield, Mass.*

If Hajime Suzuki, JA 1-3477, Mure 258, Mitaka-Shi, Japan can do as well as he does with his homebrew receiving sets why do we need a thousand dollar receiver just to get on the novice band? I have always been interested in homemade equipment and experimentation, Hajime proves his know-how. Read his letter.

How Does It Work

Last month we discussed the crystal oscillator very briefly, more will appear on this subject along with some experiments to help you understand the operation more clearly. This will help to show how and why each component is used to make a complete transmitter.

The r.f. output of a crystal-controlled oscillator is usually of small magnitude and will need to be amplified to make it of useful proportions. Any electronic device used ahead of the amplifier stage feeding the antenna is called the exciter, this includes the oscillator, buffer or multiplier stages. Each section must be made to operate correctly before going to the next stage. If a transmitter operates with its output frequency at the crystal fundamental, the stages between the oscillator and the final amplifier stage must be neutralized to prevent oscillation of frequencies other than the crystal frequency. These spurious oscillations are called parasitic frequencies and they usually fall on some frequency outside the amateur bands.

If the amplifier stage is adjusted to amplify the r.f. signal from the oscillator, the tank circuit of

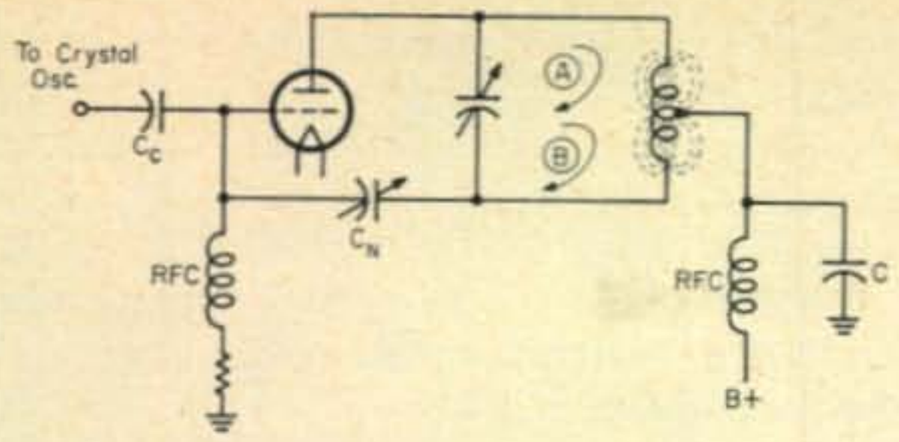


Fig. 1—A neutralized single tube r.f. amplifier. C_n is the neutralizing capacitor, C_c is the coupling capacitor to the oscillator.

both the oscillator and the amplifier will be tuned to the same frequency. The amplifier circuit will look like a tuned plate-tuned grid oscillator circuit, as it has all the same characteristics of an oscillator circuit. Unless some precautions are taken to prevent it, the amplifier stage will break into oscillation causing a very unstable operating condition. Correct phase relationship between the grid and plate circuit exists to cause oscillation. An out of phase voltage can be fed back from the plate circuit to the grid circuit to cause degeneration thus stopping the tendency toward self-oscillation. Degeneration is the opposite of regeneration (oscillation), it acts to impair oscillation. This is done in single stage amplifiers by using a center-tapped coil in the plate circuit and feeding a small out of phase voltage from the plate circuit to the grid. High voltage is applied to the tank circuit through the r.f. choke coil which is bypassed to ground through capacitor *C*. This places the center-tap of the coil at r.f. ground potential. When r.f. currents flow through the upper half of the tank circuit to ground, the lines of force, or magnetic field, induces a voltage in the lower half, which is always out of phase with the upper half. This can be seen in Fig.—1. In Fig.—1 (A) voltage is applied to the center tap of the coil and energizes a magnetic field about the upper half as shown, with the lines of force moving towards the center. When the magnetic field starts to break down in the amplifier coil it acts like the coil in the Oscillator, it discharges in the opposite direction, away from the center. This is depicted by (B) in fig.—1. It is this action that produces the degenerative voltage.

Thus a small voltage taken from this section of the tank circuit and fed to the grid will provide the necessary out of phase voltage to stabilize the amplifier. By varying the adjustable capacitor C_n the correct amount of out of phase voltage can be fed back to balance the voltage normally fed back through the interelectrode capacitance of the tube and thus prevent any possible oscillation. This capacitor is called a neutralizing condenser and the process is called neutralization. It is a very important part of tuning the transmitter correctly.

Letters

As you know I have used very few letters from s.w.l.s as these have not been considered part of the communication hobby, but, once in a while they have so many good ideas that it seems just too bad not to get the information on to our readers. Here are some gems chosen from the many I have received. I'm sure you will get many good points from them. I can only use excerpts from them as they are too long to print in their entirety, I usually print the entire letter as received.

"Dear Walt: My name is Hajime Suzuki, a student boy of an Institute of Technology here, majoring in the field of electronics.

"I have been interested in ham-radio for several years, but I am enjoying SWL action all time. My SWL number of the JARL is JA1-3477 and that of JSWC is JSWC 2495.

"In these three years, I have been very interested in DX reception. I started the DX job on July 31, 1961. I am an ardent reader of your *CQ* as well as *QST* of the ARRL.

"Your *CQ* has very unique articles in every issue and also the advertisers will help you and I well. I am buying every issue of your *CQ* here in Tokyo two months later than you in the USA. When I can make a Subscription it will make for my earlier reading here in Japan.

"Walt, I'm of course one of the eager readers of the NOVICE column. You're writing very good and useful articles for the column every month. I'm now an s.w.l. and must learn very many things to be a good ham, therefore I must read the NOVICE first. Of course, Walt, I have interest in other articles in *CQ*.

"By the way, Walt, my receivers are a 2 tube t.r.f. (6AU6-6AV6) for 1.8 to 30 mc reception, 2 tube super-regen (6C4-12AU7) for 50 mc and also 2 tube super-regen (6J4-12AU7) for 144 mc, all are homebrew. My antennas are a 10 meter indoor shortwire antenna for the low freq. bands, a 1 element indoor Quad for 50 mc and a 5/8 wave ground plane as described by Herb W9EGQ in *CQ* for 144 mc.

"With my t.r.f., I have confirmed 157 countries out of the ARRL countries list and have heard 187 countries. I have a good aim, that is, I would like to hear over 200 countries with my simple 2 tube t.r.f. and a short wire antenna. Is there in the U.S.A. any OM who have heard over 200 countries with a t.r.f. ever? I got the DXLCA of the RSGB, mine is #50. I sent 1550 reception reports and have received about 470 QSLs. Also I have confirmed 27 certificates. My confirmations are almost all on c.w. The t.r.f. is a good c.w. catcher, I believe, Walt.

"As to my v.h.f. reception, I have confirmed 110 QSLs on 50 mc in the last year and 10 QSLs on 144 mc since March, 1964. I need a better antenna for this band.

"I would like very much to QSO you when I get my license, Walt. Please forward my best wishes to all of your friends, novice and general. You will soon hear me from my homebrew station. I like homebrew researches Walt.

"Walt, I have heard 237 USA ham stations and sent them reception reports over. I have re-

ceived only 49 QSLs. I guess you Americans are not good QSL operators though you Americans are good c.w. operators, frankly speaking.

"I took the enclosed photo by myself with a very cheap 6 cm × 6 cm box camera. I am QRU for now, keep up the good work, Walt. GL es FB DX, best 73, Yours. Hajime Sazuki, JA1-3477, Mure 258, Mitaka-Shi, Japan."

Thanks for the nice letter and I'm sure that many of us envy you your reception with that fine receiver, none of us could do better.

"Dear OM: I read *CQ* magazine and pay my best attention to the NOVICE section. Although we have no novice class in Portugal. I am one of them, being an s.w.l. for a long time and now starting to become a real ham "on the air."

"I must tell *CQ* and your section have helped me a lot, but I would like to point out one important fact: the magazine is obviously written for U.S. readers. Most part of the equipments described or parts used are not available here in Europe. And, what is worse, you sometimes write that, the transformer used is the Merit P....., which characteristics we do not know and cannot find in our data files. Also we are unable to purchase such items here. This causes a lot of trouble to our beginners, who start saying that it is useless to buy American magazines. You use only American types of transistorized circuits and diodes and never give any detail about the European types.

"Now, about the late July issue, I think it would be useful to have a list of conversion data for the surplus equipment. *(Ed note: I have received many letters to this effect from now a total of 7 countries.)* Even in Portugal we are buying now a lot of BC's. I have one command receive receivers, two transmitters (3-4 and 7-9.1 mc) and one BC-611. Usually I work in a team with CT1LR, KH, MC, MM, LV, and a few others, s.w.l.ers or newly licensed operators. We have been purchasing a few conversion manuals, but not enough for the work we want to do on the equipment.

"Also, do you know more about suppliers of TO's and TM's? We have no one here. Another big problem, and *WE NEED HELP:* the US stores do not send us small parts. They just accept big orders—$10.00 or more, usually. So, who is able to send us the small parts we need to build the *CQ* circuits such as coils, capacitors, rectifiers etc. Do you know of anyone who can supply the amateur band crystals and coils for the BC-611-F?

"Please excuse my English—it is not very brilliant at all! And here is my best 73 and wishes for best DX. Thanks for everything. Vasco Felix, CTØ102, Est. de Benfica-705-lote 5-20-Frente, Lisbon 4, Portugal."

Thanks for the letter and I must say that for myself, when I put a circuit in the column I will always put the transformer and parts data in there also. You of course know that we also know little of the data concerning the radio parts made in your country, I would be glad to collect and file such information. I had not thought of any one outside the country building our circuits and I want to thank you for the new ideas. I will follow through with the ideas, remember, you asked for it. This column is your column too. . . . This is truly an International magazine, I have now received letters from 42 countries and I'm sure the other column conductors have received as many or more. Thanks for them and all the others.

That just about covers the subject for this month and as this is the December issue it will come out weeks early here in the States but will be received near Christmas in many countries. I would like to wish you the best of seasons greetings and hope that you have health and happiness throughout 1965. I might wish those trying for a license, "Stay alive in 1965 with amateur radio." It is worth all the trouble that you have getting the license. Write to me and send many pictures next year.

Thanks for past favors and Merry Christmas.

73, Walt.

John Reinartz Dead at 70

JOHN L. Reinartz, K6BJ, a pioneer short wave radio inventor and experimenter died on Oct. 5, 1964, at the age of 70. Mr. Reinartz, a ham since 1908, was credited with the invention of a short wave tuner that was the predecessor of most modern receivers. He held 28 patents, some of them still in use. In 1923 he took part in the first two-way trans-Atlantic short wave radio communication. In 1925 he served with the Byrd North Pole expedition as chief of communications. During World War II Mr. Reinartz contributed towards the refinement of radar. Mr. Reinartz is survived by his wife, Gertrude.

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

PROGRESS is our most important problem. As you are probably aware, equipment for amateur radioteletype has progressed from large, heavy, power-consuming vacuum tube devices to miniaturized solid-state units that are so small and light that they are easily tucked inside the base of the smallest Teletype machine that we use. Progress has been rapid, and your RTTY Column has endeavored to keep pace with these developments, describing each device in as much detail as the space we are allowed permits. Many of these highly specialized devices are connected together in an RTTY station, and according to some of our correspondents, these interconnections are not always obvious, particularly to the newcomer.

The most prolific contributor to our highly advanced state-of-the-art is Phil Catona, W2JAV. His first transistorized RTTY converter (TU) is described on page 107 of the *New RTTY Handbook*, and your RTTY Column has described his wide-shift polar TU in the February 1962 *CQ*. (Correction: page 87, fig. 2; the resistor in the emitter circuit of Q_2 should be 8.2K instead of 2.2K.) The companion a.f.s.k. oscillator was described in the March 1962 *CQ*. (Correction: page 92, fig. 1; the capacitor between the base and collector of Q_1 should be 0.01 mf instead of 0.1. Also, the capacitor between the emitter of Q_1 and the bottom of L_1 did not print clearly. It is 0.1 mf.) The narrow-shift polar TU of W2JAV was described in the September 1963 *CQ;* and, is built on a printed circuit board with exactly the same connections and power requirements as the wide-shift polar TU. Component parts placement for this TU was detailed in the June 1964 *CQ*. (Correction: page 74, fig. 1; the center tap, or junction of the two coils, of L_3 connects to the bottom of the 0.02 capacitor just to its right.)

A power supply designed to provide the regulated low voltage required by these solid state devices was described in the April 1962 *CQ*. The zener diode used is very expensive if bought new, however, several usable surplus zener diodes are available on the surplus market. (Leeds Radio, Vesey Street, New York City, for example.)

An extremely useful and simple test device, also solid-state, was described in the December 1962 *CQ*. (Correction: page 69, fig. 1; there should be a ground symbol on the collector of Q_1.) This is the Square Wave Dot Generator, designed by W2JAV to key his a.f.s.k. oscillator with a signal easily synchronized on a 'scope for telegraph bias checks.

The Transistorized Selector Magnet Driver

Both the wide-shift and the narrow-shift TU's of W2JAV were designed to work with the 255A polar relay for simplicity. Polar relays, it seems, are heartedly disliked by many RTTYers. Admittedly, they can be a problem to the uninitiated. So, for this reason, and in keeping with the trend towards making every piece of RTTY terminal equipment solid-state, Phil designed the transistorized Selector Magnet Driver described in the November 1962 *CQ*. (Correction: page 84, fig. 1; the zener diode CR_6 is shown reversed; and, the top position of the LOOP SWITCH S_3 should be marked 60 ma, not 20 ma.)

The actual connection between the Selector Magnet Driver and the associated TU was not too clear to some of our readers, so as requested we have drawn up a schematic diagram which traces the connections between these two units and to the Teletype machine selector magnets. Fig. 1 is therefore a simplified diagram showing only the vital stages of the units involved. Referring to the original description of the Selector Magnet Driver, an "internal" power supply provides the operating voltages, 12 volts for the flip-flop Q_1 and Q_2, and almost 60 volts for the "keyer" transistor Q_3. These voltages are not involved with the TU connected.

The TU schematic is partially shown in the lower right of fig. 1. (The 8 to 9 volt "battery" shown could be the separate power supply described in the April 1962 *CQ*.) Note that the battery is not involved directly with the Selector Magnet Driver. The 220-ohm resistors replace the coils of the polar relay which initially connected to terminals *M*, *N* and *U*, *Y* on the TU. (The numbers in circles indicate the original polar relay socket connections.) If no meter is used the two 220-ohm resistors can be connected together, as shown in fig. 1 on page 84 of November 1962 *CQ*, and then connected, with the battery negative, to terminal *S* on the TU. There is no direct connection what-so-ever between either the positive or the negative terminals of the TU "battery" and the internal supply of the Selector Magnet Driver.

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

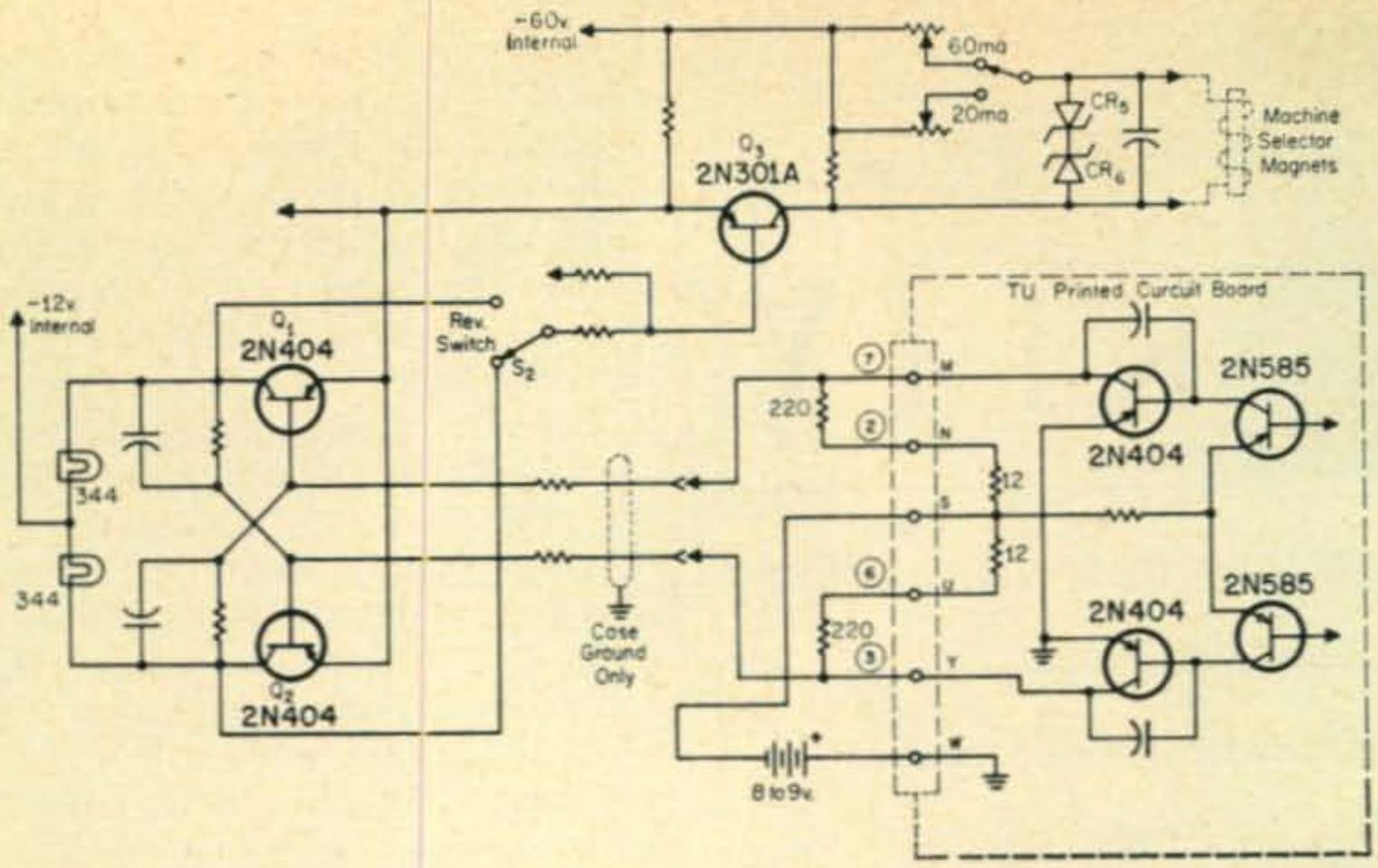


Fig. 1—Selector Magnet Driver and TU Interconnections

Theory of operation is really quite simple. The *IR* drop across the 220-ohm resistors, either positive or negative depending upon whether the TU has sensed a *mark* or a *space*, is used to flip the "flip-flop" Q_1 and Q_2. The flip-flop will then key the "keyer" transistor Q_3 into either a conducting state or a non-conducting state, depending upon the position of the REV. SWITCH S_2. The selector magnets of the machine, in the collector circuit of Q_3, are therefore keyed accordingly. Steady-state marking current in these magnets is set to either the normal 20 ma or 60 ma by the variable pots provided.

On the Bauds

K2RTQ of Kenmore, N.Y., built the W2JAV tube-TU. (from the *New RTTY Handbook*) W2IPB of New Hyde Park, N.Y., reports that he had his machine re-conditioned by Bob Tetrault of 17 Dick Street, Clifton, N.J., with very satisfactory results. W2NQW of Port Jervis, N.Y., is looking for a keyboard base for a Model 15. K2SBD of Albertson, L.I., is building a KW final for RTTY. K3SQY (ex-W8PNM) of King-of-Prussia, Pa., is looking for a Model 15 or 19. K3HOL of Wayne, Pa., is building a 50 kc i.f. TU. (from the *New RTTY Handbook*) W3OPO of Washington, D.C., uses a Model 19 with his W2JAV wideshift transistor TU. Jim and K3GAX are getting set for narrow-shift. W3RXY of Chevy Chase, Md., is building the selector magnet driver to go with his transistor TU.

K4GXO of Decatur, Ga., is building a W2JAV narrow-shift TU and is looking for a board on the wide-shift TU. K4DKC of Hampton, Va., works 80 with a Model 19, and a W2JAV tube-TU. Jim is also going narrow shift. W4RYI (ex-KA2NY) is getting set for retirement from the Navy to Sarasota, Fla., with Model 19, 15, and 14 equipment which he now uses on leaves. W4AIS of Taylors, S.C., reports successful narrow-narrow-shift (30-cycles!) tests with I1RIF. George uses a CV-89B/URA-8 TU, and has an extra one for sale or trade.

W6PZN of Sylmar, Calif., uses a pair of 4-400A's on 80, 40 and 20 with a Drake 2B, a transistor TU, and a Model 19. Jerry is about to go narrow-shift. W6SCR of Los Altos, Calif., has for sale some sub-assemblies (SU101) of the AN/URA-8A for $25 each. Chuck also has information available for converting the Northern Radio Models 152 and 153 to wide-shift operation. WA6CWZ of Los Angeles is looking for dope on frequency-shifting his B & W 5100. WA6JGI, 3232 Selby Ave., Los Angeles 34, Calif., has available simple (such as for the Twin City TU) single-tuned plug-in filters for 2125 and 2975 cycles for $5.95 per set, postpaid. W6VPC of Oakland, Calif., has a Model 19 for sale for $175.

K8ECK of Canton, Ohio, is looking for 5/32-inch tape for his odd-ball Model 14. W9VQD of Milwaukee, Wis., is building a W2JAV narrow-shift transistor TU. W9HXW reports that he, W9HYI, K9UFK, K9HSL, and WA9BBC are all on 146.70 f.m. with a.f.s.k. in the Chicago area. W9CAV will soon join them. WA9-HDG has Model 19's for $130 and Model 15's for $75. K9UXP of Eau Claire, Wis., has a Model 15, a KWM-2 and is building a W5BGP TU. KØGYZ (ex-WA4SDO) of Rapid City, So. Dakota, has a Twin City TU and Models 14, 15, and 19. Austin is looking for a transistor selector magnet keyer. WØILP of Nora Springs, Iowa, is looking for an inexpensive machine.

KH6AX of Honolulu, Hawaii, works 20 with tape. KV4BZ of St. Thomas, Virgin Islands, got his Model 28KSR via MARS. VE4BJ of Winnipeg, Manitoba, has Teletype parts and a Model 14 reperforator for sale. (Send him a SASE.) VE3SD of Guelph, Ont., has a Model 15 and a 32S-1. VE3ASE of Scarborough, Ont., has a Model 15 and 150 watts on 80 meters.

Comments

As the year, our 9th as RTTY Editor, draws to a close, we like to lean back in our arm chair and reflect upon RTTY progress during the past year. Since we are "gadgeteers,"[1] much personal pleasure has been gained in the trend towards solid state terminal gear. Unfortunately, this greatly simplified and inexpensive equipment is still not available over the counter. As the result, most RTTYers *build*. Sure, we have contributed to the state-of-the-art, but at the expense of operating activity, such as handling traffic. As mentioned in past Columns, *we* are thoroughly acquainted with the advantages of handling traffic by high speed (60 w.p.m.) tape. We remember, too, with pleasure, the transcontinental RTTY skeds of W1BDI ARRL Communications Manager, the late WØBP, and K6GZ. *This was more than 5 years ago!* If only W1AW were to send the Official ARRL Bulletins on RTTY perhaps the dyed-in-the-wool traffic handler would *then* realize that he is missing a *big* bet by not utilizing RTTY for his purpose. We suggest that you ask *your* Director why W1AW cannot now (in light of the rebuilding program) plan to send Bulletins on RTTY.

73 and a very Merry Christmas, Byron, W2JTP

[1]Hart, *QST*, October 1964, P. 88.

YL

LOUISA B. SANDO,* W5RZJ

SPECIAL congratulations to these gals who have joined the comparatively few YLs to have earned the coveted Worked All Zones award. YL #21 to achieve WAZ is DJ2YL, Susi Liebig; #22 is VK3KS, Mavis Stafford; #23 is ZL2JO, Thelma Souper; #24 is LU4DMG, Maria M. De Dantiacq, and #25 is W1YYM, Ellen White.

Thelma was first licensed in March, 1931 and in addition to ZL2JO has held calls ZL2FR and ZL1CN. She operates mostly 20 c.w., with some s.s.b. She has worked over 200 countries. Her OM is Noel, ZL2UW (licensed in '55). At the end of '63 Thelma retired from the full-time position she held for 17 years as secretary of the Crippled Children's Society in New Zealand, and now devotes herself to gardening as well as ham radio.

VK3KS, Mavis, has been licensed since 1939 and in addition to WAZ holds DXCC. She has competed in the last six YL-OM contests, earning high score for VK and making WAC on each occasion. Mavis' OM, VK3XB, is QSL Mgr. for VK3 and was the first VK to earn the USA County Award. They operate on 80, 40, 20 and 15 meters, c.w. and s.s.b. Rig is a 32S-3 and receiver is a 12-tube homebrew one. Mavis and Ivor have three jr. ops, ages 19, 13 and 10, and Mavis also enjoys gardening.

LU4DMG, Maria, was licensed in '49 and first operated as LU4MG, working 151 countries with that call till '51, and over 200 on phone with her present call. She also has been active on c.w. and for a long time was the only YL on c.w. in Argentina. Maria's OM is LU8DMC.

YLRL V.P. WØHJL

At the time we were preparing the report on the 1965 officers of YLRL for Nov. *CQ* the newly elected vice president, Kayla, WØHJL, was on a trip to the East to get her oldest daughter, 18, off to Europe for a year. Here are a few more notes to add to the Nov. write-up.

As we mentioned, Kayla became KH6CKO in 1957. She left Hawaii for Denver in Dec. '62 and adds, "I'm still mourning my loss of paradise and take every opportunity to talk to the KH6s!" Originally an Ohio gal, Kayla left there in '43 to become a WAC in WW II. She was a cryptographer in D.C. late in the war where she met her OM, Bernie. He is a psychologist with the U.S. Public Health Service and holds WØHJN. They have two other girls, ages 14 and 12.

Look for WØHJL on all bands, except 6, s.s.b. and c.w., and occasionally a.m. She uses an HT32B rig and Drake 2B receiver with a W3DZZ beam on 10-15-20 and a trapped inverted-V on 40-80. Kayla is editor of *Loose Change*, the Colorado YL's newspaper, contributing editor to two other newspapers, member of Denver RC and New Zealand Women's AROC and QRP. She is a firm believer in low power and a prime interest is antennas as well as propagation.

When Kayla works away from home it is as a statistician doing research in connection with her OM in the field of mental health. Besides family and community activities, she is interested in music, sewing, cooking, is an avid reader and an "incurable night owl." All this—and think of the hundreds of contest logs that will be descending upon Kayla as V.P. throughout the year also!

YLRL 7th D/C

According to word from K7MRX, Fran, secretary of YLRL, the district chairman for the 7th district for 1965 will be W7LIZ, Edith Caldwell.

1965 YL-OM Contest

W6QYL gives the following dates for YLRL's 16th Annual YL-OM Contest: Phone—Feb. 20-21; C.W.—Mar. 6-7, 1965. Full rules will be in January *CQ*.

W6QYL New QTH

Please note this new QTH for YLRL's vice president for 1964, and president for 1965: Martha Edwards, W6QYL, 2855 West Avenue M-8, Lancaster, Calif. This was effective Oct. 15, so YLRL Anniversary Party logs should be mailed to Martha at this QTH.

Winners among the YLs in the 1964 V.H.F. Sweepstakes display the gleaming trophies awarded them at the third annual banquet of the Six Meter Club of Chicago. L. to r., K9FHM, Mildred, 3rd place; W9AFA, Eleanor, 2nd place; K9ZWV, Val, 1st place.

*4417 Eleventh St, N.W., Albuquerque, New Mexico 87107.

Left, VK3KS, Mavis Stafford, No. 22 among the YLs to earn WAZ. Right, ZL2JO, Thelma Souper, 23rd YL to earn WAZ. Since this photo was taken she has changed to a KW Viceroy exciter with small linear and a Drake 2B receiver.

Book Pages Available

At the 25th Anniversary YLRL Convention held at Columbus, Ohio, June 19-21, 1964, the YLs present requested our book *"CQ YL"* be brought up to date, and, at the suggestion of K4LMB, within minutes donated enough money to pay for printing four pages (two sheets printed on both sides). The pages are 14-A & B, updating the general information in Chap. Two on the Young Ladies Radio League. The other pages are 36-E & F, bringing current through 1965 information on officers of YLRL.

These supplemental pages are now available, and, since the printing is already paid for, they are *free* for the asking to anyone who has a copy of *"CQ YL"!* Just send your name and address to W5RZJ (QTH at beginning of column). Please enclose a 5¢ postage stamp to cover mailing (the pages will be mailed flat in a large envelope). They are perforated for easy insertion into the book's spiral binding at the proper place.

(Note: *All YLs attending the YLRL Convention will receive the book pages automatically, so do not write unless you fail to receive them.* There also will be bulk shipments to the YL clubs for distribution at meetings, so if you belong to a club, check first with your president or secretary.)

We also still have available some copies of the first two supplements to *"CQ YL"*—pages 36-A & B (printed in 1959) and pages 36-C & D (printed in 1961). If you have not yet received these, you may request them also.

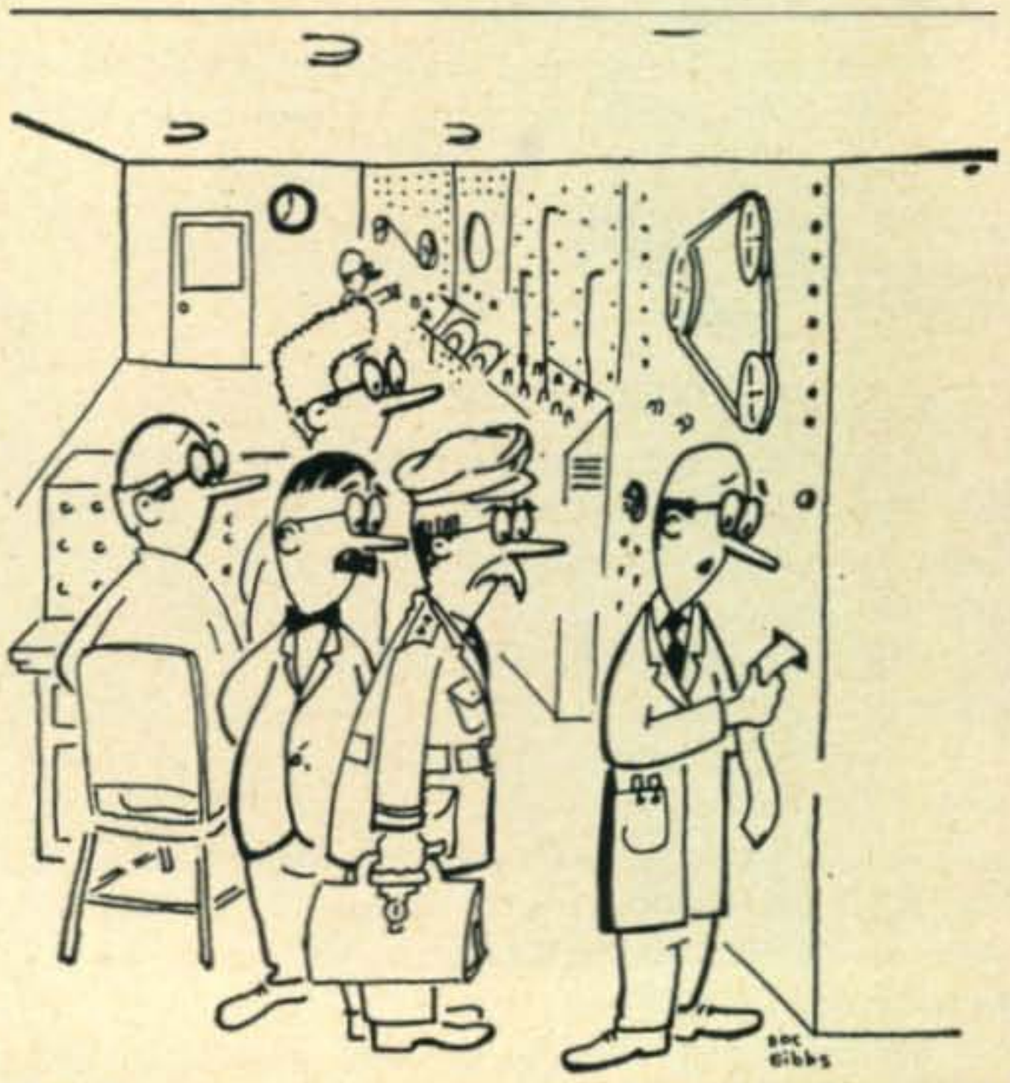
OZ1MR Comments

An FB note from OZ1MR, Margaret, in which she says, "I have read the *YL* pages in Sept. *CQ* and wish to thank you for your report and pix on the YLRL Convention. I have a copy of your book *"CQ YL"* and would like to keep it up to date, so please put me on the list for the additional pages. *"CQ YL"* is very very interesting and since I've had my copy I have re-read it several times! I'll never lose interest in it, and furthermore, it is a book that can be used for reference as well as for inspiration!" Thanks, OZ1MR, and you, as well as all others requesting them, will receive the newly printed supplemental book pages.

Copies of *"CQ YL,"* the one and only book about the YLs, may be had from W5RZJ for $3 each, postpaid. As noted above, the book is now up to date through the 1965 YLRL officers. Tell your OM you'd like it for a gift (or give *him* a copy), or get it for a friend! We may soon be having two whole new chapters available to add to the book; more on this later.

Happy Holidays and all the best in 1965!

—33, W5RZJ



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The Carborundum "Ham Load" is supplied as a single unit with standard coax connector for easy mounting on rack or cabinet, or for designing into home-brew equipment. Although small in size, the high-temperature ceramic resistance element dissipates up to 250 watts **output** for 5 minutes! Unlike bulbs or wire-wound resistors, SWR remains essentially flat at less than 1.5:1 up to 54 Mc (with the load mounted at least 5" from metal reflecting surfaces).

SPECIFICATIONS

Resistance: 50 ohms, non-inductive. **SWR:** Less than 1.5 at 54 Mc. **Dissipation:** 250 watts (up to 5 minutes); 150 watts continuous. **Connector:** Standard coax (SO-239 type). **Size:** Approximately 13½" long by 1" diameter. **Mounting:** Any convenient location. **Caution:** Due to heating when loaded at high power, the unit should be mounted in freely circulating air.

ROTRON WHISPER FAN

The fan that moves 60 cu. ft. of air per minute . . . while running so silently you have to look to see if it's running! Removes heat to save your rig, yet uses only 7 watts. Measures 4½" square by 1½" deep. Has run for years in computers and other commercial equipment without attention — lifetime lubricated.

Operates on 110-120V. A.C.
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OUR 37th YEAR

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For further information, check number 31, on page 106

Announcements [*from page 18*]

5. It should be emphasized that this proposed amendment does not in any way affect renewal by present holders of the Conditional Class license. Nor does the proposal affect eligibility for this class license on the basis of protracted disability, service in the armed forces or temporary overseas residence.

6. The specific proposed amended Sections 97.9(d)(1) and 97.27(a) are set forth in full in the Appendix to this Notice. The Proposed amendment is issued pursuant to the authority contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended.

7. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before November 16, 1964, and reply comments on or before December 1, 1964. All relevant and timely comments and reply comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may also take into account other relevant information before it, in addition to the specific comments invited by this Notice.

8. In accordance with Section 1.419 of the Commission's Rules and Regulations, an original and fourteen copies of all statements or comments shall be furnished the Commission.

FEDERAL COMMUNICATIONS COMMISSION
BEN F. WAPLE
Secretary

APPENDIX

Proposed Amendment of Part 97,
Amateur Radio Service Rules.

1. Section 97.9(d)(1) to read as follows:

§97.9 Eligibility for new operator license.

(d) * * *

(1) Whose actual residence and amateur station location are more than 175 miles airline distance from the nearest location at which examinations are held at intervals of not more than 6 months for General Class amateur operator licenses.

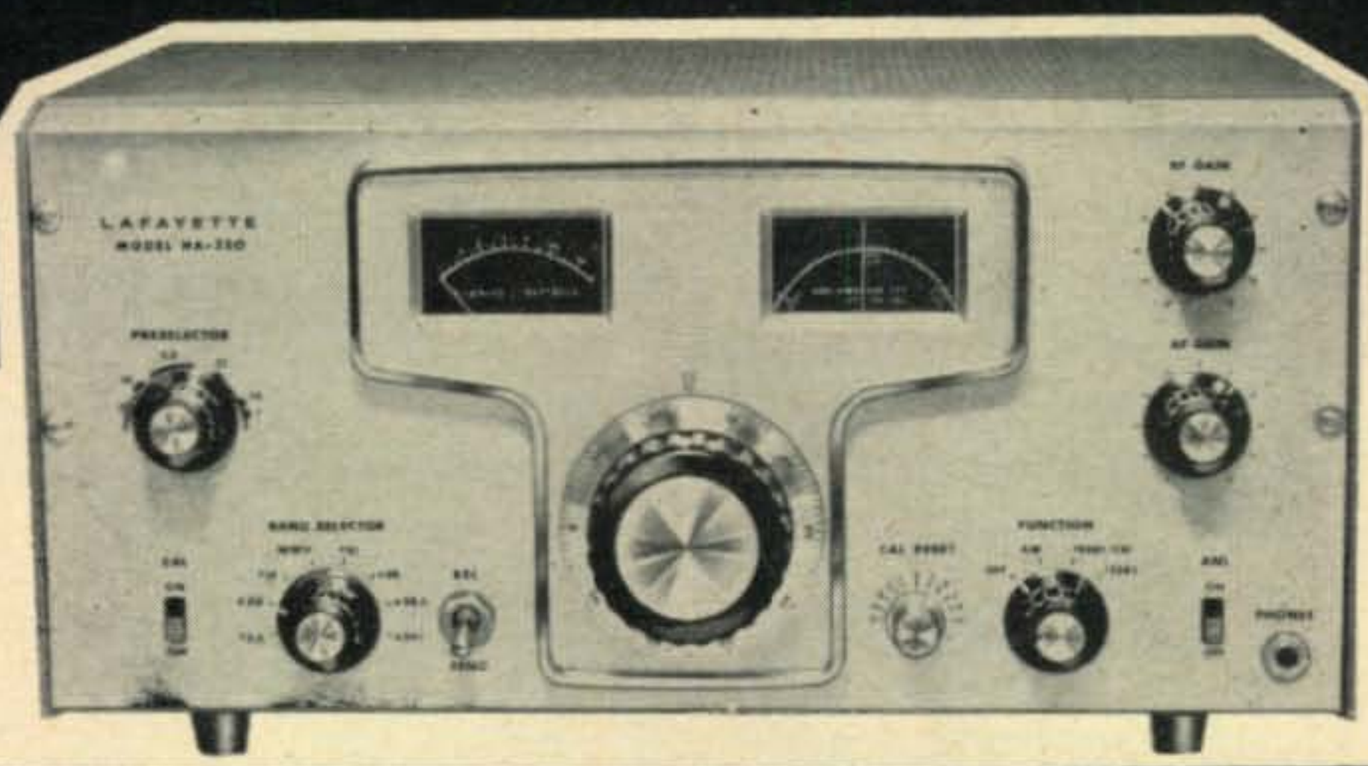
2. Section 97.27(a) to read as follows:

§97.27 Availability of Conditional Class license examinations.

* * * *

(a) If the applicant's actual residence and proposed amateur station location are more than 175 miles airline distance from the nearest location at which examinations are conducted by an authorized Commission employee or representative at intervals of not more than 6 months for amateur operator licenses.

NEW! LAFAYETTE



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MODEL HA-350

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Uses Mechanical Filter For Exceptional Selectivity— Offers 2KC Bandwidth!

Lafayette's newest! A dual conversion superheterodyne communications receiver covering the 10 through 80 meter amateur bands and offering a high order of electrical and mechanical stability for superior AM, CW and SSB operation. Check some of the exceptional features!

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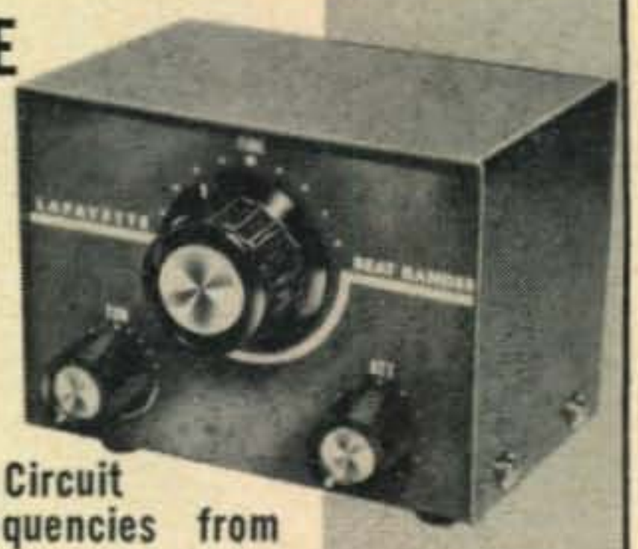

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Lafayette Radio Electronics Corp., Dept. CL-4, P.O. Box 10, Syosset, L. I., N. Y. 117

For further information, check number 33, on page 106

Contest Calendar [*from page 75*]

case of foreign countries 2nd and 3rd place awards may be made if participation warrants.

Log sheets and United States Operating Regulations for 160 may be obtained from *CQ* upon request. A large s.a.s.e. please.

Mailing deadline for your logs is February 28th and they go to: *CQ*, Att: 160 Contest, 14 Vanderventer Ave., Port Washington, L.I. N.Y.

Editors Note

The TOPS Club is holding its 80 M. Contest on December 19-20 from 1200 to 1200 GMT. Announcement received too late to include rules, but we will publish them next month so you can score your logs correctly.

A study of the Spring Calendar for 1965 will show that it is becoming more crowded and confusing each year. What is the solution? Cut down the number of activities? Hardly, each organization has a right to its activities.

It is highly recommended however that these activities be limited to one week-end *only*. State parties could also limit their operating time. (*i.e.:* The New Hampshire and New England parties.)

Some of the foreign organizations could combine their c.w. and phone contests on the same week-end. (*i.e.:* PACC Contest.) Usually the phone participation is limited and very few stations enter both categories.

And last but not least, dates should not be picked at random. It is the purpose of this Column to assist you in your contest activities.

73 for now, Frank, W1WY

SB-400 [*from page 57*]

When independent transmitter frequency control is employed for c.w. and the receiver muting line is connected between the transmitter and the receiver, the steady tone is evidenced. R.f. filtering in this line should correct the trouble.

Performance

The measured performance of the SB-400 transmitter came very close to the specifications and in some cases was better, particularly in respect to calibration and stability. With an a.c. power line potential of 120 volts, p.e.p. output on s.s.b. was 100 watts on 80, 40 and 20 meters, and 90 watts on 15 and 10. C.w. output was about 5% less. In answer to a number of queries in this regard, the c.w. power usually is lower than the p.e.p. with s.s.b. due to the drop in plate voltage under key-down conditions, whereas, a degree of dynamic voltage regulation is obtained from the filter capacitors which hold up the voltage during voice modulation with s.s.b.

Carrier and unwanted sideband suppression (above 1 kc) were at least 50 db down as was the noise level. Distortion was not checked; however, two-tone envelope and trapezoid patterns indicated good linearity. On-the-air s.s.b.

[*Continued on page 94*]

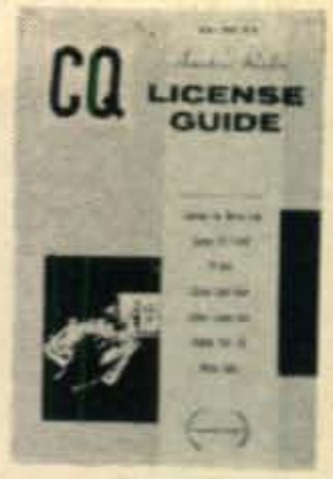
CQ TECHNICAL BOOKS

CQ ANTHOLOGY I

We've looked back through the years 1945-1952 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable.

CQ LICENSE GUIDE

212 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator.



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Top favorite CQ articles from 1952 to 1959 . . . including some you may have missed . . . compiled into one new information-packed book! No more need to try to locate sold out back copies of CQ. This Anthology includes past articles of lasting interest to every amateur radio enthusiast. Over 250 pages of text. Over 75 different articles. A definite Must for your shack!

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This new Mobile Handbook by Bill Orr, W6SAI, has been getting raves from top experienced mobile operators. Written for advanced, as well as beginning mobile operators, much of this information cannot be found anywhere else. This is NOT a collection of reprints.

SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, who was almost one full year in the preparation of this terrific volume. This is **not a technical** book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff gadgets, receiving adaptors, exciters, amplifiers.

VHF FOR THE RADIO AMATEUR

If you are, or are planning to be a VHF operator, you can't afford to be without this dynamic new handbook written especially for you. Filled from cover to cover with all new and original construction material presented so you can understand it. Written by Frank C. Jones, W6AJF, nationally acclaimed for his VHF pioneering.

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For further information, check number 56 on page 106

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For further information, check number 57, on page 106

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New DK72

SINGLE POLE THREE THROW COAXIAL SWITCH

Weatherproof coaxial relay for remote switching of r.f. sources. Designed for mounting on mast and remote switching up to 3 antennas. Not a rotating or stepping switch. Simplify installation, save money by running one cable instead of several to your antenna array.

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MODEL DK72 with UHF Connector **$22.95**
With type N, BNC, TNC OR C connectors **$26.95**

DOW KEY CO., Thief River Falls, Minn.

For further information, check number 58, on page 106

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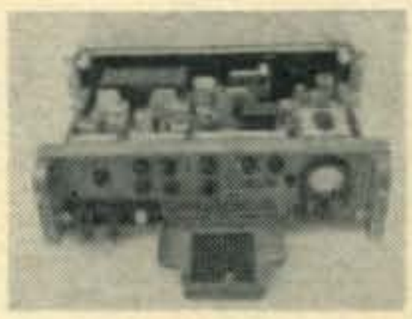

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ALL BAND TRAP ANTENNA !

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For ALL Amateur Transmitters. Guaranteed for 600 Watts AM 1200SSB Pi-Net or Link Feed. Light. Neat. Weatherproof.

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SIMPLE-TO-INSTALL, HI-PERFORMANCE ANTENNA SYSTEMS:

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For further information, check number 60, on page 106

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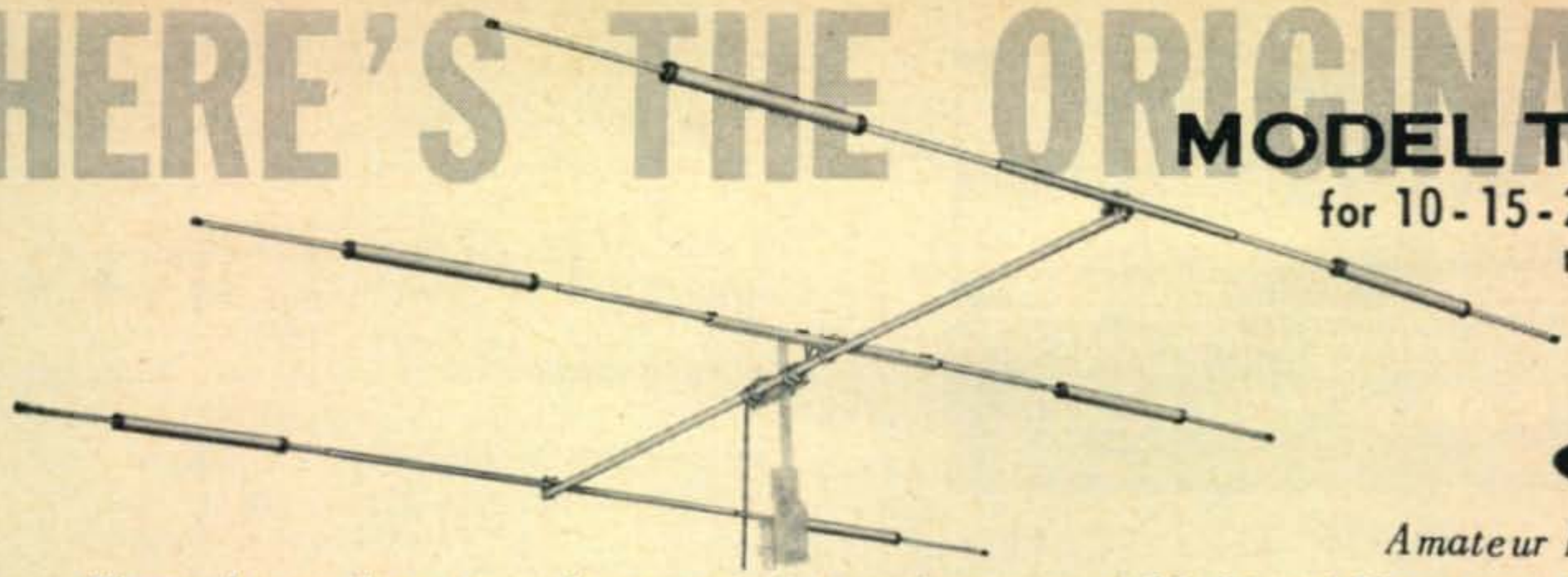

MODEL TA-33
for 10-15-20 meters.

TRAP MASTER

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SPECIFICATIONS AND PERFORMANCE DATA: ■ Fwd. gain up to 8 db. ■ Front-to-back is 25 db. ■ SWR, 1.5 or less, at resonant frequencies. ■ Maximum element length is 28 feet. ■ Boom length is 14 ft. ■ Turning radius is 15.5 ft. ■ Assembled weight is 40 pounds. ■ Wind surface area is 5.7 square ft. ■ Wind load is 114 pounds. ■ Shipping weight is 53 pounds.

Mosley Export Division: 64-14 Woodside avenue, Woodside 77, New York.
Electronics Inc., 4610 N. Lindbergh Blvd., Bridgeton, Mo., 63044.

For further information, check number 34, on page 106

One Control tunes this rig . . . from VFO thru final

Special gang-tuned circuits in Li'l Lulu let you QSY instantly — there's no buffer tuning and final dipping needed when the frequency is changed. And the rig is really TVI proof! By keeping the VFO grid circuit in the 25 mc range, TVI is eliminated. Price: $225 thru your dealer.

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1275 Bloomfield Ave., West Caldwell, N. J.

Li'l Lulu

COMPLETE

50 MC

TRANSMITTER

For further information, check number 35, on page 106

SB-400 [*from page 90*]

reports indicated excellent audio quality and unwanted sideband suppression. The vox system operated very smoothly and with positive action. Excess flattopping was not in evidence as long as the a.l.c. was operated within the specified limits.

C.w. keying was a little on the soft side, yet not hesitant, resulting in clean character formation without key clicks. Operation without continual relay clatter was a pleasure as was the sidetone monitoring.[3] The 1 kc offset during c.w. transceive work provided most convenient and rapid operation.

The only criticism of the unit is that an instantaneous switch cannot be made between independent and transceive operation, as this requires lifting the cabinet cover and substituting l.m.o. jumpers as needed for the particular type of operation.[4]

The SB-400 transmitter embodies the same styling as its counterpart, the SB-300 receiver, and is of the same size, 14⅞" w. × 6⅝" h. × 13⅜" d. Weight is 26½ lbs. Besides containing the assembly and operational instructions, the manual includes trouble-shooting, voltage and resistance measurements charts along with X-Ray views of the printed-circuit boards and bottom and top chassis sectional photos, all with component identifications.

The performance, features and high quality of the SB-400 make it a worthwhile investment which not only will justify the work and time required for its assembly, but which also will provide the enjoyment and satisfaction of putting your own gear together into a high-class affair and in having a piece of equipment the equal of which probably would cost considerably more if it were factory built. The Heathkit SB-400 transmitter kit is priced at $325.00. It is produced by The Heathkit Company, Benton Harbor, Michigan 49023.

Addendum

Before proceeding with the assembly of the SB-400, carefully check all parts against the part's list in the manual. You will thereby become familiar with the various components, reducing chances of errors, and in the event there are missing or incorrect parts, time required for replacement will not hold up the work as it might otherwise do if a parts error were discovered at the last minute during the course of assembly.

Read each assembly step carefully and "think it through" before proceeding. Time consuming errors will thereby be avoided. Also, if you have difficulty distinguishing the resistor colors, due to color blindness or

---

[3]If headphone operation with sidetone monitoring is desired with c.w., instead of employing the loudspeaker, the a.f. output from the receiver to the transmitter, normally obtained from the speaker output of the receiver, must be taken from the phone jack instead and the phones must be connected to the speaker output jack on the transmitter.

[4]If the carrier-generator crystals do not happen to be exactly on the same frequency as that of the corresponding receiver b.f.o. crystals, the b.f.o. cable from the receiver must be removed during independent transmitter-frequency control operation to avoid a residual beat note, between the crystal frequencies, from being heard in the receiver.

For further information, check number 55, on page 106

some other reason, check each resistor with an ohmmeter just before it is installed; in fact, this will be a good practice anyway. Before mounting each completed circuit board, examine it carefully for between-foil shorts. This may be done by holding the board up to a bright light or by examination with a magnifying glass with which the soldered connections also may be checked. After the SB-400 has been completed and before applying power, again check the circuit boards and, using the magnifying glass, make sure all the connections in the unit are properly soldered. Also check switch contacts to make sure that they are not twisted or bent.

Suggestions and Corrections

The unit assembled by the writer was an early model, so many of the following items will probably be included in later assembly manuals.

Page 37—see that the 4700 ohm resistors mounted on the coils do not rest against the coil-mounting tab.

Page 46—The "Caution Note" will be clearer if wording is changed to, ". . . *the boards* should be supported from the lettered side. . . ."

Page 48, column 1, steps 2, 3 and 4—It will be easier to later install the switch support if these steps are left to be done *after* the 6th step, column 2, page 68.

Page 51—When the large cable is installed, take time out to determine just where and how the individual leads from each breakout are to be subsequently run and connected. Besides referring to Pictorial Diagram 11, check with illustrations 13, 13E, 14 and 16. This will enable you to more easily install the harness and make a neat looking job, with the lead arrangements and connections from each breakout readily made. Where the breakout leads are too long to make a neat installation around the mode switch, they may be trimmed to shorter lengths as needed after the switch is mounted.

Page 60, last step—Before installing the mode switch, run the white, white-green and the black leads from breakout #8 toward the end of the chassis so they will be positioned under the switch. All other leads from BO #8, bend up out of the way toward the center of the chassis over board HP. This will make it easier to install the switch and to later select the proper leads.

Page 69, Detail 16D, left drawing—Note that the orange-white and the orange leads from breakout #2 of the harness extend out on *opposite* sides of the rubber grommet. The orange lead eventually will be connected to the hooked terminal of the feedthrough capacitor at the center of the switch support shown in both views of Detail 16D. The orange-white wire should be on the other side of the shield. (Pictorial 16)

Page 72, 2nd column, 1st step—If difficulty is encountered installing one of the screws for the dial-pointer drive arm, remove the mounting screws from terminal board HM and lift the board up to provide better access for manipulating the screw. The small open-ended wrench, supplied with the kit, also will be helpful here. Do not remount this board until the steps through page 74 have been completed.

Page 74, after completion—Pressure against the dial from the nylon spiral follower may produce enough drag to impair free dial rotation. If this occurs, slightly bend back the dial-pointer drive arm near its mounting bracket.

Page 75—Scrape off the paint on the rear of the panel panel around locations B and F and at the sides of the panel where it eventually will be mounted against the side brackets of the chassis.

Page 76—An easier and neater job, without strain on the shielded cables, can be made by installing the cable leads on control B *after* the panel is mounted (following 1st step, 2nd column, page 77). See fig. 3-4 in rear of manual for positioning of leads.

Page 80, 2nd column, 3rd step—Do not wrap the wire tightly around the capacitor lug prior to soldering, as you may have to remove it later to enable removal of the driver coil enclosure in the event an assembly error has been made or servicing is required.

Page 87, 2nd column, 2nd step—Rather than risk the chance of damaging capacitor TY by making too close a bend in its lead to enable the lead to reach the terminal of coil EB, solder a bare-wire splice between the two points. ■

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ANTENNAS SINCE 1921 **telrex** COMMUNICATION SYSTEMS LABORATORIES

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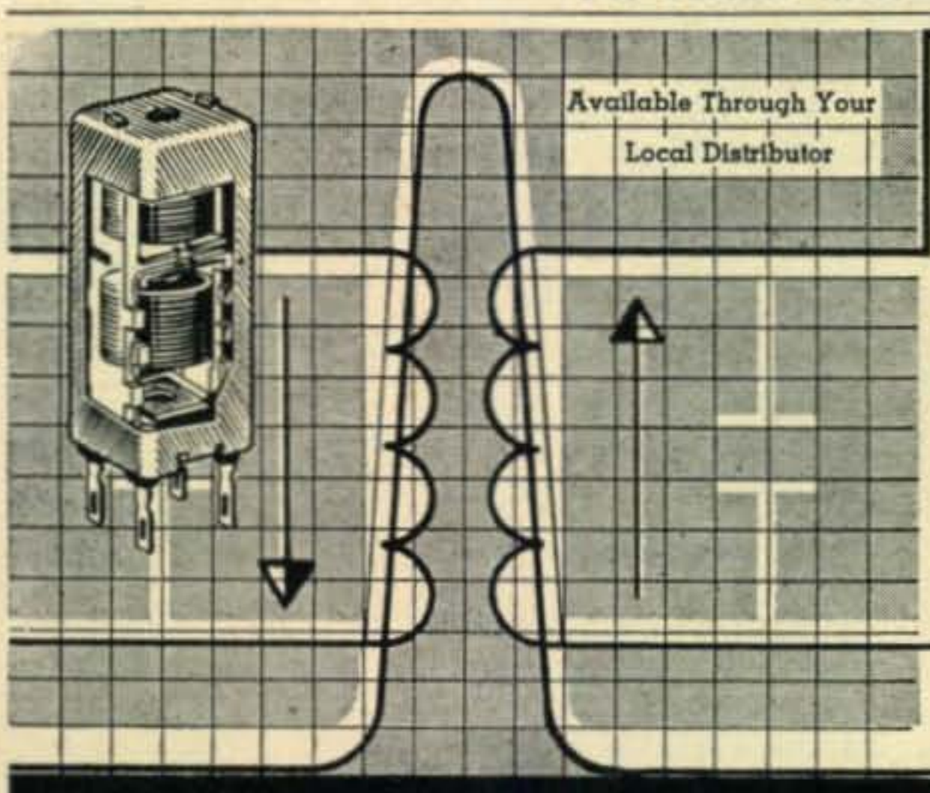
For further information, check number 62, on page 106



COMMUNICATION

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TYPE		ITEM	6 db*	20 db*
12-C30	455 kc.	Input/Interstage I.F.	11.5 kc.	30.1 kc.
12-C31	455 kc.	Output I.F.	13.6 kc.	32.6 kc.
13-W1	1500 kc.	Input/Interstage I.F.	130.0 kc.	264.3 kc.
13-W2	1500 kc.	Output I.F.	121.4 kc.	240.5 kc.
913-C1	455 kc.	Input/Interstage I.F.	8.5 kc.	24.3 kc.
913-C4	455 kc.	Output I.F.	10.9 kc.	28.6 kc.
913-W1	1500 kc.	Input/Interstage I.F.	19.5 kc.	61.5 kc.
913-W4	1500 kc.	Output I.F.	25.6 kc.	73.4 kc.

J. W. MILLER COMPANY

5917 So. Main St., Los Angeles 3, California

*Tolerance: ±10%

For further information, check number 63, on page 106

TRANSISTORIZED POWER SUPPLY

12 v.d.c. input — 120 v.d.c. out at 125 ma
Intermittent basis 25w.

•

Applications — 115 volt light bulbs

Electric shavers
Receiver power supply
Power for small AC-DC radios
Emergency power supply

•

Measures 3¾" x 2" x 1¾"

•

Plugs into car lighter socket

•

Model Whirlaway. Hermetically sealed. Operates from 20° C to 55° C. Short circuit proof.

List price $22.50 Amateur net $14.95, prepaid
Check or Money Order only.

CQ The Radio Amateur's Journal

Box: SYDMAR • 14 VANDERVENTER AVE.
Port Washington, L.I., N.Y. 11050

For further information, check number 64, on page 106

New! SPACE AGE ELECTRONICS!

CPR SPEECH COMPRESSOR.....only $14.95

- TRIPLE average power output
- Mounts on panel connector
- Powered by common battery
- Compression level adjustable

DP-4 2M/6M FREQUENCY DIVIDER.....only $6.75

• One feedline runs up tower where DP-4 feeds separate 2M & 6M antennas; second DP-4 in shack combines outputs of 2 & 6M transmitters • Loss ½ db max • Power 200 watts • Waterproofed SO 239 connectors unless others specified

FL-2 2 METER BANDPASS FILTER.....only $6.95

• Reduces spurious signals in receiver or TVI from transmitter • 50 ohm impedance • Loss 1 db maximum • Power 100 watts • Signals below 130 mc and above 155 mc attenuated more than 25 db • SO 239 connectors

(Florida residents include 3% sales tax)

COMMUNICATION COMPONENTS COMPANY
P. O. Box 8721 Orlando, Florida

For further information, check number 65, on page 106

S.S.B. Results [*from page 47*]

UA3DR	..	"	23,725	75	315
UA4PB	....	"	18,879	93	203
UN1AB	..	"	14,229	93	153
UA3DB	..	"	13,320	74	180
UA4SS	....	"	11,960	65	184
UA1CK	..	**7**	**3,055**	**47**	**65**
UA3RB	..	**3.5**	**308**	**14**	**22**
		Estonia			
UR2AR	....	**14**	**15,022**	**74**	**203**
UR2KAA		"	602	14	43
UR2RCC		**3.5**	**735**	**21**	**35**
		Lithuania			
UP2ON	....	**A**	**12,308**	**68**	**181**
UP2KNP		"	4,464	48	93
		Latvia			
UQ2FX	....	**A**	**14,271**	**71**	**201**
UQ2AZ	....	**14**	**24,475**	**89**	**275**
		Maldavia			
UO5RO	..	**14**	**1,344**	**28**	**48**
		Ukraine			
UB5UN	....	**A**	**58,911**	**123**	**479**
UB5WE	..	**14**	**116,482**	**139**	**838**
UB5EF	..	"	10,292	62	166
UB5CI	....	"	1,265	23	55
UB5DT	..	"	1,100	20	55
UB5WJ	..	**3.5**	**204**	**12**	**17**

Oceania

		Australia			
VK2AHT	..	**A**	**216,692**	**142**	**531**
VK6RU	....	"	29,625	79	375
VK3XB	....	"	936	18	52
VK3SM	..	**21**	**372**	**12**	**31**
VK3TL	....	**14**	**74,030**	**110**	**673**
VK2APK	..	"	29,248	64	457
VK2KM	..	"	23,793	77	309
VK2ANO		"	7,708	41	188
		British North Borneo			
ZC5AJ	.....	**A**	**202,616**	**152**	**1333**
		New Zealand			
ZL1AIX	....	**A**	**321,750**	**150**	**2145**
ZL1AGO	..	**7**	**686**	**14**	**49**
		Guam			
W4SLW/KG6	....	**14**	**12,000**	**50**	**240**

South America

		Brazil			
PY2SO	....	**28**	**432**	**9**	**48**
PY2CQ	....	**21**	**2,784**	**26**	**107**
PY3AHJ	..	**14**	**16,167**	**51**	**317**
PY2BGO	..	"	348	12	29
		British Guiana			
VP3HAG	..	**A**	**102,221**	**119**	**859**
		Columbia			
HK4EB	..	**14**	**72,732**	**114**	**638**
		Ecuador			
HC2JT	....	**14**	**354,522**	**161**	**2202**
		Netherlands W.I.			
PJ2AA	....	**14**	**154,354**	**142**	**1087**
PJ3CD	....	"	10,105	47	215
		Uruguay			
CX3BH	....	**A**	**228,105**	**137**	**1665**
CX2AY	....	"	5,280	40	132
		Peru			
OA4PI	....	**A**	**19,840**	**32**	**620**
OA4PD	....	**14**	**64,862**	**113**	**574**
		Surinam			
PZ1AX	....	**A**	**226,570**	**139**	**1630**
PZ1CE	....	**14**	**178,562**	**127**	**1406**
		Venezuela			
YV5BIG	....	**A**	**273,969**	**139**	**1971**
YV5BS	....	"	75,824	112	677
YV4GD	....	**21**	**7,400**	**40**	**185**
YV5BPG	..	**14**	**14,784**	**42**	**352**

MULTI OPERATOR

World Wide

		North America			
W3MSK	....	**A**	**267,460**	**215**	**1244**
K6EVR	....	"	109,560	166	660
KØKKU	..	"	22,260	88	253
WØIHR/VO1	....	"	33,390	97	350
		Africa			
5A2TZ	....	**14**	**250,432**	**144**	**1678**
		Asia			
		Christmas Island			
VK9XI	....	**14**	**18,420**	**60**	**307**
		Europe			
		Austria			
OE1PHW	..	**A**	**40,479**	**108**	**309**
		England			
GB3RAF	..	**A**	**347,072**	**187**	**1856**
G3OSE	....	"	44,165	121	365
		Finland			
OH2AA	.....	**A**	**134,152**	**164**	**818**
		Germany			
DLØCA	....	**A**	**189,057**	**181**	**1597**
DL5AU	....	"	158,406	157	1009
DL5UW	..	"	84,816	152	558
DJ8EG	....	"	69,027	133	519
DJ1SX	....	**14**	13,115	67	115
DL8AJ	....	**A**	11,932	76	157
		Iceland			
TF2WIN		**14**	**27,004**	**86**	**314**
		Norway			
LA1H	.....	**A**	**143,507**	**133**	**1079**
		San Marino			
9A1ZG	.....	**A**	**349,002**	**207**	**1686**
		Sweden			
SM5CZQ	..	**A**	**153,990**	**174**	**885**
		Switzerland-Geneva			
4U1ITU	...	**A**	**24,128**	**62**	**394**
		U.S.S.R.-European			
UA1KBW		**A**	**192,060**	**180**	**1067**
		Latvia			
UQ2KAT	....	**A**	**8,820**	**60**	**147**

Number groups after call letters denote the following: Band (A-all), Final Score, Number of Prefixes, Number of points. **Bold face** listings are certificate winners.

6BLZ Special [*from page 58*]

hiss and peak distortion. Note that this modification is for the crystal b.f.o. circuit shown in fig. 2 of the original article.

Examination of the S meter amplifier and a.v.c. circuit in fig. 2 of this article shows no A.V.C. DELAY switch. The 0.1 and 2 meg resistor served nicely and the switch was eliminated. You may, of course, remove this if you so desire.

R.F. and I.F. Stages

Because the i.f. coils are working at high impedance the stages may be prone to oscillation unless all parts of each particular stage are returned to a common ground lug. If the constructor has a stable i.f. working, much more volume can be obtained by reducing the cathode resistor in each of the 6BA6 cathodes to 68 ohms. The increase in gain brings up hiss which can be reduced by putting in an i.f. gain control. Return both of these cathode resistors to a 5000 ohm potentiometer for an i.f. gain control.

Any instability can be stopped in the 2nd i.f. by putting a 47,000 ohm resistor across the primary of the i.f. transformer.

The cathode resistor of the r.f. stage 6BZ6 can be reduced to 68 ohms and the a.v.c. bus can be attached to the bottom of the 1 meg grid resistor. By doing this, a.v.c. is only needed on the r.f. stage and first i.f. stage. ■

Thevenins Theorem [*from page 50*]

Thevenin at points *CD*, we remove all circuitry to the right of *CD* and work with just the remaining circuit. We find that the open circuit voltage V_{CD} equals 50 volts and the resistance looking to the left of *CD* is 15 ohms assuming zero internal resistance of the voltage source.

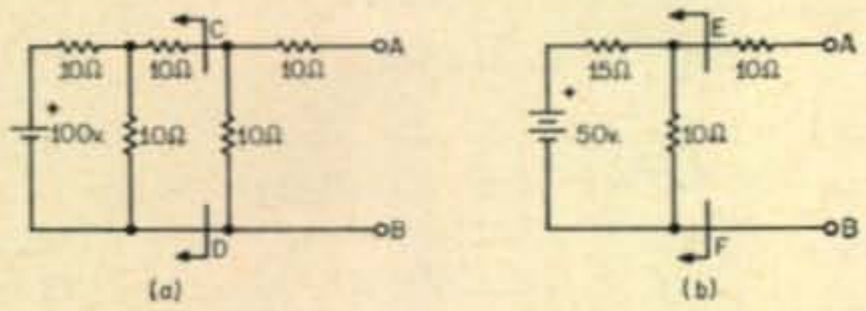

Fig. 3—Thevenin's theorem can be useful in such complex circuits as shown above.

The circuit then appears as in fig. 3b. If we consider the open circuit voltage V_{AB}, it will be equal to the voltage V_{EF} since the ten ohm resistor connected to terminal *A* will pass no current in the circuit shown. As in the previous example the voltage V_{EF} can be calculated as follows:

$$\frac{V_{EF}}{R} = \frac{V_t}{R_t} \quad V_{EF} = R\frac{V_t}{R_t} = 10\,\frac{50}{25} = 20 \text{ volts.}$$

The open circuit voltage V_{AB} is then 20 volts. Considerable time and effort is saved by this method of analysis since the calculations are simple and straight forward. ■

RTTY A-Z [*from page 38*]

i.f. passband. With this condition the S-meter reading should be the same for each. When this is done the b.f.o. should be turned on and adjusted to 2550 cycles so that the beat note from *mark* is 2125 cycles and the beat note from *space* is 2975 cycles. (Assuming the shift to be 850 cycles). Be sure that the previously adjusted tuning for the equal reception of the two signals *is not touched* while this adjustment of the b.f.o. is being made. *The b.f.o. should be left at this position* so long as the signals being received uses the 850 cycle shift or any other shift whose beat notes you wish centered on 2550 cycles. The machine is on *mark* when resting so this suffices for the transmission of a constant *mark* signal. A constant space signal can be transmitted by simply breaking the keyer circuit. The easiest way to do this is to open the break switch on the machine.

The author has already briefly touched upon the tuning and operation of a receiver for the proper reception of the two tones of a F.S.K. signal. Next month this subject will be further discussed. The author will also cover some of the things to look for in a receiver that is particularly desirable in copying RTTY.

[*To be continued*]

The Arc-Port [*from page 29*]

This is enough power, on 80 meters to really get out. We have worked Arizona, Nevada and stations to the north of San Francisco with S9 reports on the 60' of wire.

The Gas regulator tube should never have more than 25 ma flowing through it and the 8K series may have to be adjusted. As long as the VR tube was there, we decided to use it on the local oscillator of the 6K8, to help stabilize signal drift. The pin connection on the oscillator coil is number five and the 150 volts regulated can be fed here when the wire is cut and another routed to the relay.

The Cabinet

This nice looking cabinet is just a piece of do-it-yourself from the local hardware store. It was bent and slipped over the whole chassis. What could be simpler? The bezel was added for looks, and is one inch wide, and tapered at the bottom.

The total weight, with key and antenna, checks out on my bathroom scales at 10 lbs., and easily going by air. Either way, driving or flying, on a trip this little rig will give you many enjoyable QRM free QSO's on the 80 meter band!

Ham Clinic [*from page 73*]

volved in a high school science fair competition.

32S-1 and 32S-2 Improved Carrier Suppression—"I have a very early second hand Collins 32S-1 transmitter. I understand that a bulletin came out sometime ago showing how to improve carrier suppression. If so, what do I ask Collins for?"

Ask Collins for Bulletin No. 2, dated 4-1-60. This bulletin contains 5 pages. If upon inspection of your 32S you find that there are only two diodes in the balanced modulator circuit, it is recommended that you make the modifications suggested in the bulletin.

KWM-2 and WM-2A ALC Improvement and ALC Overshoot Elimination—Bulletin No. 4 dated 9-2-60 covers improvements to a.l.c. action and elimination of a.l.c. overshoot in early models of the KWM-2 and KWM-2A.

SP-600JX—"The dial lamps light in my SP-600JX but nothing is heard from the speaker or headphones. What do you suggest I look for first?"

Check for a blown B minus fuse (F_2 on the diagram). This is not the 1.6 amp line fuse. Be sure to replace the B minus fuse with one having a rating of 3/8 amp.

SX-25 Gain Control—"What is the value of the SX-25 r.f. gain control? Also, can you suggest a tube to replace the 6SK7 r.f. tube?"

The value of the gain control is 10,000 ohms. Try the 6BZ6 for the 6SK7, or get a 7 prong miniature adapter and try the Nuvistaplug described earlier in this column.

SR-34 Crystals—"I just got my tech license and was lucky enough to obtain a second-hand Hallicrafters SR-34 (2 and 6 meter transceiver),

but without the instruction book. What crystals do I use in this set?"

Suggest you write Hallicrafters for an instruction book before you attempt to use this fine set. The crystals are 8 mc units mounted in FT-243 holders.

SB-300—"I just assembled the SB-300 receiver but I do not seem to be getting proper a.g.c. action. What do I look for?"

First of all look at page 68 in your instruction book and you will find 6 possible causes for defective a.g.c. action. Anyone can shoot trouble in the SB-300 for Heath has made it very easy with their comprehensive trouble shooting charts. However, if you are like a few others who have assembled the set, you did not *heat-sink* the diodes CR_1 and CR_2 and you held the soldering iron on the connections too long—bye-bye diodes. Check the diodes with an ohmeter. In one direction you will get a low resistance reading, in the other a very high or infinite reading. If the diodes are open you'll get no reading at all. If the diodes are shorted you'll get a low resistance reading in both directions. Incidentally, you did pick the best receiver kit available!

Mohawk Receiver—"My Mohawk has given me wonderful service but the last time I turned it on the line fuse blew. I replaced the fuse and it blew again after a couple of seconds. I note that there is sputtering around the filament of the 5V4 rectifier. What do I look for?"

First suspect the 40 mf electrolytic as shorted. If this is not the case check the 100 mf output filter capacitor. If it is okeh then check the 7 henry 150 ma choke for a short to ground. If okeh, then check for a shorted by-pass on one of the tubes' screen lines. A heavy short will cause rectifier tube "sputtering." Be sure you check all tubes for shorts.

DX-60 Plate Modulation (Again)—"I want to modify my DX-60 for plate modulation. Do I have enough power to do so?"

No. To do a good job you would need an outboard modulator (amplifier) and separate power supply. The a.f. amplifier would have to be a 30 watt unit for full 100% modulation. If you tune that DX-60 properly its modulator works fine.

BC-1335 to 6 Meters—"Where can I find information for converting the BC-1335 to 6 meters?"

CQ December 1958.

Thirty

We wish our readers a very Merry Christmas.

73, Chuck, W6QLV

Ham Shop

Rates for the Ham Shop of 5¢ per word for advertising which in our opinion, is non-commercial in nature. A charge of 25¢ per word is made to all commercial advertisers or organizations. Since we do not bill for Ham Shop advertising, full remittance **must** accompany all orders.

Closing date is the 10th of the 2nd month preceding date of publication. Your copy should be typewritten, double spaced on one side of the page only.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publisher of CQ cannot vouch for the merchandise listed therein. We reserve the right to reject advertising which we feel is not of an amateur radio nature.

CREATIVE QSL CARDS free, new catalog and samples. Personal attention given. Wilkins Creative Printing. P.O. Box 787-2, Atascadero, California.

QSL's Samples free. Little Print Shop, Box 9363, Austin, Texas.

QSL's . . . $1.90 . . . Dime . . . Filmcrafters . . . Martins Ferry, Ohio

RUBBER STAMPS for QSL Cards. Kits available. Free sample impressions. E & R Stamp Co., 50 Gerald Rd., Rantoul, Illinois.

QSLs Samples, dime. Print Shop, Corwith, Iowa.

QSL CARDS $2.50 per 100 in three colors. Samples and catalog free. Garth, Box 51C, Jutland, New Jersey.

QSL CARDS. As low as $2.50 per 100. Samples free. Radio Press, Box 24C, Pittstown, New Jersey.

RUSPRINT QSLs—SWLs 100 2-color glossy $3 postpaid. QSO file cards $1 per 100. Rusprint Box 7507, Kansas City, MO. 64416.

QSL's 3-color glossy. 100 $4.50. Rutgers Vari-typing Service. Free Samples, Thomas Street, Riegel Ridge, Milford, N.J.

QSLs SWLs XYL-OMs (Sample assortment approximately 9¾¢) covering designing, planning, printing, arranging, mailing, eye-catching comic, sedate, fantabulous. DX-attracting. Protopay, snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minn.

QSL's Samples 25¢. Rubber Stamps; Name, Call, Address, $1.55. Harry Sims, 3227 Missouri Avenue, St. Louis, Mo. 63118.

QSL's, CB, WPE samples 10¢. Nicholas & Son Printery, P.O. Box 11184, Phoenix, Arizona. 85017.

QSLs $2.00 per 100 postpaid. New style glossy 2-colors. Free sample. Hobby Print Shop, Umatilla, Fla. 32784.

PICTURE of yourself, home, equipment etc. on QSL cards made from your photograph. 250—$7.50 or 1000—$14.00 postpaid. Samples free. Write Picture Cards, 129 Copeland, La Crosse, Wis.

DELUXE GSL's Professionally printed prestige cards custom-designed just for you. Flair Printing Corporation, 8 West 45th Street, New York, N. Y. 10036.

QSL's??CB's??SWL's?? Finest samples 25¢. Deluxe 35¢. (refunded). Sackers, W8DED, Holland, Michigan. (Religious samples 25¢).

FREE! Write for blue book list. WØGRQ offers you hundreds of reconditioned equipment bargains. Galaxy 300 $229; AF-67 $49.95; HT-37 $269; Warrior $195; Poly-Comm 62B $229; HT-32 $254.50; HX-50 $249.50; Cheyenne $49.95; Marauder $254.50 Meteor $59.00; HT-41 $254.50 and many more. Ask for our new 1965 catalog. Write Leo, Box 919, Council Bluffs, Iowa.

WANTED: Commercial, Military, All types, ARC, ARN, ARM, GRC, PRC, URR, URM, TS, 618S-1-T, 17L, 51R-V-X, APN, others . . . RITCO. P.O. Box 156 Annandale, Va.

COMPLETE mobile rig! Cheyenne, matching power supplies, mike, Super-12, Slim Jim whip. FB condx. $175. WA6UYB, 5037 Raton Circle, Long Beach, California.

FOR SALE Apache $170, HQ110-C $150, Hallicrafter HA-5 VFO $60 (used under two hours). College bound. WA2RFH, 227 North Jackson Avetnue, Endicot New York ST5-6763.

NIKE MISSILE CONTROL LAUNCH PANEL Aluminum, console type. Approx. 6′ h × 4′ w × 3′ d. Contain telephone sets (8010134) rectifiers. Motors & blowers, meters, switches, transformers and dozens of electronic tubes, relay, lights, etc. and thousands of feet of nylon coated copper cable. Approx. wt. 400 lbs. Only three units @ $150 each. Like new. F.O.B., W. B. Prothro, Box 3661, El Paso, Texas.

SELL: DX-60, HG-10 VFO $95. S-108 $75. All 3 $170. Free delivery within 50 miles of Boston. K1YJC, 18 Eliot Avenue, West Newton, Mass. 02165.

SELL: Heathkit SB10 partially constructed complete in original packing $50 prepaid. KØVRN. 3A-5th Street, West, Randolph AFB, Texas.

HRO-60 coil sets wanted, state type, price, and condition in first letter. WB2FIL, RD-1, Box 315, Old Bridge, New Jersey.

PLASTIC CALL SIGNS. Baisden Specialties, Box 6174, Savannah, Georgia.

PRINTED CIRCUIT BOARDS Hams, Experimenters. Many different projects. Catalog 10¢. P/M Electronics, Box 6288 Seattle, Washington 98188.

HAMS Convert any television to sensitive, big-screen oscilloscope. Simple changes. No electronics experience necessary. Illustrated plans, $2.00. Relcoa, Box 10563, Houston, Texas.

COLLINS 32S-1, 75S-3 516F-2 with cables and manuals like new in original boxes. $975.00. Also, Heath 2KW PEP xmtr with spare 4-400 and matching Heathkit 3200 volt power supply. $395. Will finance. Gene Cramer W8APQ, P.O. Box 612, Benton Harbor, Mich.

WANTED Commercial, Military, All types, ARC, ARN, ARM, GRC, PRC, URR, URM, TS, 618S-1-T, 17L, 51R-V-X, APN, Others. RITCO, P.O. Box 156, Annandale, Va.

WASHINGTON Amateur Radio News. Free copy. Foundation for Amateur Radio, 2509 32nd St., S.E., Washington, D.C. 20020.

JOYSTICK Pending internal merchandising arrangements please order direct to Partridge Electronics Ltd., 7 Sowell St., Broadstairs, Kent, England.

JOYSTICK, Cave dwellers, Cliff dwellers. Your prayers are answered. Send only $18.15 to Partridge Electronics Broadstairs England for complete DX antenna system by return mail. Just stand it in the shack, connect to TX (or RX) and fire away all bands 160 thru 10, CB Mars frequencies. Money back guarantee.

ELECTRONIC TUBES—Top brands sold at substantial savings! (Minimum Order $15.00). Authorized GE Distributor. Send for free Buyers' Guide for all your tube requirements. Top Cash pad for your excess inventory (New only—Commercial Quantities). Metropolitan Supply Corp., 443 Park Avenue South, New York, NY. 10016, 212 MU 6-2834.

ATTENTION HAMS! We buy, sell ham gear. Repair and alignment facilities available. Hold Advanced and First phone. Used gear always reconditioned. Money back guarantee. KitKraft Company, P.O. Box 406—Canal St. Station, New York N.Y. 10013.

COMMUNICATIONS teletype, unusual surplus bargains. Free flyer, MDC, 923 W. Schiller, Phila. 40, Pa.

ANTENNA tuning unit, brand new $3.00 postpaid (cost Navy $85.00). MDC, 923 W. Schiller, Phila., 40, Pa.

REMOTE CONTROL unit, 9 tubes, AN/ARW-26, brand new, complete, $5.00 postpaid (cost Navy $125.00) MDC, 923 W. Schiller, Phila., 40, Pa.

FOR SALE Complete instructions including 28 page booklet and 22" × 36" schematic for converting the ART-13 transmitter to a.m. and s.s.b. Satisfaction guaranteed. $2.50. Sam Appleton, 501 No. Maxwell St., Tulia, Texas.

ATTENTION RTTY'ers. Typewriter ribbon re-inking device—$3.00 postpaid! WØAJL—Walter E. Nettles, 201 So. Eudora St., Denver, Colorado, 80222.

12 DB GAIN forward. 100 db front to back ratio. Our rhombic antenna is superior to any other antenna on the market. We challenge you to find an antenna on the market with as much forward gain. We do not guarantee good performace, just the best. Specifications: 2000 watts p.e.p. 600 ohms impedance, swr 1.3 to 1, low Q, easy to match. Complete with high tensil strength copper wire, insulators, and termination resistor. This is the same antenna used by telephone companies for overseas communication. Sold on a fifteen day money back guarantee. Exact frequency must be specified. Order now! 20 Meters $44.95, 15 Meters $37.95, 10 Meters $39.95. The Hilliard Laboratories, Box 2614, Macon, Georgia.

JOYSTICK See July "**CQ**" p75. Watch future ads in "**CQ.**"

TOROIDS uncased 88 mh 60¢ each or 5/$2.50. Fasold, WA6VVR, Box 34, Dixon, California.

BUY, SELL, TRADE Ham, CB Directory. 12 issues $1.00. Philupi, 1225 Hillside, North Bergen, New Jersey.

STOP paying high prices for QSL's. Add your call & handle to our low cost QSL's and you're in business. 250 for $1.50 or $1.00 for 150 cards. Haral Assoc., 1133 Broadway, New York, N.Y.

WANTED Tubes, parts, components, new and used Amateur, Industrial, Commercial. Mid-West Electronic Supply, 54 Mia Ave., Dayton 27, Ohio.

FOR SALE: Swan 240 and 110 volt power supply, $350. K3MHK, 338 Grandview Ave., Chambersburg, Pa., Phone 264-4547.

ELIMINATE Mobile Vibrator Noise. Revolutionary device outmodes noise-creating vibrator. Completely transistorized unit plugs directly into vibrator socket. No moving parts. Same size as vibrator. 12 Volts. Not a kit. Comes completely wired ready to use. **For negative ground only.** State make and model of transceiver. $11.95 PPD.-$5.00 deposit on all C.O.D. orders. Tel-Trol Systems, 2180 Bronx Park East, Bronx, N. Y.

SALE: One each: SX-111 near new with R-47 speaker $160, Heath HR-10 receiver near new $50, D-104 mike $10, Globe AT4 Matcher Sr. (new) $50, Globe 755A VFO (new) $40, Globe Scout Deluxe transmitter with factory improved circuitry (near new) $100. K5STO, 7418 Quail Run, San Antonio, Texas.

SLASH water usage, water saver $1.00 postpaid. R. H. Bucher P.O. Box 41, Lansdale, Pa. 19446.

PULEEZE let me have your expired call letter license plates for my collection. Other types of plates also appreciated very much. Postage promptly refunded. I would love to hear from you. Chuck Crisler, WA5ERC, 154 Ronald Blvd., Lafayette, Louisiana 70501.

FREE catalog: Wholesale electronic parts and equipment. Hundreds of bargains. Western Components, Box 2581, El Cajon, California.

MAKE REASONABLE OFFER: Johnson Viking Valient with Matchbox-HQ129X with speaker. Both excellent condition. K2EHM, Glenn Farnsworth, 4409 Sharon, Pennsauken, New Jersey.

SALE: FCV 2 Two meter converter in LMB box $13. FCV 2 Six meter converter $13. AN-APR/4 RCVR, built in a.c. power supply, no tuning units $18. Motorola Xmtr (part of FM two-piece) on 6 meters (FM) $9. W3WUA, Box 25, Bigler, Pa.

FOR SALE: Gonset G-50, 6 meter transceiver, good shape, first $200 buys. Donald K. Szatkowski, 706 W. Wylie, Bloomington, Indiana.

FOR SALE: Cheyenne, $45 with UTI 470, HFS National $80 with manuals, FOB WØTKU, 3030 Tomahawk, Rapid City, South Dakota.

RADIO frequency converters from $10. World's largest selection of frequencies, also transmitters, receivers, vidicon TV cameras. Catalog 10¢. Vanguard, 190-48 99th Avenue, Hollis, N. Y. 11423.

BUY OF A LIFETIME for VHF homebrewers 100 Watts output up to 250mc. Type 5894 Tubes made by Amperex including Johnson recessed ceramic sockets $14.95 each. Ruggedized for mobile use. Brand new in original cartons. 1 yr. REPLACEMENT GUARANTEE shipped postpaid. Cash or M.O. WØFUV, Box 463, Troy, Ohio.

SELL: Apache TX-1 Transmitter, $225. National NC-125 Receiver, $75. Both units are in A-OK condition. Chas. Fink, W2BXD, 33 Chittenden Ave., Tuckahoe #7, N. Y.

32S-1 CONV. to S-3 Cond. and 7553 and a.c. Supply. 7553 has 500 Mech. Filter in am Position and pair have $200 DeLuxe conversion. Easily worth $1400. Sacrifice to firm buyer for $1000 cash. Bill Guimont, W6YMD, 1980 Meadow View, Thousand Oaks, California. Phone 495-5648.

JENNINGS 10-300mmfd 10KV vac uum variables $35 each, new 4x250 $10 each, new 4-400A $20 each, used OK $5 each. Send stamped envelope for list of other goodies. WA4ETD, 1075 Powatan Street, Fayetteville, N. C.

CENTRAL ELECTRONICS 10A W/QT-1 Harvey Wells TB5-50 W/v.f.o. Knight TV-FM Sweep Generator Heathkit impedance Bridge @ 1 kc ferris noise & field intensity meter 32A Wheatstone Bridge 1-49. Best offer Takes. Gordon Ostlund, 212 Market Street, Pocomoke City, Md.

BARGAIN list, clearing out, transformers, chokes, meters diodes, relays, cabinets. Collins 75A-1 receiver, matching speaker, manual, xtal calibrator, excellent $160, Heath HR-10 receiver, new $50, 4D32 tubes, guaranteed, $8. Thordarson 3000v, 720ma CCS plate transformer with matching swing choke, fully enclosed, $45, 3Kc lattice filters, new, $8, WØLWZ, 1030 So. Dudley, Denver, Colorado. 80226.

WANTED: Tx Micomold 45 watts, 3 bands, Aerovox LC-checker, Edukit, old SW manuals Thordarson Stancor Hammarlund, state edition and printing year, small light power plant 110 v.a.c. or Olson-Rice engine ¾ hp, Knightkit SWR meter, CB test set, Heathkit MP-10, IM-20, HR-10. L. Larsson Vulcanusgatan 8, Stockholm Va Sweden.

BEST offer before Jan. 1st, 1965 takes one original copy "200 Meters and Down" in excellent condition. W2RXW Walter L. Babcock, 405 Sayles Street, Oneida, New York.

TV CAMERA instructions how to build at low cost $1.50. Denson Electronics, Rockville, Conn.

URGENT: I would like to hear immediately from any American overseas missions equipped for ham radio and interested in direct QSOs for R.I.A.L. promotion. All denominations please reply NOW, air mail or via ham radiogram to Dick Ellers, K8JLK, Jaycees, Warren, Ohio, U.S.A.

FOR SALE: Clegg 99er good cond. $90; HE45 Good Cond. with v.f.o. $85; Gonset Com., two meter transceiver, Good Cond. $90. WB21FC, 413 Holmes Drive, Burlington, N. J.

FOR SALE: Near new Mosley CM-1 s.s.b. receiver. Will ship in original factory carton with manual $130. K7WJT, 6240 Placita Pomona, Tucson, Arizona, Phone 297-2482.

TECHNICAL MANUALS for surplus electronics. Stamp for list. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

FOR SALE: T-150 xmtr, mobilette 61 converter. Make offer. K1ZKR, Milton Columbus, 43 Hartley St., Webster, Mass. 01570.

COLLINS 32V3 Excellent condx, $225. Ken, K2SUY, 127 W. 3rd St., Rancocas, N. J., (607-AM7-5589).

WANTED—AN APR-14, 13 receivers. SG-13, H-p4, SG-1, SG-2, MD-83, 479 Collins, in any condition. T-368-C xmtrs. R-390, 390A, R-388, 389, 391. Receivers. RT-66 thru 70 Rt units RT/77-GRC-9, GRC-10, GRC-19. RCA, Bendix, Collins Aircraft Radio and Radar Equip. Hewlett Packard, General Radio, Tektronix, etc., Test Equipment. GRC, PRC, GRR, TCC, ARC, sets. ARM, PRM, URM, UPM, URM, SG Test sets any and all types. You name it. Call E. Charol, Tech Systems Corp., 42 W. 15th Street, N. Y. 11, N. Y. CH 2-1949 Collect.

FOR SALE: Kilowatt Transmitter pp-250TH, 810 Mod. 1½ Kw PS. 14 Simpson Meters, Commercial BUD rack with casters. Everything wired except to tie in thru meters. 2 KW, Antenna Tuner with plug in coils. A thing of beauty. Will deliver within 100 miles for $300. Walter George Bergman, P.O. Box 214, Wellesley Hills, Mass. 02181.

WANTED: Mint condition BC-342 with 200-400 Kc Low band. With 110 v.a.c. PS. Write Walter George Bergman, P. O. Box 214, Wellesley Hills, Mass. 02181.

KWM-2 with mobile mount. High Serial. $850 WA9HKV, R2, Medford, Wisconsin.

SELL/TRADE: Complete parts for KW linear 10-80M 2-813's, 2-886A's. Worth $175+. Pick up only. Free TV and old console radio with deal. Also: D-104w/PTT, NEW: Wen Drill w/accessories, Superior Instruments Model 79 Super-Meter, Accurate Instruments Model 156 Genometer. For guns OR? What Have You? Stephen Clifton, WA2TYF, 800 West End Avenue, N. Y., N. Y. 10025, 212 MO 3-4941.

GONSET G-76 Transceiver with Gonset Power supply both like new (less than 5 hours on the two) with manual $350. cash for both. D. R. Andriesian, K7EZX-502, Witeaker St., Cottage Grove, Ore.

SELL: Lampkin frequency meter model 105BSER. #5914. Approx. two years old. In new condition. Manual, calibrated charts for C. B., Marine and several business frequencies. Best offer. Will consider trade for good test equipment. Cost new $260. All inquiries answered. Stanley Laska, Brushy Plain Road, Branford, Conn.

WANTED: R-390 or R-390A in any condition. Write stating price to Duncan Covington, K5CMY, Quarters 2509C, Fort Lewis, Washington.

WANTED: Hammarlund SPC-10 Converter, also good modern tube tester. State price and facts. Will answer all letters. C. F. Albertoni, 1410 Brookwood Drive, Suffield, Ohio, K8JBE.

ATTENTION! "Equipment Exchange-Ham Trader: now combined! Bigger, better offers than ever! Send $1 for next 12 interesting issues. Sample free. Al Brand, WA9MBJ, Sycamore, Ill.

WANTED: DeForest receivers, transmitters, Audion with screw base, "H" tube, Oscillion, Fleming valve, Boonton 160A "Q" meter. W9EWK, 610 Monroe Avenue, River Forest, Illinois, 60305.

MODEL 15 teletype, good condition $175. Will not ship. W2SAD, H. S. Warren, 196 Madison Ave., Mount Holly, N. J.

NC-183 rcvr $110. S-119 Hallicrafter Rcvr $18.50. Eico 1060K Battery Eliminator $21. EIMAC 4 × 65A $4.00 each. Josef Schilling, 1409 S.W. 66th, Oklahoma City, Okla.

SELL: Excellent Apache, SC-111 speaker, headphones, antennae, coax, etc., Best offer. All offers considered and answered. Art Bernstein, WA2YJN, 2411 East 3rd St., Brooklyn, N. Y. 11223.

FOR SALE: Globe Scout 680-A with new final, Lafayette KT-320 and speaker; $125. Also Knight-Kit CPO, 8-ohm headphones, 20-meter folded dipole; $5. Write Dennis Haarsager, Beresford, So. Dakota.

FOR SALE: HQ-110C in perfect condition. Ship if necessary. WA2RUB, 311 Blackheath Road, Long Beach, N. Y., or call 516 GE 1-3565.

FOR SALE Hallicrafter complete kw. Excellent condition. HT 32A; 33A; SX 101A; HA-1 Keyer and key; Johnson kw Matchbox; mike & relays, etc. Asking $1500. Make cash offer, will not ship. K2HDW, Carr, 505 So. Main St., Geneva, N.Y.

FOR SALE: Heath Kit Mohican GC1A used, like new. Best cash offer accepted. H.C. Codd, Sunset House, Alberta.

SELL: As new Johnson Thunderbolt. No modifications. Ship in original packing. $325. Write W7GYO, 1214 Beach St. 98270, Marysville, Washington.

Latest SBE 33 and DC2 dc power supply with mobile mounting plate $395. WA2FSD, 11 Burbury Lane, Great Neck, N.Y. Telephone: 516 482 7857.

MOVING, W6KEG is selling out! Write for large list of receivers, transmitters, tubes, test equipment, meters, miscellaneous parts, etc.—Send stamp for list to Bob Woods, 2142 Parkway, El Monte, California.

WANTED: May 1945 issue of CQ for CQ collection. Issue must be complete and in good condition. Contact the CQ editorial office with price and condition.

HOLIDAY BEST WISHES from WØCVU. On air since 1913. First Iowa radiophone station on eighty meters. 73's and CUL.

QSL's Frier Specialties Harvard St., Schenectady Large "Clip and Design" Catalog with samples 25¢.

COLLINS—AM wired kit $5.00! State model! KWM-2 skc independent receive control $15.00! Kit Kraft, Harlan, Ky.

For further information, check number 36, on page 106

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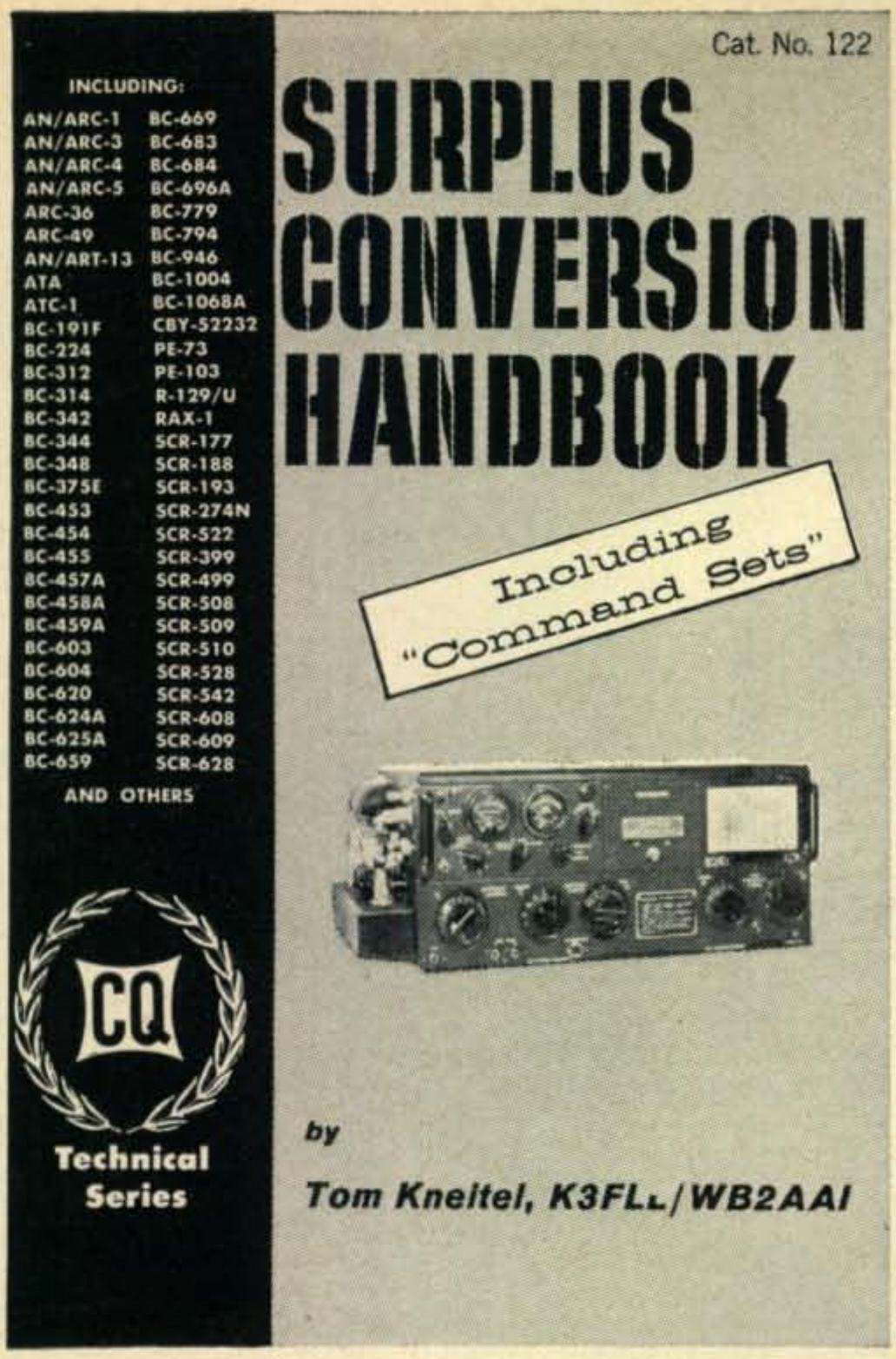

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The most popular handbook ever to be presented in the CQ Technical Series was the venerable old "Command Sets." Countless signals on the air today are there because of the information contained in "Command Sets," which went on to become the standard reference guide and definitive work on the topic. It went through 5 sellout printings, and when the last book of the final printing was stripped from our stock room we decided that the next printing would be an even bigger, newer, expanded, revitalized version of "Command Sets."

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"Surplus Conversion Handbook," Edited by Tom Kneitel, K3FLL/WB2AAI, is a book which every ham will find to be a valuable and interesting addition to the shack. It's available for immediate delivery.

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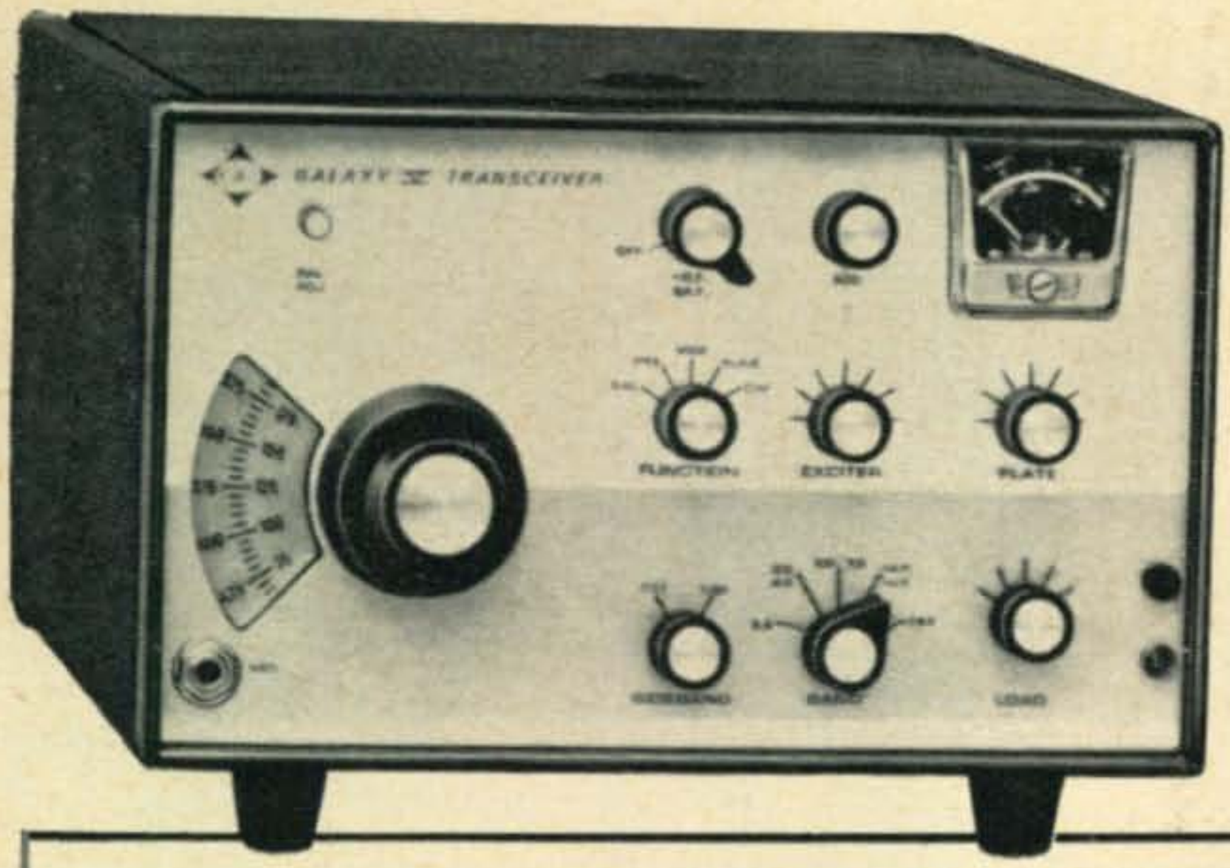

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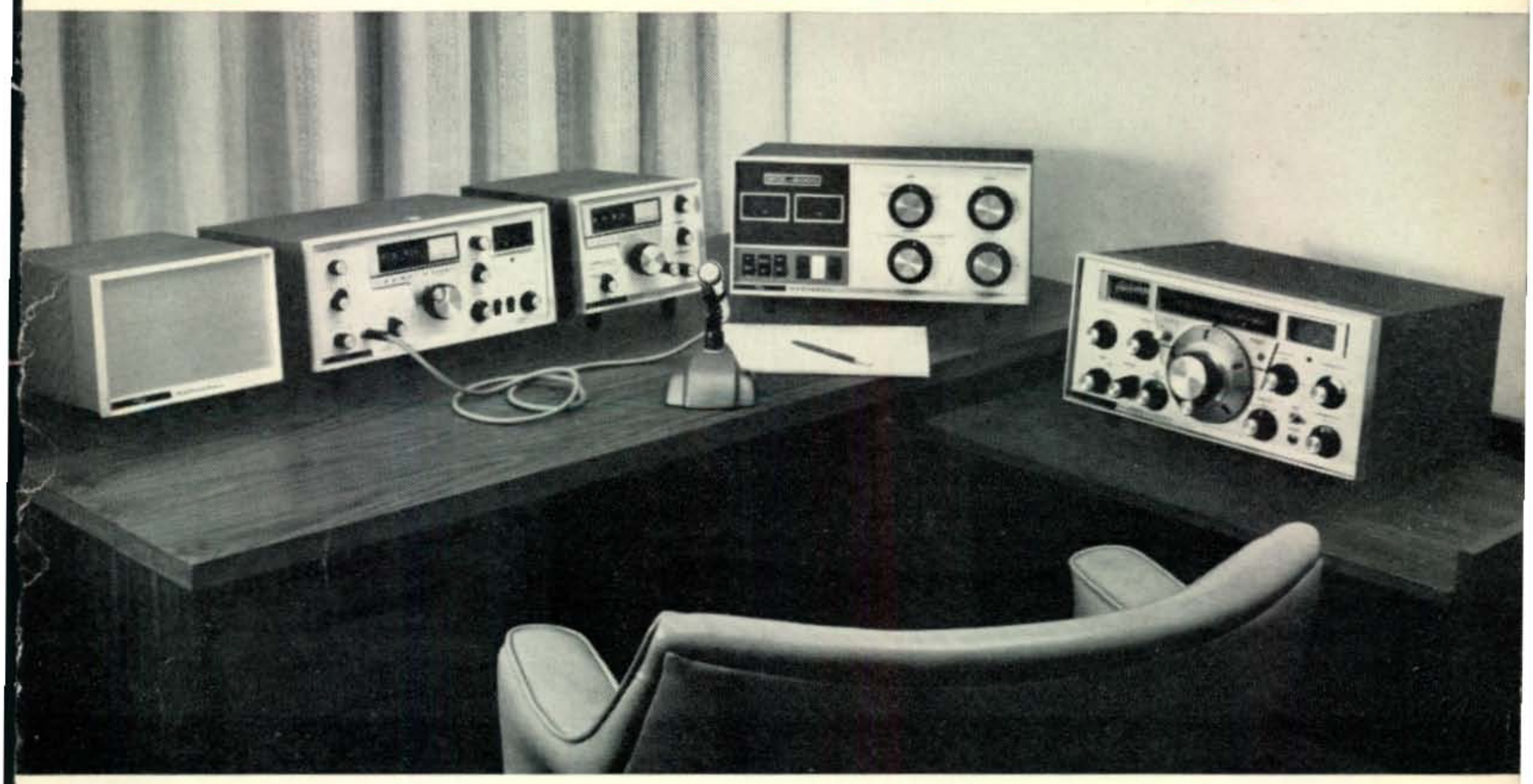

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