October 1961

50¢

CQ

87TH CONGRESS
1ST SESSION

S. 2361

IN THE SENATE OF THE UNITED STATES

AUGUST 1, 1961

Mr. GOLDWATER (for himself and Mr. SCHOEPPEL) introduced the following bill; which was read twice and referred to the Committee on Commerce

A BILL

To amend sections 303 and 310 of the Communications Act of 1934 to provide that the Federal Communications Commission may, if it finds that the national security would not be endangered, issue licenses for the operation of an amateur station to certain aliens for any temporary period, not in excess of three years.

The Radio Amateur's Journal

For further information, check number 1, on page 126

It pays to insist on

PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934

Z-2

Z-9A
Z-9R

Z-1

2XP

AMATEUR TYPES

Fundamental, PR Type Z-2

Frequency Ranges in Kcs.: 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (2M); 8,334 to 9,000 (6M).

Rugged. Low drift, fundamental oscillators. High activity and power output. Stands up under maximum crystal currents. Stable, long-lasting; ±500 cycles.......... **$2.95 Net**

(All Z-2 Crystals calibrated with a load of 32 mmfd.)

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Hermetically sealed; calibrated 24,000 to 24,666 and 25,000 to 27,000 Kc., ±3 Kc.; .050" pins.......... **$3.95 Net**

6 Meters, PR Type Z-9A

Fifth overtone; for operating directly in 6-meter band; hermetically sealed; calibrated 50 to 54 Mc., ±15 Kc.; .050" pins. **$4.95 Net**

CITIZENS BAND CLASS "D"
Type Z-9R, Transmitter

FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225, 27.255, calibrated to .005%. (Be sure to specify manufacturer and model number of equipment) **$2.95 Net**

CITIZENS BAND CLASS "D"
Type Z-9R, Receiver

Specify I.F. frequency, also whether receiver oscillator is above or below transmitter frequency. Calibrated to .005%. (Be sure to specify manufacturer and model number of equipment.).......... **$2.95 Net**

Type Z-9R, Radio Control

FCC assigned frequencies in megacycles: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255; calibrated to .005%. (Be sure to specify manufacturer and model number of equipment.).......... **$2.95 Net**

Type 2XP

Suitable for converters, experimental, etc. Same holder dimensions as Type Z-2.

1600 to 12000 Kc., (Fund.) ±5 Kc.......... **$3.45 Net**

12001 to 25000 Kc. (3rd Overtone) ±10 Kc.......... **$4.45 Net**

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Commercial Crystals available from 100 Kc. to 70 Mc. Prices on request.

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Official assigned frequencies in the range. Calibrated to .005%.
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Channels 2 thru 13.......... **$6.45 Net**

4.5 Mc. Intercarrier, .01%.......... **$2.95 Net**

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100 Kc. .. **$6.95 Net**

Z-6A

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For further information, check number 3, on page 126

✶ Very Hot News . . . from hallicrafters

Two great new kits...a complete, high-performance AM/CW station, from the world's most experienced designers of short wave equipment

HALLIKITS, we call them—a completely new concept of kit engineering that brings to your workshop, for the first time, these two outstanding advantages:

First, the unparalleled design experience of Hallicrafters' communications laboratories; and *second,* production-line proof of "Constructability" *before you buy.*

Have a wonderful time! Save a bundle of money! End up with a station the most experienced amateur would be proud to call his own.

HT-40 TRANSMITTER, $89.95

A perfect match for the handsome SX-140, both in quality and appearance. Hallicrafters' transmitter leadership is evident in every precision-engineered feature of this crystal-controlled 75-watt beauty—features as important to old-timers as they are to novices.

- **FEATURES:** You get excellent CW performance as well as AM. Full band switching, 80 through 6 meters. Enjoy easy tune-up and crisp, clean styling that has efficient operation as well as appearance in mind. Unit is fully metered, TVI filtered.
- **SPECIFICATIONS:** Maximum D.C. power input: 75 watts. Power output in excess of 35 watts CW, 30 watts peak AM phone. (Slightly less on 6 meters.) Frequency bands: 80, 40, 20, 15, 10 and 6 meters.
- **TUBES AND FUNCTIONS:** 6DQ5 power output; 6CX8 crystal oscillator and driver; 12AX7 speech amplifier; 6DE7 modulator; silicon high voltage rectifiers.
- **FRONT PANEL:** Function (AC off, tune, standby, AM, CW); Band Selector (80, 40, 20, 15, 10, 6); Drive control; Plate tuning, plate loading, Crystal-V.F.O.; Grid Current; Meter; AC indicator light; RF output.
- **REAR CHASSIS:** Microphone gain; antenna co-ax connector; remote control terminals; AC power cord.

SX-140 RECEIVER, $104.95

Doesn't it make sense to team up your skill with the experience of a company who has designed and built more high-performance receivers than any other in the world? Especially when the result is the *lowest-priced amateur band receiver available?*

- **FEATURES:** You get complete coverage of all amateur bands 80 through 6 meters, with extremely high sensitivity and sharp selectivity. Unit has RF stage; S-meter; antenna trimmer; and XTAL calibrator. Tuning ratio is 25 to 1.
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- **TUBES AND FUNCTIONS:** 6AZ8 tuned RF amplifier and crystal calibrator; 6U8 oscillator and mixer; 6BA6 1650 kc. IF amplifier and BFO; 6T8A 2nd detector, A.V.C., ANL and 1st audio; 6AW8A audio power amplifier and S-meter amplifier; (2) silicon high voltage rectifiers.

P.S. *Both units are available fully wired, and tested. SX-140, $124.95. HT-40, $109.95.*

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CQ—(Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second class postage paid at New York, N. Y. and at Garden City, New York. Subscription Rates: U.S.A. and Possessions, APO, FPO, Canada and Mexico: one year $5.00; two years $9.00; three years $13.00. Pan-American and foreign, one year $6.00; two years $11.00; three years $16.00. Printed in the U.S.A.

Postmaster: send Form 3579 to *CQ*, 300W. 43rd St., N. Y. 36, N. Y.

VOL. 17, NO. 10 OCTOBER 1961

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DEPARTMENTS

COMING NEXT MONTH...

...This annual event has already become a tradition in amateur radio and is eagerly awaited by everyone in the hobby.

Each year we try to out-do ourselves to make the annual "BIGGER and BETTER" ...This new issue "tops" last year—as you will agree, when you read it. There's EXTRA SPECIAL ARTICLES, SPECIAL DISTRIBUTOR SECTION and many feature items that will satisfy each and every ham.

We are dedicated to making it and keeping it the best in Amateur Radio.

So, if you're an active ham and are not on our subscription list, you owe it to yourself to give the idea serious consideration.

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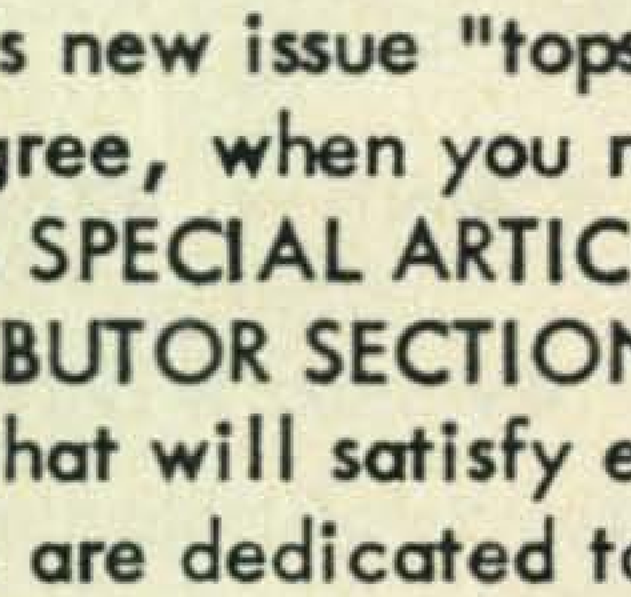

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For further information, check number 5, on page 126

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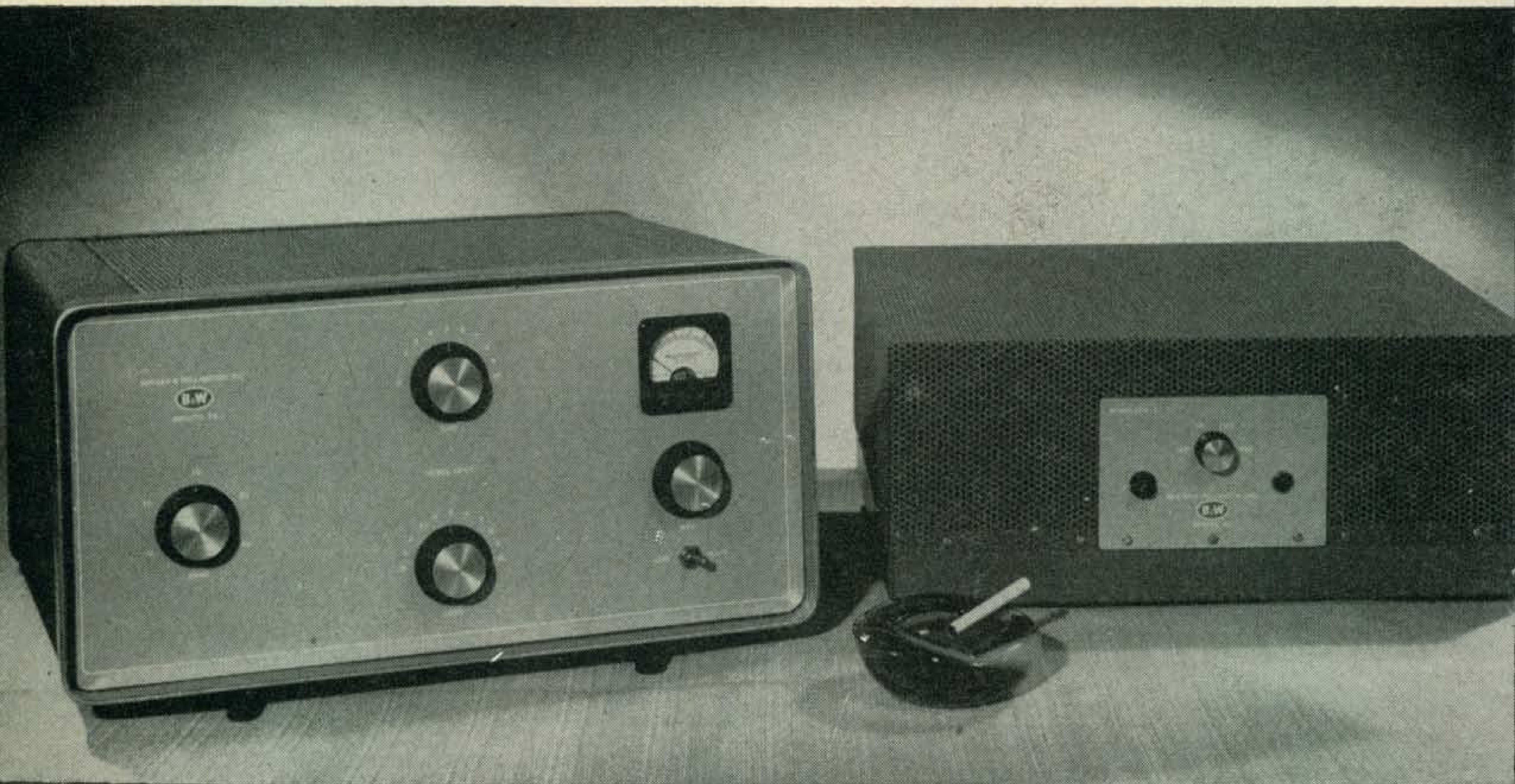
PACKAGED FOR TODAY'S AMATEUR



LPA-1 GROUNDED GRID LINEAR AMPLIFIER
NET PRICE $375.00 COMPLETE WITH TUBES

LPS-1 POWER SUPPLY
NET PRICE $205.00 COMPLETE WITH TUBES

Power—a full kilowatt with this smartly designed, excellently styled version of the famous B&W linear amplifier family! New compactness . . . takes up no more space on your table than a receiver. New features . . . for greater performance and flexibility than ever before.

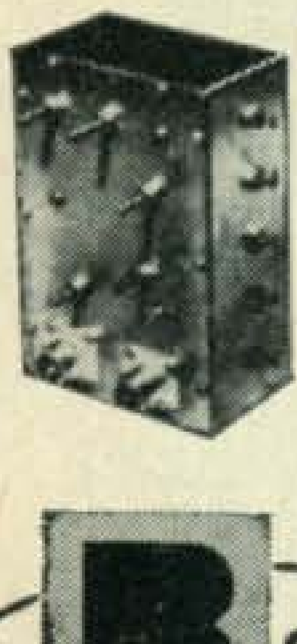
Separately housed LPA-1 R. F. section employs two Type 813 beam power tetrode tubes, connected as high-Mu triodes in a grounded-grid circuit. Blower, filament and bias supply are included in this section.

High voltage power supply unit LPS-1 may be remotely located. Switching control panel is removable for convenient installation at the operator's location. Circuit consists of a full wave single phase bridge rectifier, using four Type 816 mercury vapor rectifier tubes. R. F. filtering protects tubes and prevents mercury vapor hash radiation.

The LPA-1 can be driven by most exciters in the 100 watt class, such as the B&W 5100/5100B series, Vikings 1 and 2, Valiant, Collins 32V, KWM-1, 32S-1 series, Heath DX100 and others.

A compact impedance matching unit, the B&W LPA-MU, is separately available. It provides for operation with fixed output exciters such as the Hallicrafters HT 32 Series and similar types. A similar unit, the LPA-MU-2, is also available for use with the B&W L-1000-A and L-1001-A.

Your local distributor should have these advanced units *now* . . . see them soon.



LPA-MU MATCHING UNIT $36.00
LPA-MU-2 $36.50

Send for this illustrated brochure in full color giving specifications and detailed descriptions of the new B&W LPA-1, LPS-1 and LPA-MU.

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For further information, check number 6, on page 126

ZERO BIAS

S. 2361, as partially depicted on this month's cover, is a Senate Bill, introduced on August 1, 1961 by Senator Barry Goldwater, ex-6BPI, and Senator Andrew Schoeppel. If found to be of sufficient importance by the Committee on Commerce, to whom it has been referred, the Bill will move to the Senate and House for a vote.

This Bill, of course, deals with the extremely important problem of reciprocity, about which *CQ* devoted many pages in the past in an effort to explain the gravity of the issue.

In essence, S. 2361 is designed to slightly alter SEC. 303 and 310 of the Communications Act of 1934 as amended, to grant amateur radio licenses to citizens of other countries providing those countries are willing to license U.S. citizens. In most cases foreign governments have been more than willing to license American amateurs. Their hands have been tied however, and not until the announcement of S. 2361 has the United States offered any concessions in this matter.

At the present time (late August) the Interstate and Foreign Commerce Committee has issued questionnaires to various Federal agencies to whom this matter is of importance. Should favorable replies be returned, the Commerce Committee may see fit to pass upon this Bill, which then goes to the Senate and House of Representatives for ratification.

Regardless of one's present field of interest, *CQ* URGES amateurs everywhere to write, wire or phone the Commerce Committee concerning the adoption of this Bill.

We think it is of concern to all that we reproduce from the *Congressional Record* the remarks made by Senator Goldwater upon the introduction of Bill S. 2361.

"A serious problem has arisen in the field of amateur radio operation. The United States will not allow aliens of friendly foreign nations, except for Canada, to use their amateur radio equipment while they are in the United States without a permit and the FCC is precluded from issuing such a permit because of the terms of the Federal Communications Act of 1934 as amended. As a consequence of this situation, Mexico recently withdrew from American citizens the privilege of using their amateur radio equipment while in Mexico. This lack of reciprocal good will between Mexico and the United States is magnified when we consider that there are now only a very few countries which will still allow U.S. amateurs to operate in this foreign lands because we will not allow their own citizens to operate their equipment while in this country. This situation affects not only the amateur operators, but servicemen and others overseas who would like to take advantage of amateur radio links between several countries so they might talk to loved ones in this country.

"This amendment to the act would therefore allow for aliens of friendly nations to operate with their own equipment while in this country, provided that their country offers this same reciprocal courtesy to U.S. citizens. The passage of this amendment would do much to foster more good will with friendly foreign nations and at the same time protect our national security as there are provisions in the bill covering this important area."

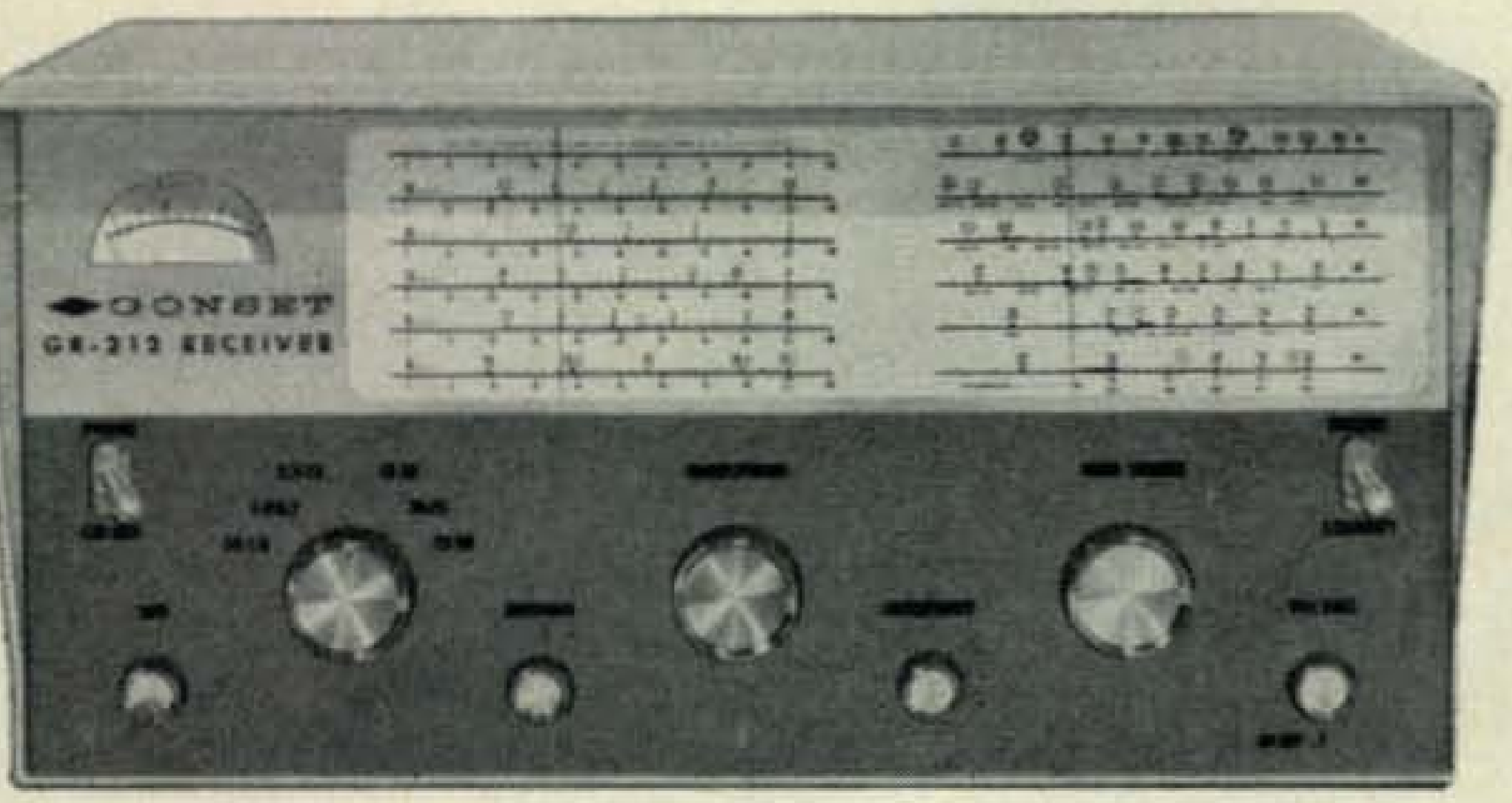
Members of the Interstate and Foreign Commerce Committee are: Warren G. Magnuson (Chairman), John O. Pastore of Rhode Island (Chairman, Sub-Committee on Communications), A. S. Mike Monroney of Oklahoma, George A. Smathers of Florida, Strom Thurmond of South Carolina, Frank J. Lausche of Ohio, Ralph W. Yarborough of Texas, Clair Engle of California, E. L. Bob Bartlett of Alaska, Vance Hartke of Indiana, Gale W. McGee of Wyoming, Andrew F. Schoeppel of Kansas, John Marshall Butler of Maryland, Norris Colton of New Hampshire, Clifford P. Case of New Jersey, Thruston B. Morton of Kentucky, Hugh Scott of Pennsylvania.

They are NOT amateurs; they do not realize the importance of this Bill to radio amateurs—let them know today!

For further information, check number 7, on page 126

From Gonset...

THE ONLY DUAL CONVERSION RECEIVER PRICED UNDER $100!



GR 212

The new GR 212 is a deluxe dual conversion receiver that offers the radio amateur a host of highly-desirable features. In handsome industrial-designer styling, the GR-212 provides superlative performance at modest cost!

Compare these deluxe features:

- Dual conversion for increased selectivity.
- Variable BFO.
- Sensitivity: At least 6 db $S + \frac{N}{N}$ at 1 uv (mod. 30% at 400 cps) input on all H.F. bands.
- Two full-vision, illuminated, slide-rule type dials provide instant identification of broadcast and short-wave frequencies.
- Panel-mounted "S" meter.
- Band-spread tuning knob is inertia fly-wheel weighted for smoothest tuning.
- Separate band-spread dial for amateur bands.

Amateur net price $99^{50}

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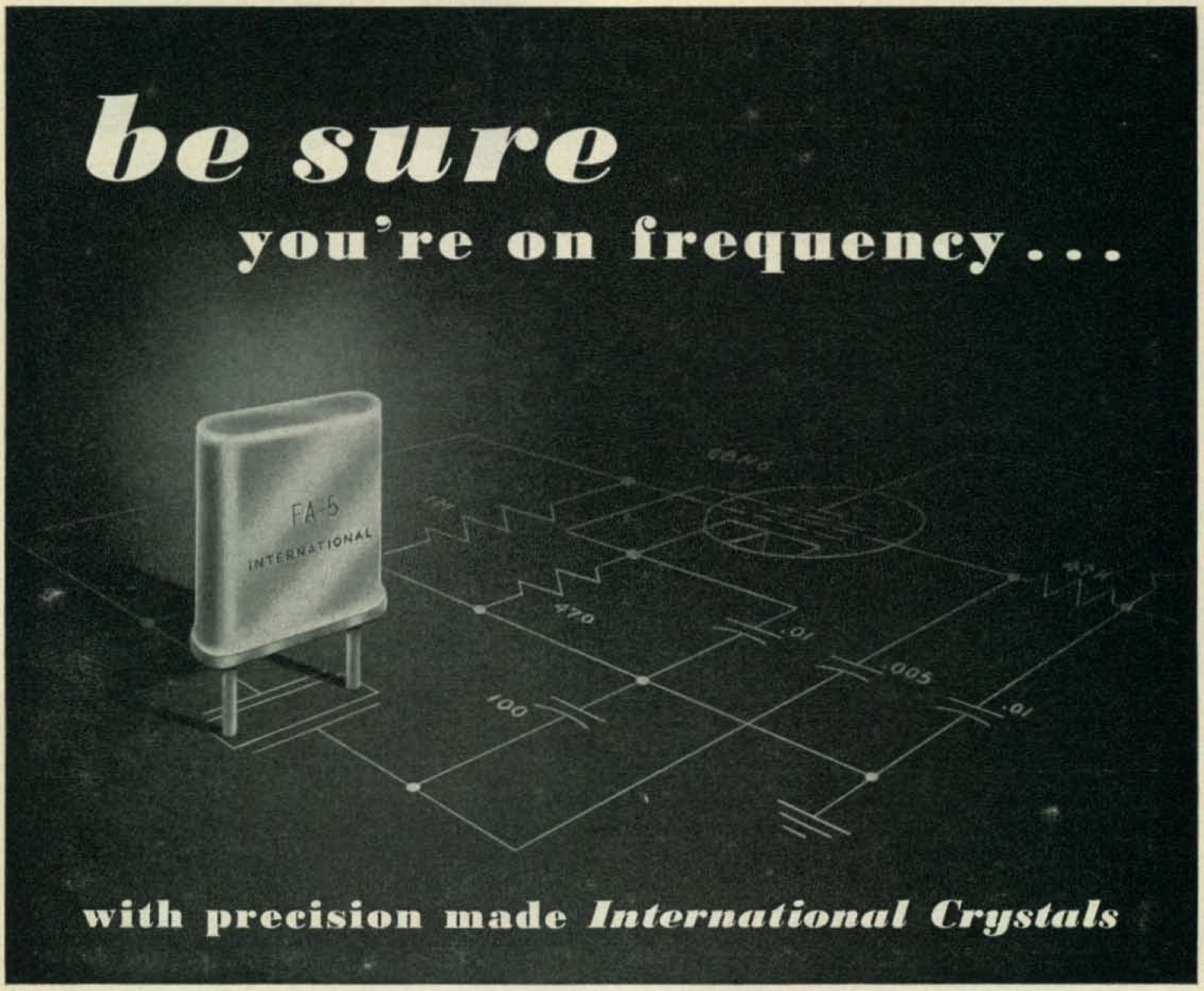
DIVISION OF YOUNG SPRING & WIRE CORPORATION

801 SOUTH MAIN STREET, BURBANK, CALIFORNIA

For further information, check number 8, on page 126



International Crystals are designed for all types of communication service . . . Amateur — Commercial — Citizens. Thousands of transmitters, transceivers, and receivers this very moment are on frequency with International Crystals. From a quartz blank to the finished plated crystal, hermetically sealed in its can, International insists on the highest standard of manufacturing. You can be sure you're on frequency because International precision made crystals have built-in DEPENDABILITY!

For information on International's complete line of Amateur, Commercial and Citizens band crystals write International Crystal Manufacturing Company today.

> International type FA-5 and FA-9 wire mounted crystals are for Amateurs and Experimenters where tolerances of .01% are permissible. Priced from \$3.30 to \$5.75 for fundamental frequencies, and from \$3.30 to \$9.35 for 3rd, 5th, and 7th overtones.

INTERNATIONAL CRYSTAL MANUFACTURING CO., INC.
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For further information, check number 9, on page 126

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Ideal for veteran or novice. "Clean" 90W CW, 65W AM-phone with EXT plate modulation. 80 through 10 meters.

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"Compact; well-planned layout. Clean-sounding, absolutely hum-free carrier; stable." — ELECTRONICS WORLD.
Perfect for novice or advanced ham needing low-power standby rig. "Clean" 60W CW, 50W AM-phone with EXT plate modulation. 80 through 10 meters.

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Approaches crystal stability. 80 through 10 meters.
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Complete with rechargeable battery and charger. 9 transistors, 1 diode. Full superhet. U.S. made.
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CITIZENS BAND TRANSCEIVERS
Superhet; prealigned xmitter osc; match different antennas by variable "pi" network. Single & multi-channel models.
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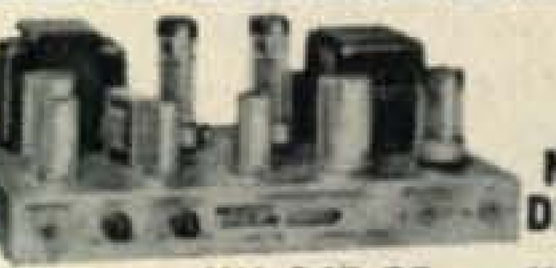

HIGH-LEVEL UNIVERSAL MODULATOR-DRIVER #730
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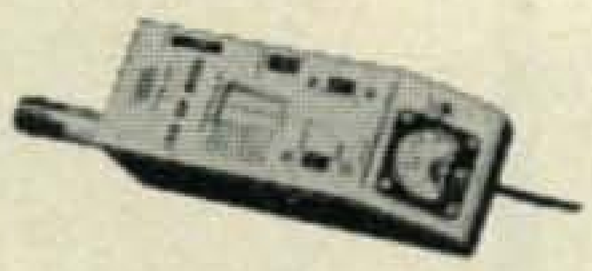
Delivers 50W undistorted audio for phone operation. Can plate-modulate transmitters having RF inputs up to 100W. Unique over-modulation indicator. Cover E-5 $4.50.



GRID DIP METER #710
Kit $29.95 Wired $49.95
Includes complete set of coils for full band coverage. Continuous coverage 400 kc to 250 mc. 500 ua meter.

PEAK-TO-PEAK VTVM #232
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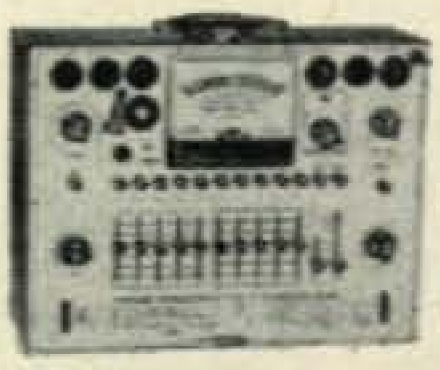

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For further information, check number 10, on page 126

Letters..... to the Editor

Phone Patching

Editor, *CQ*:

A serious situation has been developing over the past few months that, if it is not rectified, may result in severe consequences for quite a number of U.S. amateurs. I am referring to the flagrant disregard of International regulations prohibiting third party messages and phone patches, unless a specific agreement has been reached by the countries involved. Violation of this treaty agreement, which the government of the U.S. is a party, is a serious offense which is punishable by a fine not to exceed $10,000 and/or two years imprisonment. While the FCC is unlikely to demand the full penalty for violations of this treaty agreement, it is likely to revoke or suspend amateur licenses or take similar action.

There has recently been a heavy volume of phone patch traffic between U. S. amateurs and HZ1AB, Saudi Arabia; certain stations in Sao Paulo, Brazil; and occasional French and DL4 operators. None of the above is legal. The HZ1AB operation, while understandable is particularly dangerous because of the vast number of the W/K group willing to take a chance in return for a relatively rare DX QSL. The other illegal patches are run out of ignorance, or in compliance with the wish to do another ham a favor. It seems to me that until this traffic is legalized the fraternity should be made aware, regularly, of the danger one faces by violation of U.S. treaty agreements. You would be doing the reader a favor by listing the legal countries and pointing out the fact that a ham station is a worthless investment without a license.

Action to legalize 3rd Party traffic to the above stations and countries would also be worthwhile.

S. P. Wilds, KZ5SW/W4GVD
Box 2519
Balboa, Canal Zone

Third party traffic from the United States is legal with Canada, Chile, Costa Rica, Cuba, Ecuador, Haiti, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru and Venezuela.—*Ed.*

Contests!

Editor, *CQ*:

This contest business has gone far enough! I have withheld my two cents worth long enough and feel that I am compelled to flip my lid . . .

Contests are fine and dandy in their place, I have a go at certain types myself on occasion. (It's felt that this participation benefits others than myself, however.)

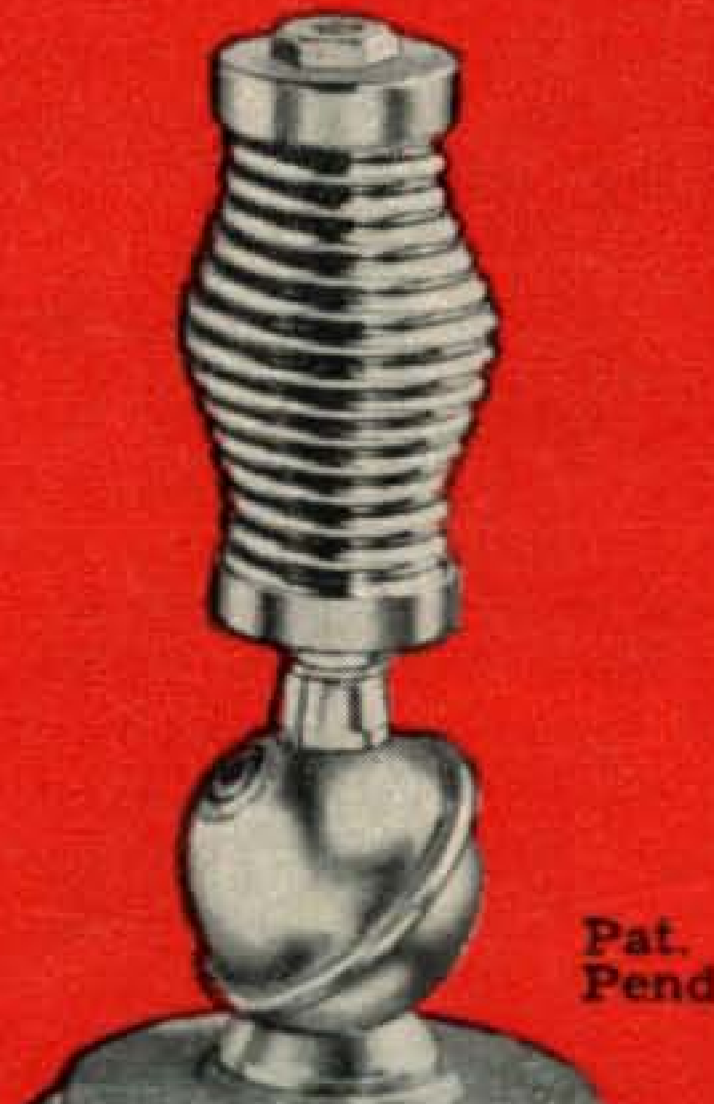
I fail to see the reasoning behind the various DX-type of rat races. To add to the DX total you say? So just what does that prove I'd like to know? I can "shoot fish in a barrel" with the rest of them if I so choose! This ole peon doesn't bend in that direction though. One often wonders how many of the "200" DX'ers got them "honest Injun" by long hours, endless tuning and real down to earth operating instead of the farce that is practiced by our kinsman at present?

← For further information, check number 11, on page 126

GET RELIEF FROM GRIEF

FIRST — Corrosion-free all stainless ball and spring mount

FIRST — basically improved design



Pat. Pend

TUNABLE ANTENNA FOR CB and AMATEUR (28-30 MC)

MODEL CB-27

Extends to 60". Collapses to 27" Swivel ball base. Sealed loading coil 5' of RG58/U cable PL-259 connector

Tunable stainless top rod section has etched tuning scales permitting field adjustment for either 27 MC Citizens Band or 28-30 MC Amateur Bands.

Pat. Pend.

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MODEL NTS-1 — ALL STAINLESS

Ball, base and spring assembly

NO EXPOSED MOUNTING BOLT HEADS
(Long leakage path)

ONE MAN INSTALLATION

LIGHTER WEIGHT

REDUCED SPRING ASSEMBLY LENGTH

Engineered and built to meet the most critical standard, this base, ball and spring assembly has no equal. It will provide long and carefree service. Also available in chrome plated and cadmium plated models.

TUNABLE ANTENNA for COLLINS NOISE BLANKER

MODEL NB-40 (40 MC)

Similar in appearance to MODEL CB-27. Has different electrical characteristics. Broad banding characteristics and tunable feature permits attenuation of power line and car ignition noises.

Complete line of stainless steel whips with set screw type removable adaptors, other antenna models, cable and accessories available for immediate delivery.

New-Tronic antennas look better, work better and last longer than any similar purpose types now available. They are engineered and built to meet the demands of modern communications. With all their extra features they are priced no higher than similar models. See them at your electronic distributors or write for literature.

NEW-TRONICS 3455 Vega Avenue Cleveland 13, Ohio

For further information, check number 44, on page 126

This ole stuff of "I haven't got time for casual DX'ing" falls on deaf ears. Why not say one does not have the patience and let it go at that? All too many of us are so busy keeping up with the Jones' that we have lost the hobby perspective someplace along the line. It may well be that some of us missed the boat entirely to start with.

It appears that this is a rather cheap and unethical way of achieving various awards and trophies in renumeration for our efforts. Personally I would be ashamed to let it be known that I didn't have the patience or knowhow to keep plugging away and still add to the total as time goes by . . .

Let it be known that I do not QSL for contacts made during any type of contest. A truly sorry way to go past-board hunting.

Until proven otherwise, I'm afraid my wife's husband must take a dim view of such goings on.

G. L. Baker, "GB," W8GIU
Valley Bend, West Virginia

We're sure "GB" is not alone, but we still think he's dead wrong.—*Ed.*

License Plates

Editor, *CQ*:

New York, the Empire State has not seen fit to issue amateur call license plates.

How about New Yorkers sending letters to Governor Rockefeller and Motor Vehicle Bureau Commissioner Hults expressing our concern and wishes. Other amateurs in states already issuing call letter plates can help by letting these two gentlemen know how the plates have helped to identify amateurs to authorities when they needed help.

Ed St. John, WA2BOY
122 Queens Ave.
Elmont, N.Y.

Space News Broadcasts

Editor, *CQ*:

On September 4, the Voice of America, in conjunction with the U.S. National Academy of Sciences, inaugurated a special series of space news broadcasts. These broadcasts, heard on shortwave six days a week (Monday through Saturday) from 10:30 to 10:35 P.M. *Eastern Standard Time*, contain the latest information (including orbit data and radio frequencies) on new satellite launchings, and up-to-the-minute revised statistics on satellites already in orbit.

The broadcasts are prepared as part of America's contribution to the international efforts of the Committee on Space Research of the Council of International Scientific Unions (COSPAR). While intended mainly for tracking stations and scientific organizatons in South America, the broadcasts should be received well in many other areas of the world, and should prove of interest to those desiring latest launching and orbital information dealing with earth satellites.

The programs are in English, and are called SPACEWARN broadcasts. The following schedule for these broadcasts will be in effect until November 4, 1961:
Monday-Saturday (10:30-10:35 P.M. EST)

WBOU	11830 kc
WLWO	11890 kc
WDSI	15205 kc
WLWO	15290 kc
WBOU	15330 kc

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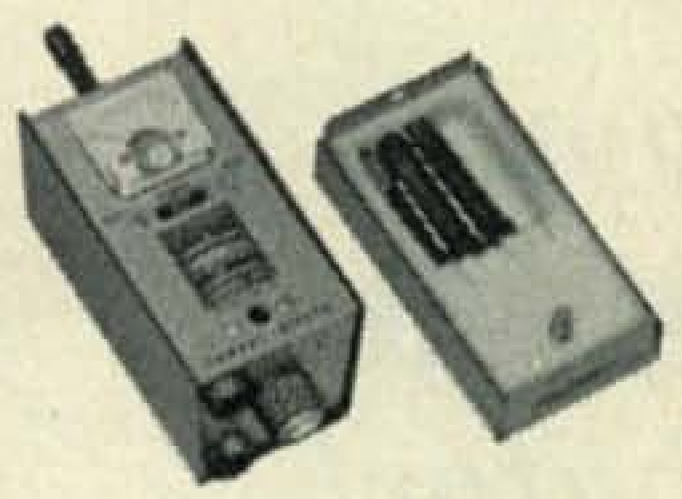

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For further information, check number 13, on page 126

ANNOUNCING

Alaska Counties Award

The Wildwood Station A.R.C. of Wildwood Station Alaska should be proud of its announcement that they are now issuing the "All Alaskan Counties Award." Requirements are that each applicant furnish proof of contact with each of the four Judicial Divisions of Alaska *plus* one QSO with a member of the W.S.A.R.C. Contacts must be made after August 15th, 1961 and minimum acceptable reports are Q4/S5-RST459. Certificates will be endorsed for single mode/band, mixed etc. A *list* certified by two licensed amateurs, radio club official, or notary public furnishing data from QSL cards in GMT *only* is acceptable. Application must be accompanied by return postage for mail service desired by applicant. Make applications out to the Custodian, AACA, Wildwood Station, Alaska.

Worked All Bronx

The Bronx High School of Science Amateur Radio Club is now sponsoring a Worked All Bronx Award (WAB) for confirmed contacts with 20 Bronx, New York stations. A certified list *only* is required together with 25¢ to cover cost of mailing of certificate. Send to: The Bronx H.S. of Science A.R.C. c/o K. Schaffer, WA2BQK, 222 E. 202 St., Bronx 58, N. Y.

Wheelin Whips

The "Wheelin Whips" are a new organization whose interests center around mobile operation. They meet the second Saturday of each month at 19315 Sherman Way, Reseda, Calif.; time: 7 P.M. Membership is open to all interested amateurs wishing to join or visit. Direct all correspondence to Larry Hoffman, K6LDC, 16945 Covello, Van Nuys, California.

Dentists

KØRXT would like to have dentists who are also amateurs (not amateur dentists) write him so that he may compile and distribute a list for a possible dental net. He's at 440 N. Riddle, Colby, Kansas.

Request

Sister Mary Alan, O.P., of Saint Mary's Convent, 705 Hoyt Street, Saginaw, Michigan has been trying for the past 12 months to round up enough gear to set up a ham shack at St. Mary's High School and assist the younger generation to learn the fine arts of electronics as only a ham can do. If any of you OM's have some spare rigs around collecting dust would you be kind enough to ship it to her at the above address.

Uraguay Calls

After reading "Know Those British Calls" in the February 1961 *CQ*, CX2AM thought it would also be appropriate to explain the CX call allocation system.

Uraguay being divided into 19 Departamentos or States, can be identified by the letter following the number as shown below:

Montevideo	A-B-C	Paysandú	I	Rivera	P
Canelones	D	Salto	J	Maldonado	R
San José	E	Artigas	K	Lavalleja	S
Colonia	F	Florida	L	Rocha	T
Soriano	G	Flores	M	Treinta y Tres	U
Rio Negro	H	Durazno	N	Cerro Largo	V
		Tacuarembó	O		

Portable or mobile operation can be identified by the insertion of "Z" between the number and the first letter. *i.e.*, CX6ZAR. CX7CO/K indicates that a Montevideo fixed station is operating from the state of Artigas. Any number can be used from 1 to 9. The Radio Club of Uraguay issues the "C 19D" for working all 19 departmentos of Uraguay and the "33 Orientales" for working 33 different CX stations.

For further information, check number 15, on page 126

Cleveland

The 1961 Great Lakes ARRL Convention sponsored by the Cleveland Amateuradio Convention, Inc., will be held on October 13 and 14 at the Sheraton-Cleveland Hotel. Displays, technical talks, MARS, YL groups etc. will all be in attendance. Amateur exams will be given by the FCC and the entire convention is expected to be a bang-up affair. The convention will conclude with a banquet in the Grand Ball room. Tickets and information may be obtained from the Cleveland Amateuradio Convention, P. O. Box 5167, Cleveland 1. Ohio.

Miss Amateur Radio

From K6RKH we receive this news of "Miss Amateur Radio," to be selected from the Southwestern Division Convention of the ARRL. Judging will be held at 1:00 P.M., November 18th, at the Chrysler Motors Bldg., 1111 Brookhurst St., Anaheim, Calif. This event will be open to the public. Any YL and XYL holding a valid amateur radio license is eligible to enter the contest. Judging will be in street clothes and based on personality, poise, beauty and public speaking. The Queen may be married or single.

The 1962 "Miss Amateur Radio" will reign over the three day convention, to be held at the Disneyland Hotel, June 1, 2, 3, 1962, as well as hold her title in the Southwestern Division through 1962. Applicants for the contest may enter by submitting a post card with their name, address and call to "Queen Contest," P. O. Box 1685, Newport Beach, Calif. before the *deadline date of November 11th, 1961*. There is no entrance fee.

Texas

October 13th through 15th is the date set for the West Gulf Division, ARRL Convention, to be held in Keerville, Texas. A program featuring all phases of amateur radio is promised, plus dancing, banquets etc. Request for tickets and info should go to the Keerville Radio Club, c/o The Sport Shop, 800 Water St., Keerville, Texas.

Brownfield, Texas

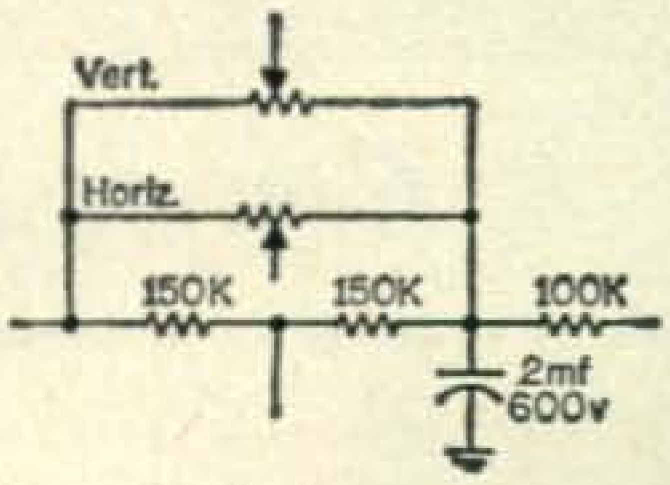
The Brownfield Free Swapfest will take place on November 12, 1961, from 7:00 A.M. to 4:00 P.M. at the National Guard Armory in Brownfield, Texas. This annual swapfest is sponsored by the Terry County Amateur Radio Club. No registration fee charged. Free coffee and donuts will be available to the early arrivals. Bring your entire family, swap gear, and enjoy looking at the other swap gear and lots of new commercial gear on display. Door prizes donated by hams and dealers will be given away. There will be meetings of Army, and Air Force MARS, SSB, and others. No speaking, just swapping and eye ball QSO's. If you wish Motel reservations write to P.O. Box 1149.

Amateur Course

This fall, the New York City Adult Education Program is sponsoring a course in radio fundamentals aimed at the General class license. Registration runs from Oct. 3rd through Oct. 6th and full information may be obtained by writing to 834 Niagara St., Elmont, N. Y.

Correction

We apologize for the omission of a .2 mf, 600 v. capacitor as shown in the accompanying diagram. The addition of this capacitor improves the high voltage d.c. filtering and results in a dot, rather than an oval shaped electron beam.



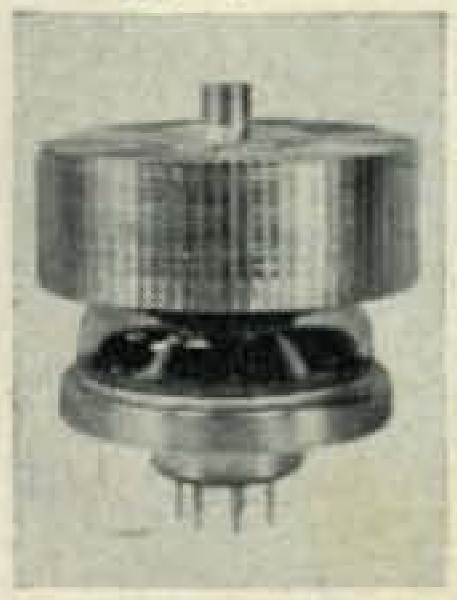
DESIGN FOR PERFORMANCE

Here is a straightforward approach to the problem of preventing electrons from returning to the screen region of a transmitting tube. When channeled into beams like those below, electrons reach the anode, where they do their useful work. Penta's exclusive, patented vane-type suppressor grid does the trick.

The characteristics of Penta tubes employing this electrode geometry approach those of the theoretically perfect beam tube. Plate current is practically independent of plate voltage. Kinks and wiggles are absent. Plate voltage can swing well below screen voltage without appreciable loss of current.

The result is outstanding linearity, efficiency, stability. Penta's PL-172, for example, delivers 1000 watts of Class AB_1 useful output at only 2000 plate volts . . . more than 1500 watts at maximum Class AB_1 ratings. Introduced in 1955, Penta tubes with vane-type suppressor grids are in important equipment the world over, and their use in high-quality linear amplifiers is growing daily.

You, too, can enjoy the advantages of this years-ahead design by specifying the PL-177A, PL-175A or PL-172 for 100-watt to 1.5-kilowatt power output applications. Detailed, factual data sheets are available for the asking. Ask also for your copy of "Transmitting Tubes for Linear Amplifier Service," which explains how and why this exclusive Penta design provides outstanding performance.



PL-172 1000W beam pentode. High-output Class AB_1 linear amplifier.

PL-175A 400W beam pentode. Popular Class AB_1 linear amplifier.

PL-177A 75W beam pentode. To 175mc. Highly efficient at plate voltages as low as 600v.

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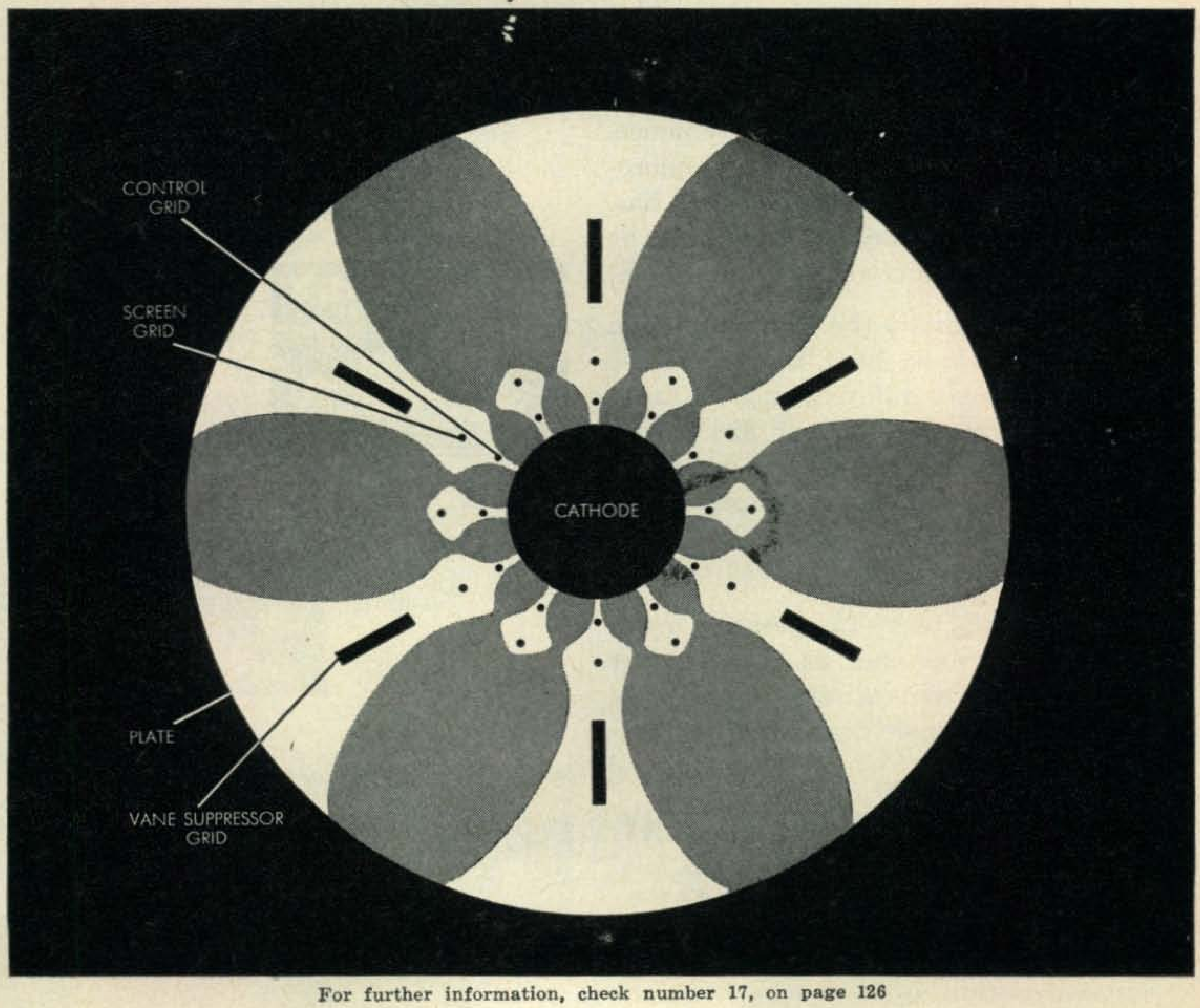

For further information, check number 17, on page 126

QSL contest

THIS month's QSL contest winner is Fred Handy, WA6JOV of Duarte, California with one of the nicest cards to arrive here at *CQ* in some time. Fred's card is a home brew silk-screened job employing 8 carefully selected colors all of which are in perfect register. Anyone familiar with silk-screen work will recognize this as quite a feat. To Fred goes a one year subscription to *CQ*.

Runners Up

INVADER
INVADER 2000

The finest SSB signal on the air!

Here's the transmitter with the sharp, penetrating signal you've been waiting for—plus more exclusive operating and convenience features than any other SSB Transmitter on the market today! Instant bandswitching coverage 80 through 10 meters—no extra crystals to buy—no realigning necessary—delivers a solid 200 watts CW input; 200 watts P.E.P. SSB input; 90 watts input on AM! Unwanted sideband suppression is 60 db or better! Built-in VFO is differentially compensated. Exclusive RF controlled audio AGC and ALC (limiter type) provide greater average speech power—high gain push-to-talk audio system has plenty of reserve gain for either crystal or dynamic microphones. VOX and anti-trip circuits are extremely smooth in operation—built-in anti-trip matching transformer—adjustable VOX time delay circuit. Mixer-type shaped keying is crisp, sharp—click and chirp free. Single knob wide range pi-network output circuit—fully TVI suppressed.

Cat. No. 240-302-2 Wired and tested with tubes, crystals and crystal filter. . . **Amateur Net** **$619.50**

INVADER-2000—All the fine features of the "Invader", plus the added power and flexibility of an integral linear amplifier and remote controlled power supply completely wired and tested. Rated a solid 2000 watts P. E. P. (twice average DC) input on SSB; 1000 watts CW; and 800 watts input AM! Wide range output circuit (40 to 600 ohms, adjustable.) Final amplifier provides exceptionally uniform "Q". With multi-section power supply, tubes and crystals.

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

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For further information, check number 20, on page 126

BASIC SPECTRUM ANALYSIS

Part III—The "Spectroscan"

BY CHATLAND WHITMORE*, K2BAJ
and SIMON RAND†, W2QZJ

Part I and II of this series introduced the theory and applications of spectrum analysis. In this the third and concluding part, the necessary information is presented to construct the "Spectroscan", a high resolution spectrum analyzer. Also included is a thorough explanation of the circuit operation and adustment procedures. Needless to say, the project is not for the beginner as its construction requires a high degree of skill and experience. The resulting high quality analyzer is a worthwhile addition to any well-equipped ham shack.

A SPECTRUM analyzer is usually considered to be a piece of laboratory test equipment. We built one primarily for checking sideband and carrier suppression and filter characteristics of s.s.b. transmitters. After using it with a communications receiver for several months it became apparent that this was more than just laboratory gear. It far surpasses the ordinary Panadaptor in versatility and usefulness; and any amateur that has a Panadaptor will tell you he couldn't get along without it.

W2QZJ has used this analyzer for over six months as a regular part of his operating equipment. It has performed excellently with no instability or other defects, and almost every visiting ham has expressed a desire to build one for himself. Because of this, and the multitude of technical questions received on the air, we decided to write this article—giving complete instructions for constructing and operating a spectrum analyzer. This is not a simple piece of equipment, and a thorough background in its operation and use is essential to the constructor.

You can follow the plans given here and, with reasonable care, it should be possible to duplicate the performance of the original unit. Perhaps you would rather use some of these ideas and incorporate them in a unit of your own design. If so, please keep in mind that while the basic circuit and layout is straightforward, extensive experimentation in component values may be necessary to obtain optimum performance with other layouts.

Well now, get out your screwdrivers and socket punches, gather together all the parts "borrowed" from brother amateurs and plug in the soldering iron. While it's heating up let's look over the schematic and see what makes the analyzer tick—or should I say "pip"?

*23 Hyatt Road, Briarcliff Manor, New York
†27 Forest Avenue, Ossining, New York

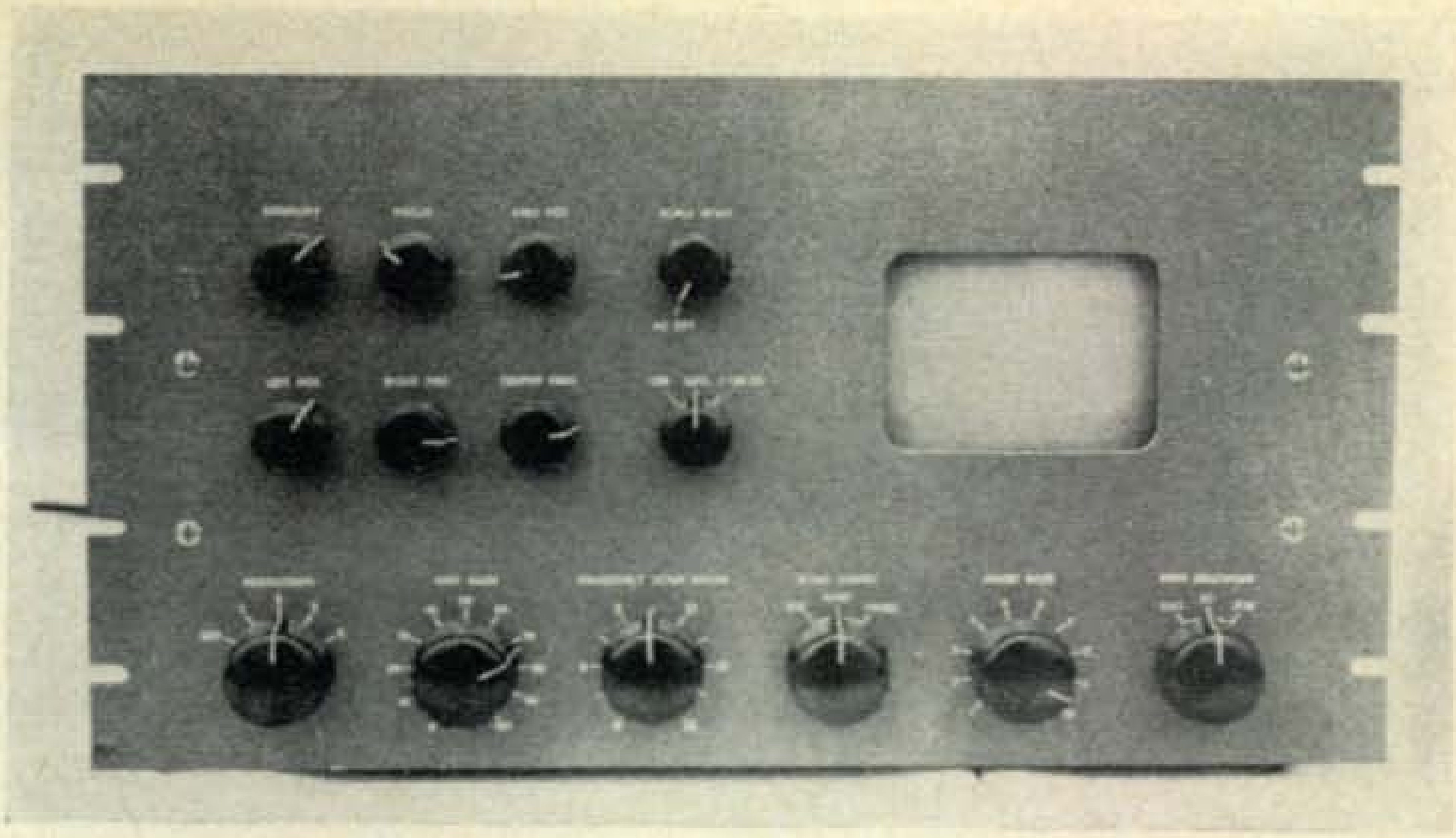
Operation

The 455 kc i.f. signals from the receiver are amplified by a conventional cascode type stage, V_1. The input transformer T_1 is overcoupled. This results in a double peaked response which, when combined with the single peak response at the plate of the mixer in the receiver, results in a flat bandpass response over a range of 20 kc or more, depending on care of adjustment. The output transformer, T_2, is heavily swamped to maintain flat response. The vertical gain control, R_1, adjusts the bias on the cathode of V_1, thus varying the gain of the cascode stage. Rectifier CR_{15}, is a diode switch controlled by S_{1A}. When conducting it shunts R_2 across the secondary of T_2, thus reducing the gain by 20 db.

The 6AH6, V_2, is a conventional pentode mixer with oscillator injection at the cathode. Its output is coupled to the first i.f., V_3 through a conventional transformer, T_3.

The local oscillator, V_7, is a Hartley circuit using one triode section of the 6J6. The signal is coupled to the second triode section via the common cathode. The grid of the second triode is grounded for r.f. so this stage operates as an untuned grounded-grid buffer.

The oscillator frequency is swept through the desired range by the reactance tube, V_6. This is connected so as to produce an inductive reactance across the oscillator tank. This reactance varies in proportion to the grid voltage on the 6AH6. Special phase-shift components are incorporated in T_4 to insure linearity of sweep.



Front view of the "Spectroscan," a high resolution spectrum analyzer using a 5CP7A. The controls on top are, from l to r; Intensity, Focus, Vertical Position, Scale Illumination-A.C. On-Off. Center row, Left Position; Right Position; Center Frequency; Linar-Logarithmic—Log 20 DB. Bottom row, Resolution; Vertical Gain; Frequency Scan Width; Scan Range (2, 20, 100 kc); Sweep Rate and Rate Multiplier.

A cathode bias control, R_{10}, provides additional linearity adjustment. Another pot, R_9, in the V_6 cathode circuit gives a fine adjustment of the d.c. grid bias, and thus varies the center frequency of the sweep. The control signal is a sawtooth wave obtained from the plate of V_{12}, the horizontal sweep amplifier, through d.c. blocking capacitor C_7 and a high impedance voltage divider consisting of R_{26}, R_{14}, and R_{11}. Potentiometer R_{11} provides a continuously variable adjustment and switch S_3 selects three basic sweep width ranges. This is accomplished by inserting shunting pots R_{13} and R_{12}, which are adjusted for the required voltage division ratio. A high impedance divider is used to permit a reasonable value for C_7 while still maintaining flat response at the lowest sweep repetition rate, approximately 10 seconds per sweep. Capacitor C_7 must be a high quality unit with extremely low leakage in order to prevent undesirable frequency drift and jitter.

I.F. Stages

The crystal i.f. stages provide the extreme selectivity which is the secret of the high resolution capabilities of this analyzer.[2]

This section is composed basically of three crystals, each driven by a phase-splitter amplifier and followed by an untuned buffer stage. The use of phase splitters permits the neutralizing capacitors, C_1, C_2, and C_3 to completely cancel signal leakage due to the capacity of the crystals and their holders. This results in excellent skirt response characteristics. The crystals used were surplus, hermetically sealed units marked 163.95 kc. Any frequency between 160 and 220 kc should be satisfactory. For best possible resolution the crystals must be matched to within a few cycles. We bought 6 and found a set of three that were within 5 cycles of each other. The various series and shunt resistors, as selected by S_2, bypass r.f. around the crystals and vary the amount of loading of the crystals to obtain several degrees of selectivity. Their exact values must be determined experimentally as they are dependent on the particlar crystals used. Resistors R_3, R_4 and R_5 primarily affect selectivity, while R_6 R_7 R_8 are used to equalize overall gain at each switch position. The selectivity (or resolution) is better than 10 c.p.s. at 6 db down in position 3.

Position 2 has a resolution of about 100 c.p.s. at 6 db down. In position 1 the resolution is about 200 c.p.s. at 6 db. In all 3 positions the skirt selectivity is excellent. Position 1 is used infrequently and may be deleted at the option of the constructor. In the OFF position the crystals are so heavily loaded that they con-

[2]Gottfried, H. L., "An Inexpensive Crystal Filter I.F. Amplifier", *QST*, February 1958, page 18.

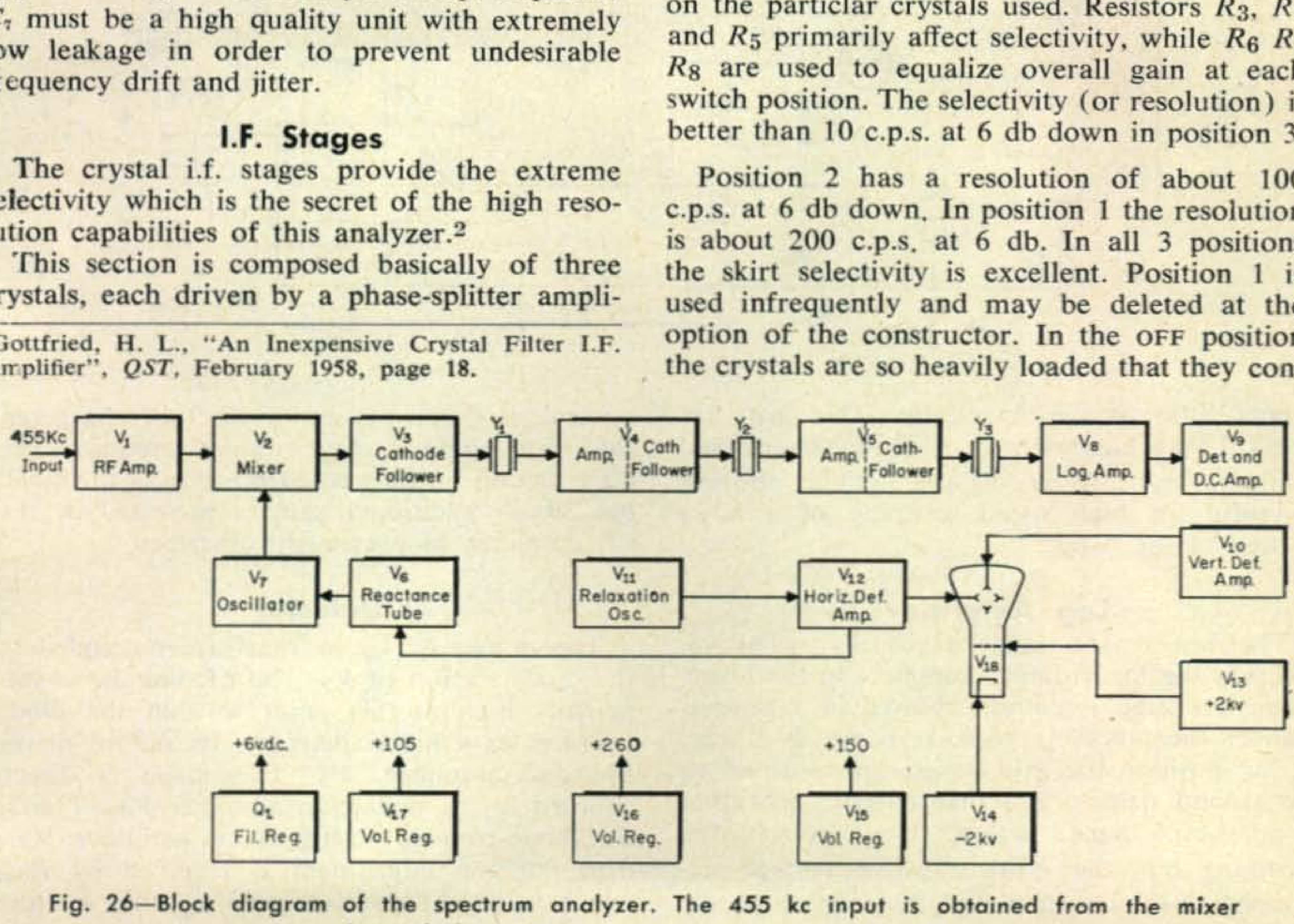
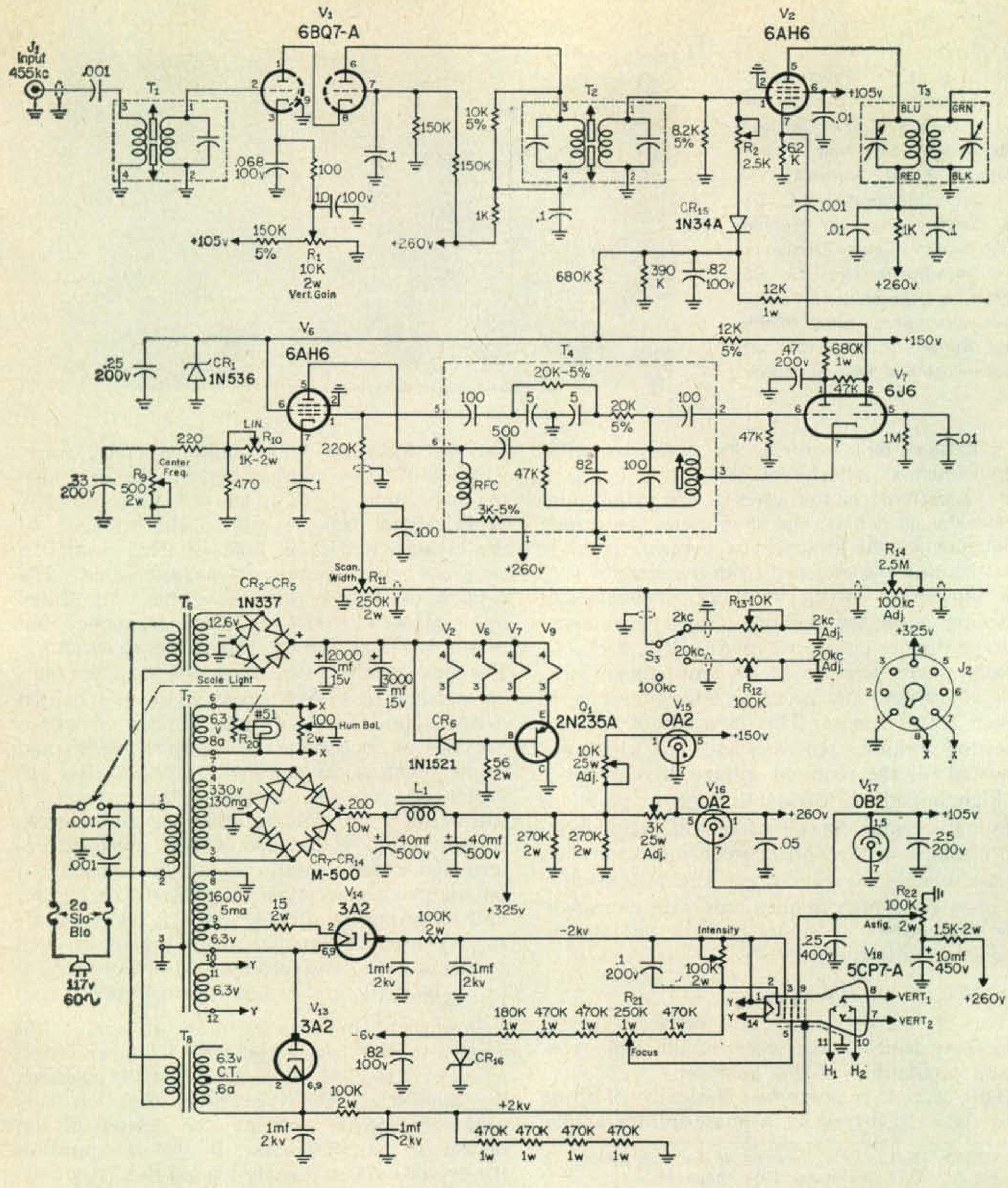


Fig. 26—Block diagram of the spectrum analyzer. The 455 kc input is obtained from the mixer plate of the station receiver as shown in fig. 29.



tribute little to the selectivity. This provides about 2.5 kc bandwith at –6 db as determined by the i.f. transformers T_3 and T_5. This position is useful for high speed scanning of a large portion of the band.

Log Amplifier

The last crystal stage feeds V_8, a 6BA6, which is the logarithmic amplifier. In the linear mode this tube is cathode biased in a normal manner and its amplitude response is linear. In log position the grid resistor is returned to the second detector's signal output, providing a pulse-type a.g.c. action. The stronger the incoming pip, the more negative voltage developed at the detector, and the more the gain of V_8 is reduced. An adjustable screen voltage control, R_{15}, permits setting the tube characteristics for optimum logarithmic response. The a.g.c. action in the LOG-20 position is identical, but 20 db additional gain is provided in the r.f. amplifier as previously described.

Detector

The output of V_8 is transformer coupled to the diode section of V_9. The r.f. voltage is sufficiently high at this point so that the diode operates as a linear detector. Its output drives the d.c. amplifier, V_9. This stage is direct-coupled to the deflection amplifier V_{10}. This is a cathode-coupled push pull d.c. amplifier. Vertical position adjustment is received by R_{61}, which varies the grid bias on V_{10_b}, thus shifting the plate current balance.

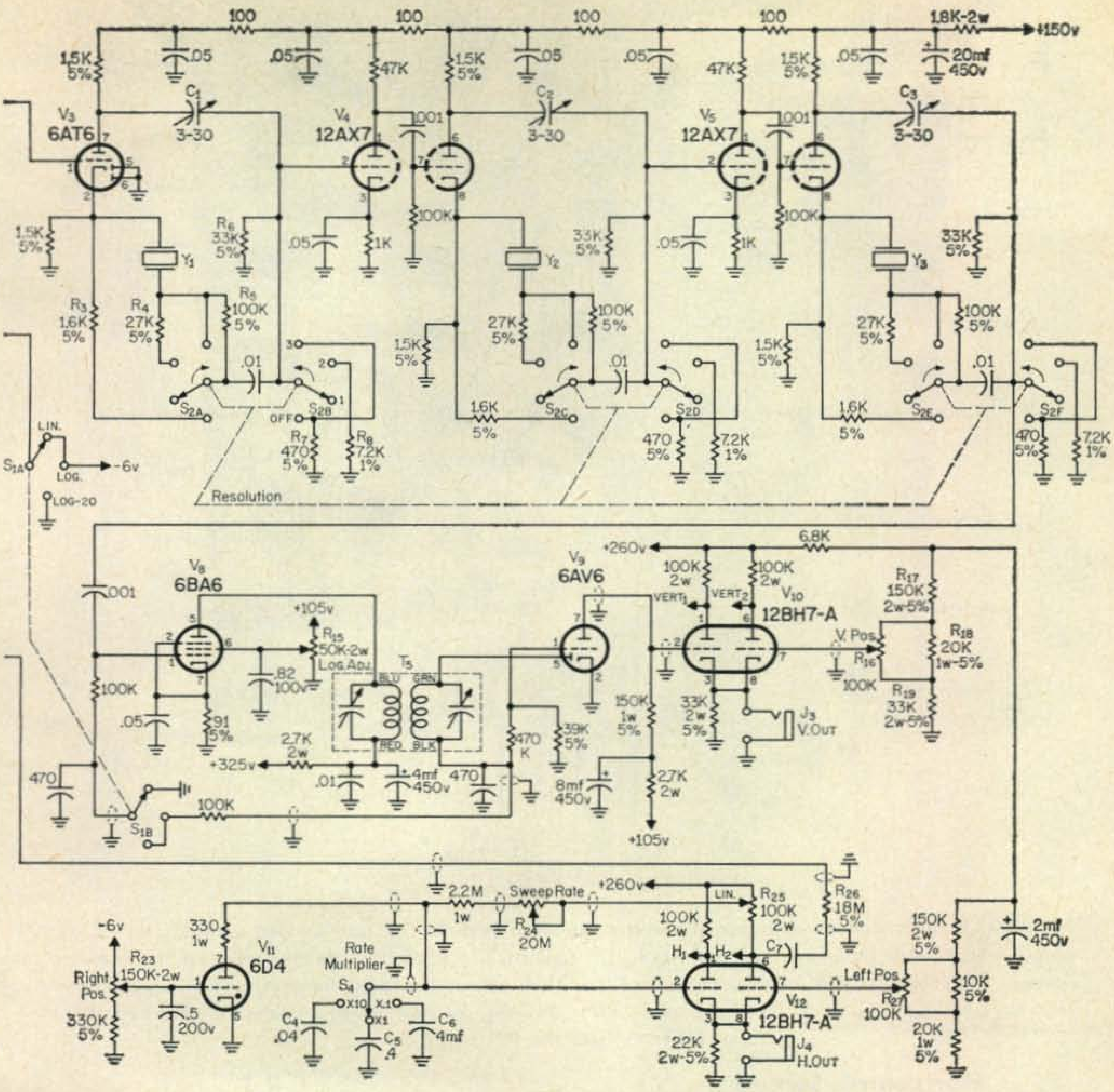


Fig. 27—Circuit of the spectrum analyzer. All resistors are ½ watt unless otherwise noted. Capacitor values over 1 are in mmf and under 1 in mf unless otherwise noted. All capacitors are rated at 600v unless otherwise noted. Capacitors C_4, C_5, C_6 and C_7 should be specially selected units with very low leakage.

C_7—4 mf, 400 v. paper Sprague CR-46 or Pyramid MPDR 4-4. See text (page 25).

CR_1—500 ma, 50 p.i.v. silicon diode used as 100 v. Zener diode, Hughes 1N536 or Motorola 1M100Z.

CR_2-CR_5—1.5 a, 100 p.i.v. silicon diodes. Transitron IN337.

CR_6—6.8 v. 1 watt Zener diode. International Rect. 1N1521.

CR_7-CR_{14}—500 ma, 400 p.i.v. silicon diodes. Sarkes-Tarzian M-500.

CR_{15}—General purpose diode, 1N34A.

CR_{16}—6 v. Zener diode. See text.

J_1—83-1R chassis mounting coax connector.

J_2—Standard octal socket.

J_3, J_4—Open circuit phone jacks.

L_1—7 hy, 150 ma filter choke (5 to 10 hy, 100 ma or more is suitable).

Q_1—2N235A—Bendix.

R_2—2.5K, ½ w. miniature pot. Ohmite AS-3605.

R_{20}—100 ohm, 4 w. wire wound with s.p.s.t. switch. IRC WPK-100 with 76-11 switch.

R_{24}—20 meg $\pm$ 30% ½ w. linear taper. Clarostat series 37.

S_1—2 pole, 3 pos. rotary switch. CRL 1472.

S_2—3 decks, each 2 pole, 4 pos. as described in text. CRL P-272 shaft and index assy. with 3 CRL Type KD switch sections. (2 pole, 2-5 positions).

S_3, S_4—Single pole, 3 position rotary switch. CRL 1472.

T_1—Merit BC-352 modified as explained in the text.

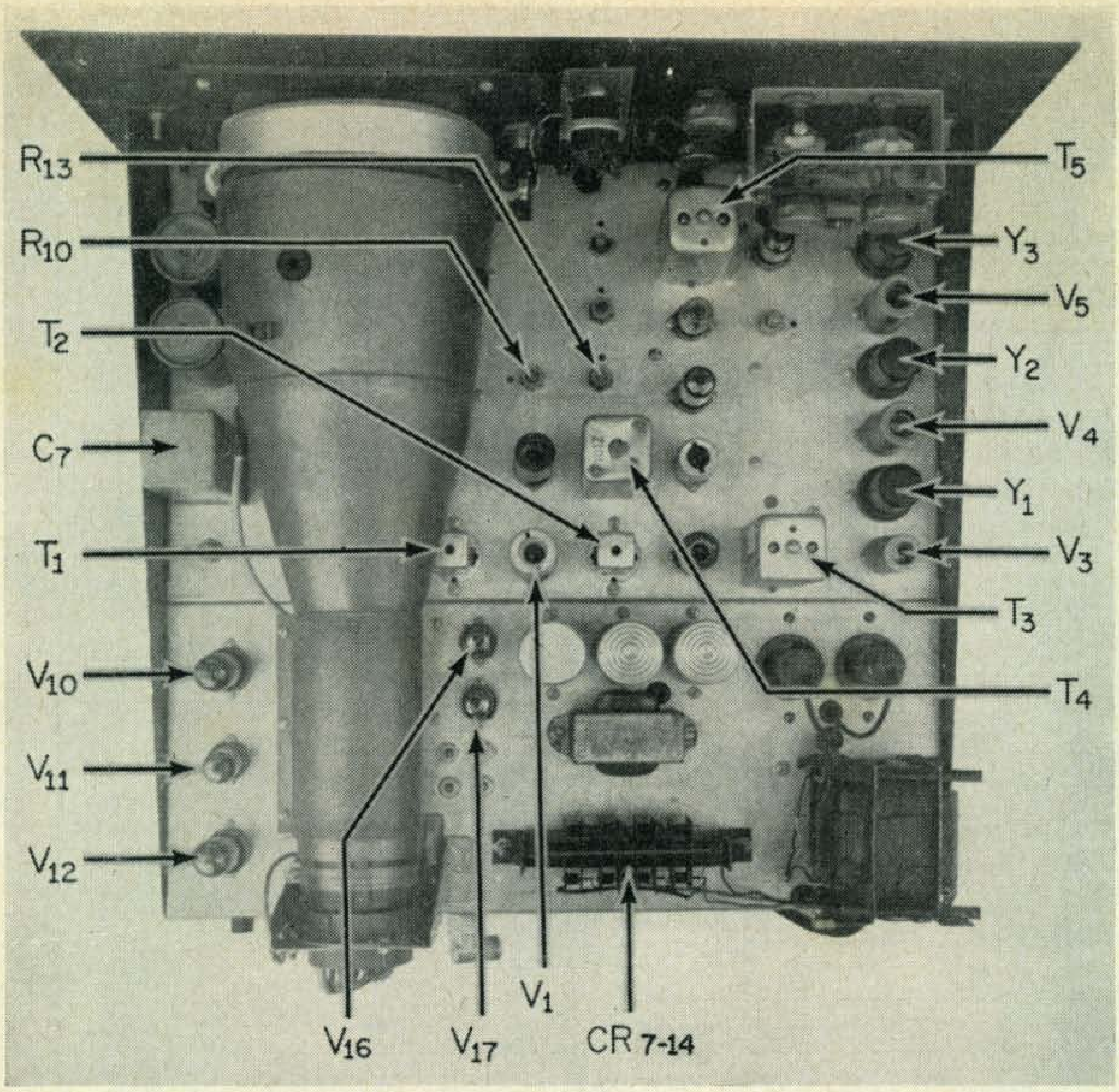
T_2—Merit BC-352.

T_3—Miller 612-K-1.

T_4—Panoramic Radio Products, Inc., 520 South Fulton Ave., Mount Vernon, N. Y. Part ZN-8297, modified as explained in the text.

T_5—Miller 612-K-4.

Y_1, Y_2, Y_3—Crystals. See text.



Top view of the spectrum analyzer showing component layout. The rear chassis contains the power supply components and sweep circuitry; r.f., i.f. and oscillator circuits are mounted on the forward chassis. The intensity and focus controls are mounted on an insulated bracket at the upper right. The log amplifier, V_8, is to the right of T_5 while V_9, V_{15}, V_7 and V_2 are below T_5. The reactance tube, V_6 is to the left of T_4.

Horizontal Sweep

Horizontal sweep frequencies are generated by V_{11}, a 6D4 gas triode. This tube acts as a controlled relaxation oscillator. Potentiometer R_{23} controls the firing point of V_{11} by varying its grid bias. The sawtooth signal is d.c. coupled to the horizontal deflection amplifier, V_{12}, which is similar to the vertical deflection amplifier. A feedback voltage is obtained from the plate of V_{12_b}. This is adjustable by R_{25}, and it is set to provide optimum sweep linearity. The sweep frequency is controlled by R_{24}, C_4, C_5, and C_6. Switch S_4 selects the desired range and R_{24} is a vernier. This is a high impedance circuit and therefore C_4, C_5 and C_6 must be very low leakage units, preferably of Mylar dielectric. Their exact values must be experimentally determined to yield proper sweep ranges with a slight overlap at each end. A unique feature of this circuit is that the three controls, R_{27}, R_{23} and R_{24} provide relatively independent control of start position (left margin), stop position (right margin), and sweep rate. This circuit also maintains near perfect linearity over wide ranges of sweep rate.[8]

[8]Circuit obtained through the courtesy of Larry France, W2VKT, and Cambridge Instrument Co., Inc.

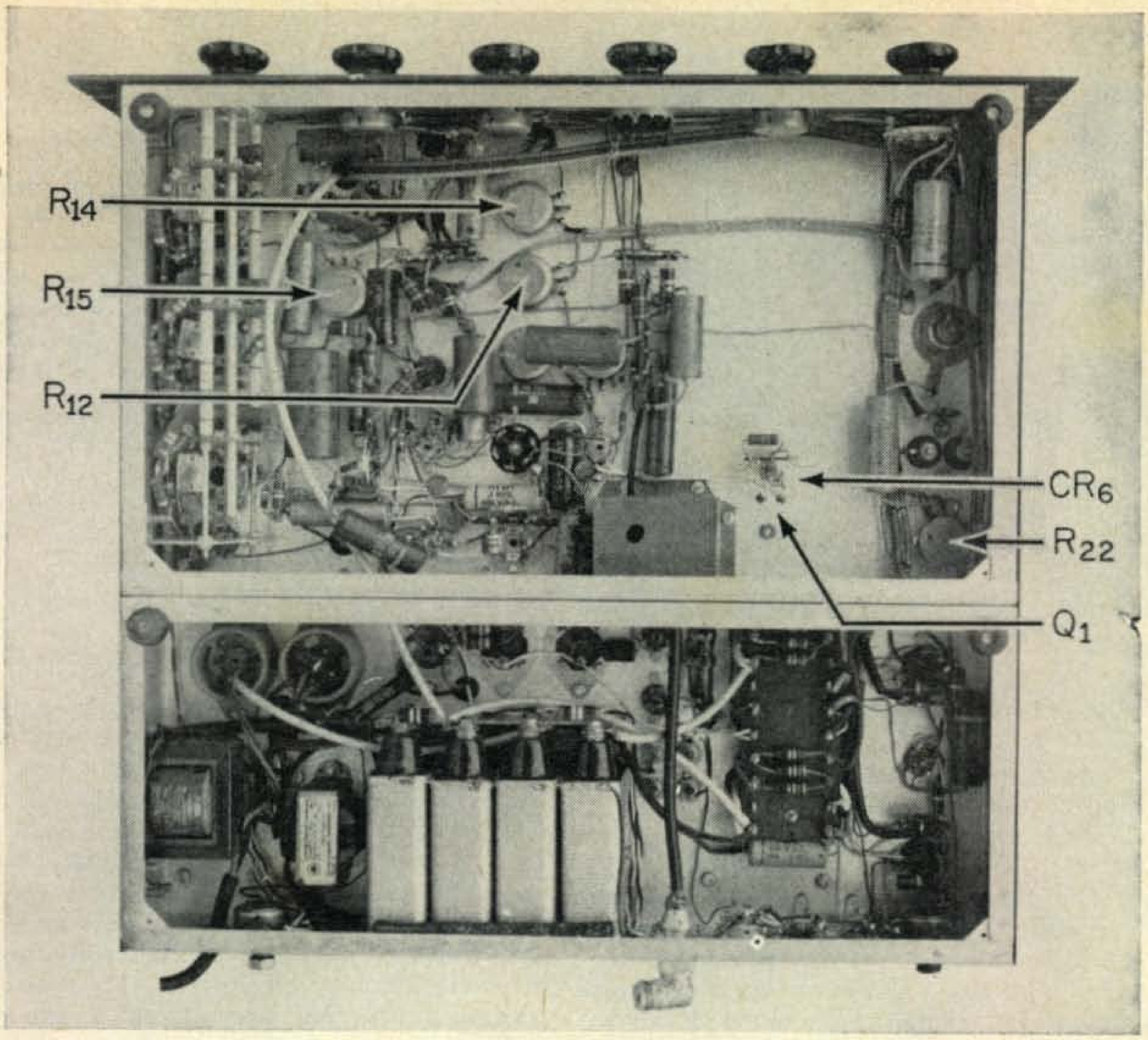
C.R.T.

The cathode ray tube is a five inch post-deflection-acceleration type with a P7 phosphor. This long persistance phosphor is needed because of the very long sweep durations encountered in this instrument. A deep yellow filter must be used over the face of the tube to remove the annoying blue flash that accompanies the trace in this type of tube. Minus 2 kv and plus 2 kv are obtained from the power supply and the net potential of 4 kv provides a bright sharp pattern that permits observation with high ambient light levels, and is also excellent for photographing traces.

The constructor is cautioned that substituting a different type of c.r.t. or operating it at substantially different voltages may require considerable change in the d.c. deflection amplifiers in order to obtain proper pattern size and good linearity. A Nicoloi or, preferably, Mumetal shield should be used on the c.r.t., and the power transformer must be carefully positioned if hum deflection is to be avoided.

Power Supplies

The power supply uses a silicon bridge rectifier to provide 325 volts of B+, and VR tube



Bottom view of the spectrum analyzer illustrating component layout and shielding. The r.f. input transformer T_1 and the r.f. amplifier, V_1 (6BQ7A) are located under the square shield adjacent to the rear of the r.f.-i.f. chassis. The resolution selector switch, S_2 assembled as outlined in the text, is anchored at the rear of its assembly by a bracket mounted on the side of the chassis.

regulators supply +260, +150 and +105 volts. A zener diode, CR_1, is used to achieve the extremely critical screen regulation necessary to prevent frequency jitter in the reactance modulator.

The plus and minus high voltage rectifiers, V_{13} and V_{14}, use the same 1600 volt a.c. winding. They require separate, well insulated, 3.15 volt filament sources. This complication could be eliminated by using high voltage silicon cartridge rectifiers.

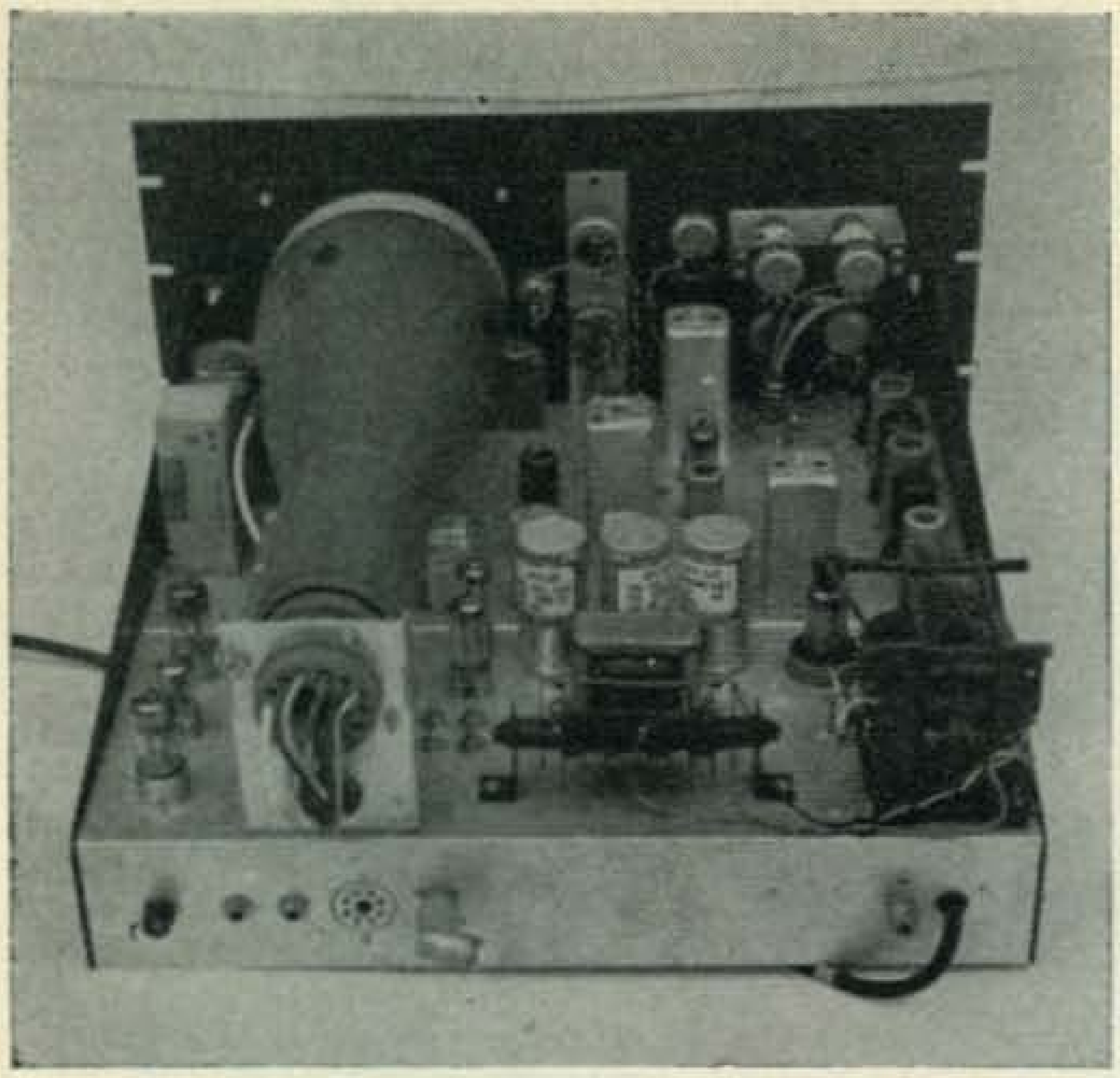
The regulated negative bias voltage is obtained from a zener diode (CR_{16}) placed in the ground return lead of the −2 kv bleeder chain. Only 1 ma of current is available here, so a diode with good zener stability at low current must be selected. Any voltage between 6 and 12 volts is satisfactory. A commercial diode in the 50 or 100 mw class should be satisfactory.

The d.c. filament supply is regulated with a power transistor, Q_1, and a zener diode reference. This is essential to prevent drift and wandering of the center frequency and of the vertical trace position. The circuit used here is a conventional silicon bridge rectifier feeding a series regulator. The transistor was placed in the ground return of the filament circuit to permit bolting its case directly to the chassis. This provides the necessary heat sink. The silicon diodes are of the stud type, and are also bolted to the chassis. The two rectifiers in the positive leg of the bridge require mica insulating washers.

Miscellaneous

An edge-lit calibrated reticule was fabricated from a piece of yellow-orange plexiglass. The desired pattern was scribed in the plastic with a sharp metal tool. The edges were then polished and the piece mounted with a small pilot bulb positioned against one side. This bulb is connected to the a.c. filament line through a 100 ohm 4 watt pot, R_{20}. This provides smooth control of the scale illumination and has proved to be a very desirable feature.

Other additional conveniences are the accessory power socket and the vertical and horizontal output jacks. The power connector supplies 6.3 v.a.c. and +325 v.d.c. for operating external test tone oscillators or frequency converters for receivers having other than 455 kc i.f.'s. The output jacks provide driving signals for mechanical recorders of the driven chart or X-Y plotting types. These would yield permanent records of transmitter or filter charac-



Rear view of the spectrum analyzer. The components on the rear of the chassis are, l to r; R_{25}, Sweep Linearity; J_4, Horizontal Output; J_3, Vertical Output; J_2, Accessory Socket; J_1, 455 kc Input and Hum Balance pot. The stud mounted silicon rectifiers, CR_2 to CR_5, used in a bridge circuit for d.c. filament supply, may be seen to the right of the neck of the 5CP7A.

teristics. A large-screen slave display unit could also be connected here.

Construction

The spectrum analyzer is constructed on a 17″×17″×3″ chassis. This is formed by bolting together a 10″×17″×3″ and a 7″×17″×3″ chassis. The power supply components and the sweep amplifiers are mounted on the smaller chassis which is positioned to the rear of the instrument. The larger chassis in the front contains the i.f. and signal components. Refer to the photographs for component layout. The positioning of the power transformer will be found to be critical. It must be oriented so as to minimize hum modulation of the cathode ray tube beam. A mu-metal shield may be fabricated for the transformer, although for best results, a shield should be placed over the cathode ray tube as this also protects it from stray magnetic fields of other nearby equipment. The i.f. and r.f. circuit wiring should closely follow that shown in the photographs. Care must be taken to prevent feedback. Wiring should be point-to-point with short leads. Bypass capacitors should be installed close to the pin terminals to which they are connected. All a.c. filament wiring should be twisted and shielded wire used for all leads carrying video signal. The focus and intensity potentiometers should be mounted on an insulated bracket so as to avoid the possibility of internal breakdown to ground. The wiring to these pots and to other high voltage portions of the circuit should be made with adequately insulated wire.

Component Modification

Several components must be modified before they are installed on the analyzer chassis. The selectivity switch S_2 is fabricated from an 8″ CRL #P272 index assembly and three CRL #KD switch sections. These switch sections have two poles and a maximum of five positions. The indexing stop must be set to provide the four positions required in this application. The spacing of the sections should be adjusted so that they clear the tube sockets and provide sufficient room for the interstage wiring. Refer to the photographs for further details.

The r.f. input transformer, T_1, is a Merit BC-352 and it is modified as follows: Remove the small capacitor soldered across the input coil winding. Loosen the glue which holds the coils to the core by carefully applying a small amount of solvent. Push the coils together until they are spaced approximately ⅛″ apart. This overcouples the windings and provides the required bandpass characteristics.

Transformer T_4, the sweep oscillator coil, is a Panoramic part #ZN-8297. It also must be modified. Add an 82 mmf, 5%, zero temperature coefficient silver mica capacitor in parallel with the existing 100 mmf tank capacitor. All other components in the analyzer are standard stock items.

Testing The Power Supply

When wiring of the analyzer is completed make the customary resistance checks to assure that no accidental wiring shorts exist. Then disconnect the high voltage and B+ transformer windings from the circuit. Apply 117 volt power to the unit. Measure filament voltages to assure that the filament, rectifiers and regulating circuits are working properly. Check to see that all tubes light. Now reconnect the B+ and high voltage transformer windings and check all voltages.

Adjust the VR tube dropping resistors. To do this open the cathode lead circuit of each VR tube and insert a milliammeter. Adjust the resistor so that at least 5 ma of current is indicated under the maximum possible load conditions. The current should not exceed 30 ma at any time.

The hum balance control on the rear of the chassis should be adjusted to balance the a.c. filament voltage. Equal a.c. voltage should be measured from each branch of the circuit to ground.

Adjusting CRT and Sweeps

Advance the intensity control and observe the yellow spot on the face of the tube. Adjust the left and right position controls and the sweep speed control until the spot is deflecting across the tube. Adjust the LEFT POSITION so that the sweep begins at the left calibration point on the reticule and the RIGHT POSITION so that the sweep ends at the right hand calibration point.

Now calibrate the sweep speed ranges. The sweep speed in $\times$ 1 position may be measured with a stop-watch or sweep second hand of a clock. It should provide from 10 seconds per sweep to one second per sweep. If necessary, trim the value of sweep rate capacitor C_6. To calibrate the $\times 1$ and $\times 10$ positions, couple the output of an audio signal generator through a .01 mf capacitor to pin 2 of V_{10} (vertical output amp). Set generator frequency to 20 c.p.s. in the $\times 1$ position. It should be possible to vary the number of complete cycles displayed on the screen from 2 to 20 with R_{24} (sweep rate control). Trim the value of C_5 if necessary. Now set the generator to 200 c.p.s.; with the range set to $\times 10$, it should again be possible to vary the display from 2 to 20 cycles. Trim C_4 as required. A slight overlapping of ranges is desirable.

The sweep linearity may also be set at this time. Adjust R_{25} for the most consistent spacing between cycles on the screen. It may be necessary to repeat the entire procedure a few times for best overall results.

Check to see that the vertical position control has sufficient range to move the trace from the bottom to the top of the screen. If not, try substituting different tubes for the 6AV6, V_9. If the trace still cannot be positioned properly, adjust the values of R_{17}, R_{18}, and R_{19} (V_{10}) as required. Adjust the astigmatism potentiometer, R_{22}, in conjunction with the focus pot, R_{21}, for best focus and spot shape over the entire face of the screen.

Alignment of the Sweep Circuits

Switch the mode switch to linear position and inject a 455 kc signal, from an accurately calibrated signal generator, through a small coupling capacitor (50 mmf) to the grid of the mixer tube, V_2. Reduce the scan width control, R_{11}, to zero. Set the center frequency control, R_9, and the scan linearity control, R_{10}, to mid positions. With an insulated alignment tool, adjust slug in transformer T_4 so that the trace on the screen peaks to maximum position. The crystal filter should be in the OFF or BROAD position for this adjustment.

Be certain that the transformer T_4 is adjusted to the proper frequency. The oscillator should be operating at 455 kc plus the crystal i.f. frequency. For the crystals used in the original model it should be oscillating at about 618 kc. Listen for the signal by coupling the antenna loop of a small a.m. radio to the oscillator circuit of the analyzer.

Aligning The I.F. Circuit

Now peak the slug adjustments of the i.f. transformers T_3 and T_5. Alternately adjust the four slugs for maximum screen deflection. Reduce the signal generator output control as required to keep the trace on the screen.

Set the SWEEP SELECTOR switch to the 100 KC position and adjust the scanning width potentiometer, R_{11}, for full width. Alternately adjust the 100 kc padder, R_{14}, the sweep linearity control, R_{10}, and the T_4 oscillator transformer slug to obtain exactly 100 kc of scanning width. The oscillator slug must be continually readjusted to maintain a 455 kc center frequency. The sweep linearity control should be adjusted for optimum uniformity of frequency sweep. The signal generator frequency may be varied step by step up and down in frequency from the center point and the position of the pips on the screen should be noted. This entire procedure may have to be repeated several times before satisfactory results are obtained.

Set the resolution control S_2 to position #2 for 100 cycle resolution. Set the scan range selector to the 20 kc position and set the 20 kc adjust padder, R_{12}, for exactly 20 kc maximum scanning width. Similarly, adjust R_{13} for a 2 kc scanning width. The resolution control must be set to the sharper position for this adjustment so that the extremes of the scanning width may be accurately observed. Now, using the 2 kc scanning width position and the slowest available sweeping speed, check through the various resolution positions. The pip in each position, although varying in width, should maintain approximately equal height and should be symmetrical on both sides of center. If not, the values of the several resistors associated with the resolution switch must be adjusted to compensate for the characteristics of the particular crystals used.

Phasing capacitors C_1, C_2 and C_3 should be adjusted for optimum skirt symmetry in the SHARP crystal position, #3. This is best done by reducing the scanning width to 500 or 1000 cycles, switching the mode switch to the LOG-20 position and advancing the gain control so that the top of the pip extends well above the top of the calibrated screen. Observation is now being made at a level of 60 db or more below the peak level of the pip and this provides a very sensitive indication of proper crystal phasing.

At this point the i.f. transformers T_3 and T_5 may be slightly touched up by observing the broad position response curve on the screen. The transformers should be adjusted for best resolution and symmetry.

Aligning the R.F. Circuit

Connect the signal generator to the input jack, using the dummy test lead as shown in fig. 28. The total length of coax used should be

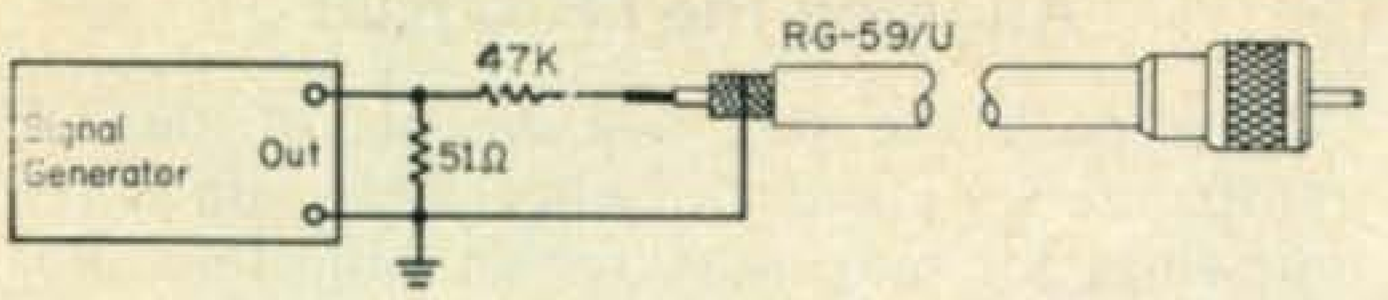


Fig. 28—Circuit showing the method of connecting the signal generator to the analyzer input jack. The length of RG-59/U cable should be the same as that to be used when permanently connected to the receiver as in fig. 29.

approximately the same as that which will be used to connect the instrument to the receiver. Peak the slug adjustments of transformer T_2 for maximum response at 455 kc. These settings are extremely broad and some care must be taken to achieve best results. The slugs of transformer T_1 should be adjusted for peak at approximately 20 kc above and 20 kc below the 455 kc center frequency. This adjustment is best made while scanning in the 100 kc width position. The signal generator should be rocked back and forth and the height of the pip observed. Adjust transformers T_1 and T_2 for uniform pip height across the desired bandwidth. It should be possible to obtain flat response over a total width of 20 kc with ease. With careful adjustment and some trimming of the T_2 swamping resistors values, greater bandwidth should be possible. Do not spend too much time making these adjustments at this time for they will have to be repeated later when the unit is connected to the receiver, as the i.f. response characteristic of the receiver slightly modifies the results as seen on the analyzer.

With the generator[4] set at 455 kc and the mode switch in LINEAR position, vary the output control of the generator and observe the pip height on the screen. Check to see that it varies linearly with the output voltage. Now switch to the LOG position. Adjust the log adjust potentiometer, R_{15}, so that the pip amplitude corresponds to the log of the applied r.f. voltage. To do this set the generator for full screen height of the single frequency pip. Note the microvolt output setting of the generator. Now reduce the generator to one-tenth of the original setting. This represents a reduction of 20 db., and R_{15} should be adjusted so that the pip comes to the –20 db mark on the screen. Again reduce the generator output by a factor of ten. The output is now 1/100 of the original value. A 100:1 ratio of voltage is a reduction of –40 db. Use the following db formula to obtain other db reductions as required for calibration:

$$V_{gen.\ out.} = \log^{-1}\left(\log\left[V_{original}\right] - \frac{db}{20}\right)$$

It should be possible to make the –10, –20, –30, and –40 db points appear at the same points on the screen as indicated on the grid illustration, fig. 9 in part II. Now switch to the LOG –20 position. Adjust the 20 db adjust potentiometer R_2 for exactly 20 db difference in gain between the LOG and LOG –20 position of the mode switch.

[4]The signal generator should be of laboratory quality, with an accurately calibrated attenuator.

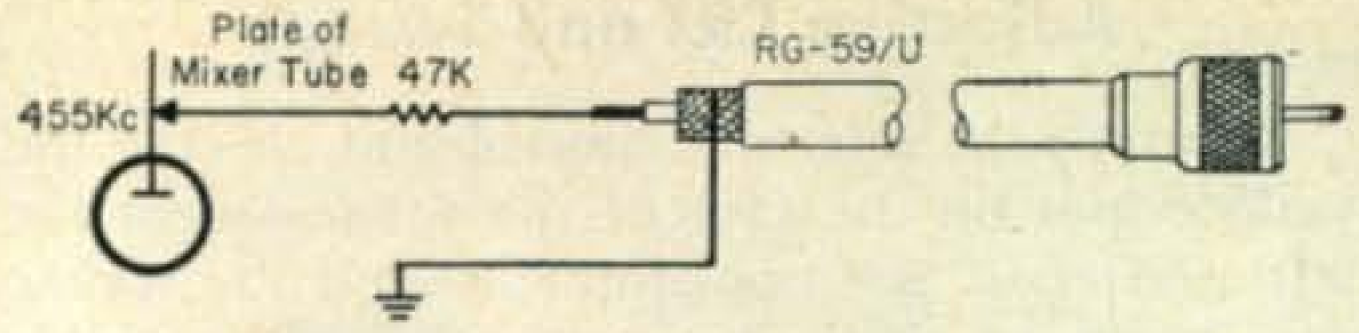


Fig. 29—Circuit of the permanent connection for the spectrum analyzer to the station receiver. The 47K resistor should be located as close to the plate of the mixer as possible

Connection to Receiver

Connect the analyzer to the communications receiver as shown in fig. 29. The 47 K isolating resistor should be connected directly to the plate of the mixer in the receiver. If the i.f. frequency of the receiver is other than 455 kc, a crystal controlled frequency converter must be used between the receiver and the analyzer. Take care not to use an excessive length of coax in connecting the receiver to the analyzer.

Readjust the r.f. transformers T_1 and T_2 as described previously for best response linearity over the desired frequency scanning range. The signal generator may now be operated on any convenient frequency to which the receiver is tuned, and varied up or down slightly in frequency to provide the desired sweep band width. The a.v.c. action of the receiver must be completely disabled or it will affect the amplitude of the pip signal as seen on the analyzer screen.

This completes the construction, alignment, and testing of the analyzer. If you have taken care in construction you will find that you now have a reliable, accurate, and versatile piece of test equipment. In case of difficulty, apply standard receiver troubleshooting techniques. Remember there is no substitute for quality parts and good workmanship. Best of luck and good analyzing. If any inquiries are forwarded to us please include a stamped envelope. ■

Correction

Basic Spectrum Analysis Part I—August 1961, page 37. The second formula shown on page 37 was incorrect. The proper formula is as follows:

$$f_c = f_{usb} - \frac{f_{usb} - f_{Lsb}}{2}$$

That is to say that the carrier frequency is equal to the upper sideband frequency minus half the difference of the sideband frequencies.

A Versatile Crystal Controlled Frequency Source

MIRKO VOZNJAK*, YU1AD

A crystal controlled frequency source providing 10 kc and 100 kc multivibrator check points. Also included are 1 mc and 5 mc checkpoints for higher frequencies. All signals can be modulated by a 120 cycle audio tone.

THE popular frequency meter available on the American surplus market, as well as around the world, the BC-221, is a fine instrument. However, for accurate frequency checking this set must be warmed up at least two hours.

Now the frequency meter described here will function similarly to the BC-221 but is easier to handle and has a shorter warm-up period. This unit needs only 30 minutes at room temperature to settle down to rock-like stability.

Features

The unit provides a choice of frequency determining signals on each 10 and 100 kc check points, and it also makes harmonics available for the higher frequency bands by using 1000 and 5000 kc crystals. These harmonics serve excellently as marker signals to avoid picking the wrong frequency on the broader higher frequency portions of the spectrum.

With an additional socket on the front panel, wired to a spare position on the frequency selecting switch, it is possible to use any external crystal in the 100 kc to 20 mc range. With this feature any desired marker frequency is available. This is desirable because most hams are interested in determining band edge frequencies.

A simple aperiodic detector connected to an a.f. stage has been incorporated in the unit for heterodying purposes, thus obviating the use of a communication receiver. Beats with signals from 10 kc up to 10 mc are very audible as well as those in the h.f. ranges of the instrument.

The addition of modulation (at about 120 c.p.s.) assists in recognizing the internally generated signals from those which may leak through. Modulation is obtained by simply pressing a button which opens the negative path of both filter capacitors; a 1 mf capacitor (C_{25}) is left in the circuit and it removes most of the raspy sound from the 120 cycle note.

The basic unit of the frequency meter is the 100 kc oscillator. It is wise, therefore, to choose a good 100 kc crystal. If you are "flush" you might even invest in a temperature controlled job which will result in accuracy that the average ham can only dream of.

*7 Koste Abrasevica, Belgrade, Yugoslavia

Circuit Operation

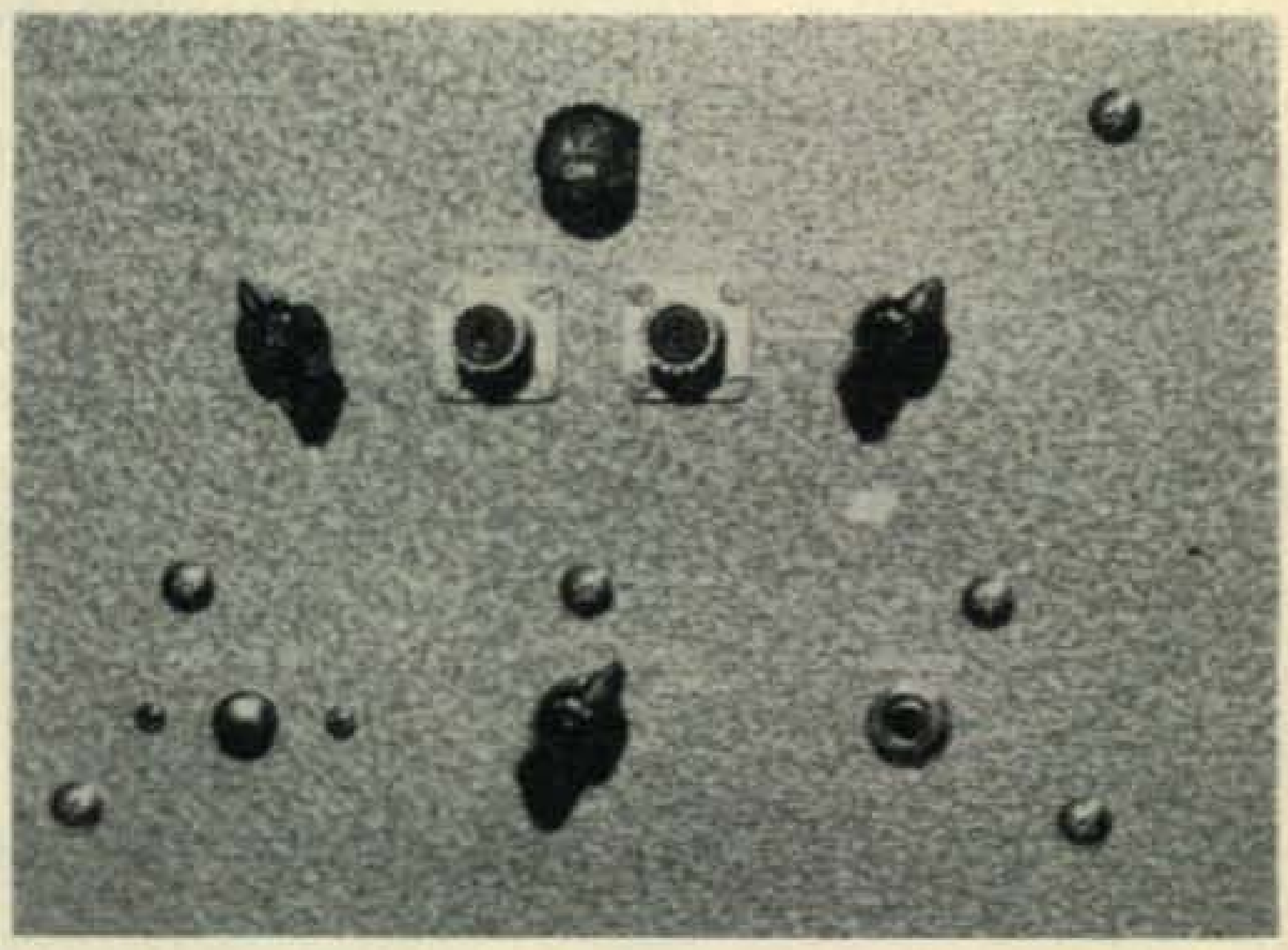
A 6BA6 is used as the oscillator tube (V_1), but any other good pentode can be used without circuit alteration. An air trimmer (C_2) is used to zero the 100 kc crystal with WWV.

The next stage, a 12AT7 (V_2), is a multivibrator and when properly synchronized with the 100 kc crystal signal, will give 10 kc signals of equal stability.

When the plate connection to the right triode of V_2 is left open it acts as a buffer stage and the signal of the 100 kc oscillator is simply fed from the plate of the left triode to the grid of the harmonic amplifier, a 6BA6 (V_3).

Amplifier V_3 also serves as a buffer stage to avoid any external loading effects. The output signal is taken through a 100,000 ohm pot (R_{15}) which acts as a simple attenuator to prevent receiver overload.

The marker oscillator (V_4), another 6BA6, is similar to the 100 kc oscillator. Three trimmers are used to tune to 1000 and 5000 kc and the frequency of the external crystal. Tuning "right on the head" is not necessary because precision calibration can be accomplished by



Front panel view of the frequency source. Controls are; upper left, OFF-ON-STANDBY; upper right, OUTPUT LEVEL; lower left, MODULATION ON; lower center, FREQUENCY SELECTOR. The two coax jacks in the upper center are MONITOR INPUT (l) and OUTPUT (r). The phone jack is located in the lower right corner. A socket for an external crystal was installed after the photograph was taken.

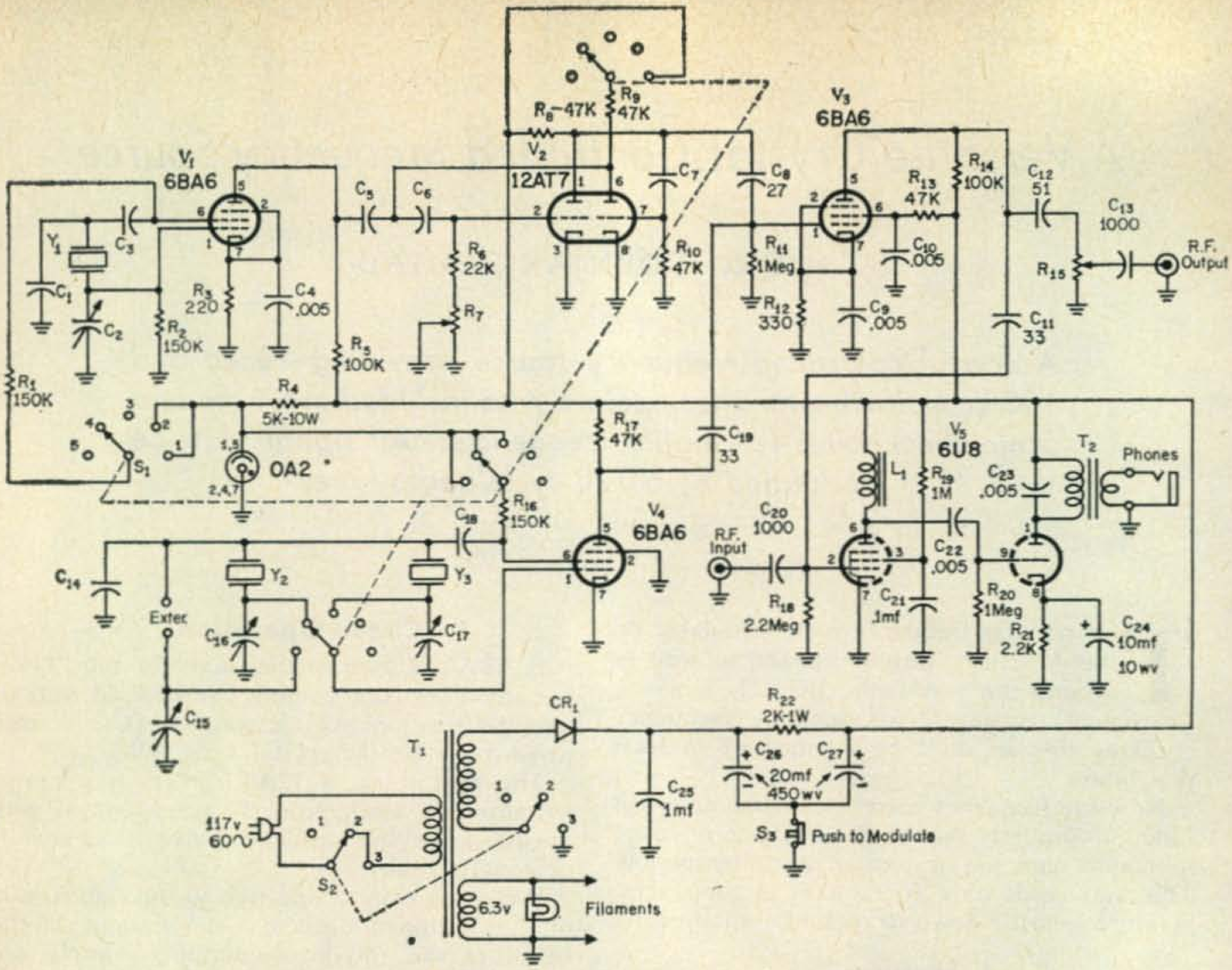


Fig. 1—Circuit of the crystal controlled frequency meter. The function switch (S_1) positions are: 1, 10 kc; 2, 100 kc; 3, 1000 kc; 4, 5000 kc; 5, external crystal. All resistors are ½ watt unless otherwise noted. Capacitors greater than 1 are in mmf unless otherwise indicated and decimal values are in mf.

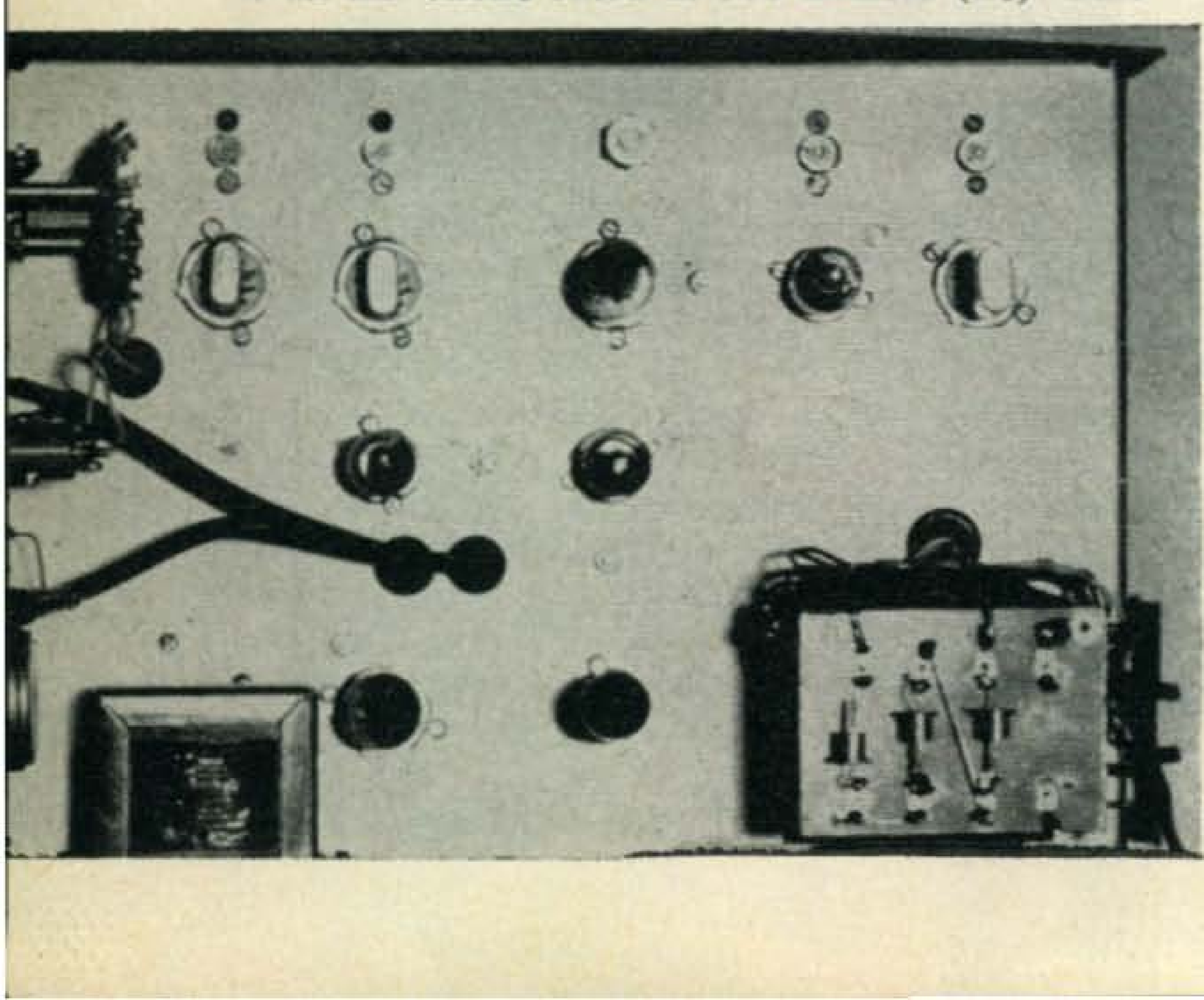
C_1, C_{14}—150 mmf NPO, ceramic.
C_2, C_{15}, C_{16}, C_{17}—5-50 mmf air trimmer, Hammarlund APC-50.
C_3, C_{18}—2000 mmf, silver mica.
C_5—10 mmf ceramic NPO.
C_6, C_7—1000 mmf, silver mica.
CR_1—Sarkes Tarzian M150.
L_1—A.f. choke, 500 h, 5 ma (see text).
R_7—50K potentiometer, linear taper, with locking nut.
R_{15}—100 K potentiometer, linear taper.
T_1—Power transformer, 270 v, 70 ma; 6.3 v, 2a.
T_2—Output transformer, see text.
Y_1—100 kc crystal.
Y_2—5000 kc crystal.
Y_3—1000 kc crystal.

using harmonics from the precision 100 kc oscillator. Either 33 mmf mica or ceramic capacitors (instead of trimmers) may be used in this circuit if desired.

The pentode portion of the 6U8 (V_{5a}) is used as a simple detector. The plate load of this stage is an a.f. choke rated at 500 henries (L_1). This choke increases the gain of the detector stage and its replacement with a resistor is not recommended. These chokes can be found in BC-221s, and I understand that they can also be found on the American surplus market with ease.

The triode section of the 6U8 (V_{5b}) acts

[*continued on page 104*]



A top view of the chassis shows the diodes mounted atop the power transformer at the rear of the chassis. The three crystals are located in the row of sockets near the top of the photo. The crystals from left to right are 5000 kc, 1000 kc and 100 kc. Tubes from l. to r. top, V_2, V_1; center V_4, V_3; bottom V_5, V_6. Output transformer T_2 can be seen at the lower left in the photo.

The R-T Coupler, Model II

BY JAMES E. TAYLOR*, W2OZH

Since the first article concerning s.s.b. transceiving appeared some four years ago[1] several manufacturers have seen fit to incorporate this useful concept in designs of ham equipment. The present article describes a more sophisticated R-T coupler for use with the 100V and other recent versatile equipment. Coverage of all bands with a single crystal, and a minimum number of adjustments are features of this design.

THE use of the original R-T coupler circuit over a period of several years on single sideband has developed a strong preference in the mind of the author for the "Tranceive" method of operation. Accordingly, when a Central Electronics Model 100V transmitter was procured recently, the development of an R-T coupler suitable for use with this versatile piece of equipment was considered to be an immediate necessity.

Two features of the 100V transmitter make it particularly suitable for use with an external R-T coupler:

(*a*) The v.f.o. output and input connections are conveniently available at phono jacks on the rear of the transmitter.

(*b*) The transmitter is completely broadbanded permitting wide frequency coverage without repeaking of the transmitter tuning.

Since the Collins receivers are quite popular among single sideband operators and because the author uses a 75A-2, the R-T coupler was developed for use with receivers using a variable master oscillator in the approximate range of 2 to 3 megacycles. Adaptation of the basic design to other transmitters and receivers will be conveniently accomplished since the dual conversion method used in this R-T coupler offers a high degree of flexibility.

The present article develops the theory, describes all the fundamentals of the circuitry used in the dual conversion R-T coupler, provides the schematic diagram and describes, in detail, the operation of the circuit in use at W2OZH.

Symbols

We will first review the frequency relationships for the 100V transmitter, the 75A-2 receiver, and the dual conversion R-T coupler. Don't be alarmed by the equations as they represent nothing more complicated than addition and subtraction of frequencies.

The symbols used in the following paragraphs represent frequencies which occur in the circuitry discussed. For simplification, crystal controlled frequencies are denoted by the symbol X, variable frequency oscillator frequencies by the symbol V, and mixer output frequencies by the symbol M. In addition, subscripts t, r, and c, denote values pertaining to transmitter, receiver, and R-T coupler, respectively. Where more than one value appears in a circuit, numerical subscripts are used. For example, M_{r2} refers to the frequency of the output of the second mixer in the receiver. Also, the received frequency is denoted by R and the transmitted frequency by T.

The use of this simplified notation permits one to identify each symbol without the necessity of referring to a tabluation of symbols.

Theory of Model 100V Transmitter

The frequency conversion circuitry of the Central Electronics 100V transmitter is shown in the block diagram, fig. 1. The crystal frequencies for the various bands are shown in Table 1.

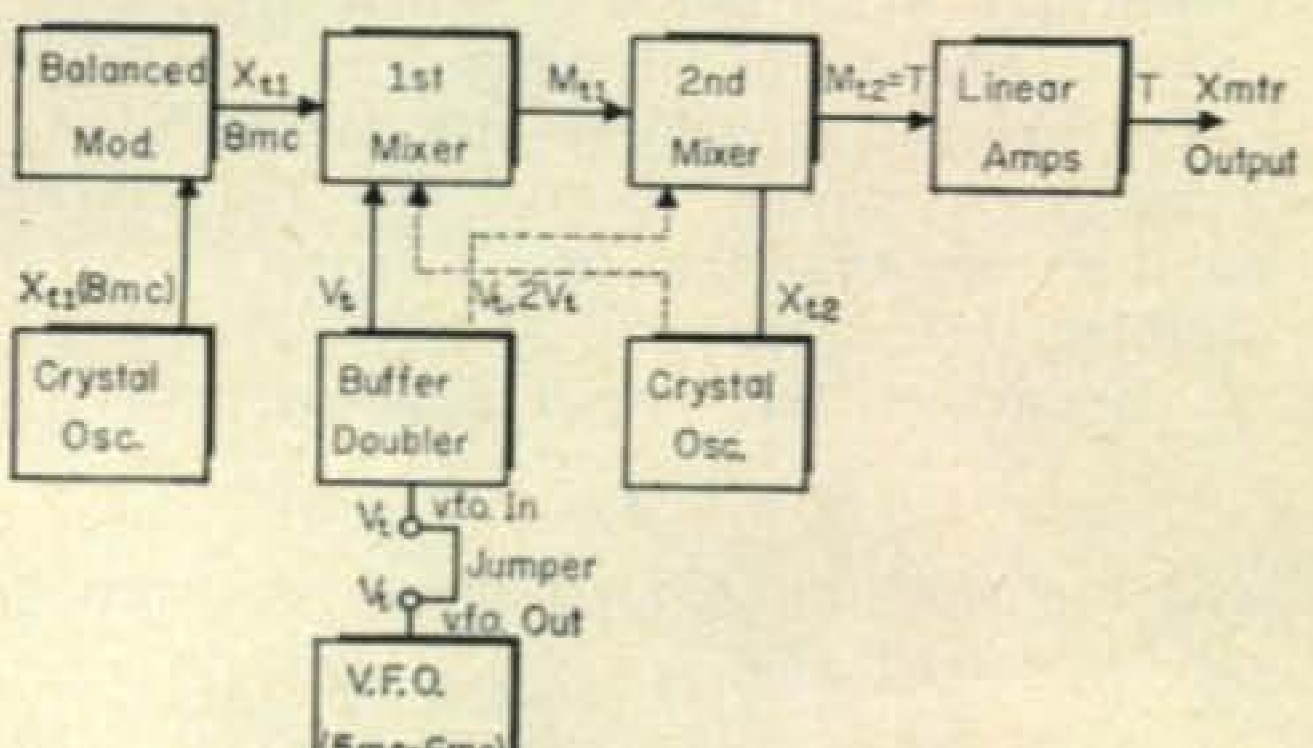


Fig. 1—Simplified block diagram of the Central Electronics 100 V. The dotted lines show the connections for the 10 and 20 meter bands.

*M. Ten Bosch, Inc., Pleasantville, N. Y.

[1]Taylor, J., "The R-T Coupler", *CQ*, November, 1956, p. 30.

TABLE I

Band	X_{t1} (Mc)	X_{t2} (Mc)	X_r (Mc)	V_{tc} (Mc)	V'_{tc} (Mc)
10	8	47.7	33.455	5.450	28.805
15	8	34.5	23.300	5.3	21.2
20	8	27.5	16.500	5.1	14.4
40	8	20.5	9.300	5.3	7.2
80	8	17.5	5.700	5.9	3.6

Frequency Relationships for Bands Other than 10 meters and 20 meters:

Referring to fig. 1, the frequency of the output of the first mixer, M_{t1} is given by the relation:

$$M_{t1} = X_{t1} + V_t \qquad (1)$$

The output frequency of the second mixer is given by:

$$T = X_{t2} - M_{t1} \qquad (2)$$

Combining equations (1) and (2) yields:

$$T = X_{t2} - X_{t1} - V_t \qquad (3)$$

Equation (3) is the relation for the output frequency, T, of the 100V transmitter on all bands except 10 meters and 20 meters.

Frequency Relationships for the 20 meter and 10 meter bands:

For operation in the 20 meter band the circuitry is seen to be identical with that treated above except that the output from the buffer-doubler is fed to the second mixer rather than the first, whereas the output from the second crystal oscillator is fed into the first mixer.

In this case, the tuning of the first mixer output is such that this output frequency is given by the realtionship:

$$M_{t1} = X_{t2} - X_{t1} \qquad (4)$$

Similarly, the tuning of the second mixer is such that this output is given by:

$$T = M_{t1} - V_t \qquad (5)$$

Combining equations (4) and (5) yields:

$$T = X_{t2} - X_{t1} - V_t \qquad (6)$$

Equation (6) is the relation for the output frequency, T, of the 100V transmitter in the 20 meter band. The relationship is seen to be identical with equation 3 which applies to the other bands except 10 meters.

For operation in the 10 meter band the circuitry is similar to that for the 20 meter band except that the output from the v.f.o. is doubled in frequency.

The first mixer output is given by—

$$M_{t1} = X_{t2} - X_{t1} \qquad (7)$$

and that for the second mixer is given by—

$$T = M_{t1} - 2\,V_t \qquad (8)$$

Combining equations (7) and (8) yields the expression for the 100V transmitter in the 10 meter band to be—

$$T = X_{t2} - X_{t1} - 2\,V_t \qquad (9)$$

The equations (3 and 9) will be used later to determine the operational parameters of the R-T Coupler to be used with this transmitter. The first receiver used to control the 100V was the Collins Model 75A2. Therefore the frequency relationships for this receiver will be reviewed using the above scheme of notation.

Theory of Model 75A2 Receiver

The frequency conversion circuitry of the Model 75A2 receiver is reviewed in the block diagram, fig. 2.

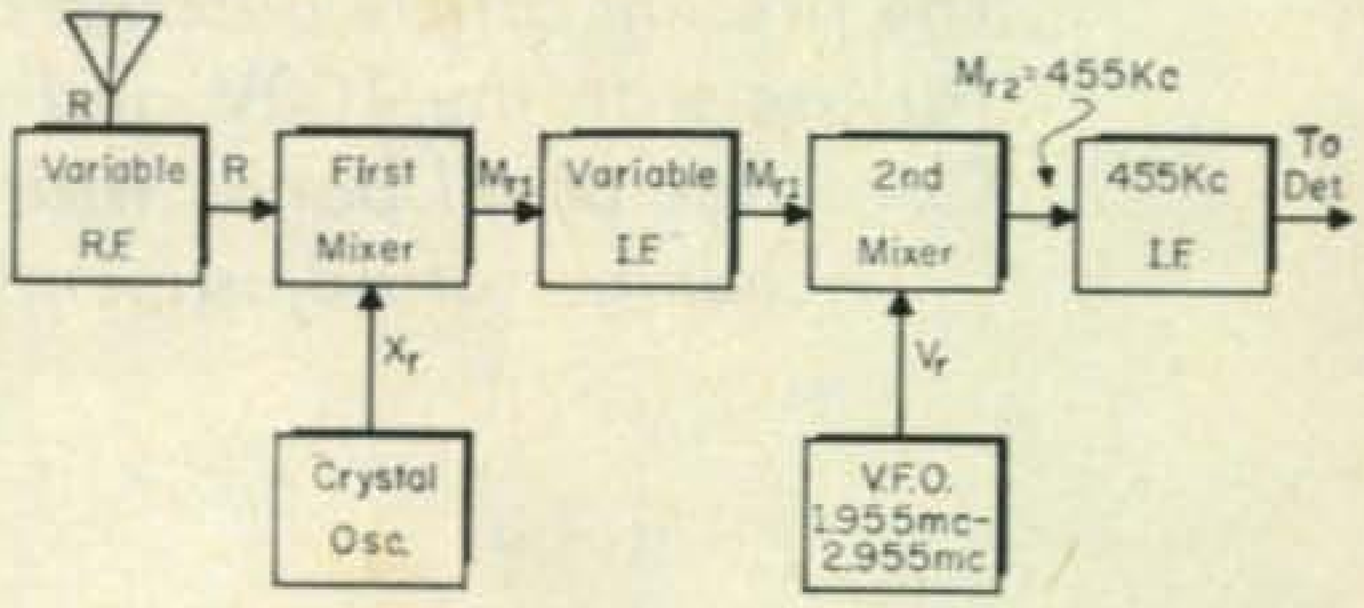


Fig. 2—Simplified block diagram of the 75A-2 receiver. The signal is taken from the v.f.o. and fed to the R-T coupler.

The crystal frequencies used for the various bands are listed in Table I.

The frequency relationship for the first mixer circuit in the receiver is:

$$M_{r1} = X_r - R \qquad (10)$$

For all bands except the 10 meter band, the relationship for the second mixer circuit is:

$$M_{r2} = V_r - M_{r1} \qquad (11)$$

Combining equations (10) and (11) yields:

$$R = M_{r2} + X_r - V_r \qquad (12)$$

The operation of the receiver on the 10 meter band is the same except that the second harmonic of the v.f.o. output is used so that instead of equation (12) we have

$$R = M_{r2} + X_r - 2\,V_r \qquad (13)$$

Equations (12) and (13) are the frequency relationships for the received frequency, R, of the 75A-2 receiver in the low frequency bands and the 10 meter band, respectively.

The theory of the dual conversion R-T coupler will now be developed so that the equations for transmitter and receiver operation can be appropriately combined in a single simple convenient circuit.

Theory of the R-T Coupler

The ideal R-T coupler should utilize the output of the receiver v.f.o. to control the transmitter frequency with a minimum of bandswitching and tuning operations.

The R-T coupler described incorporates dual conversion circuitry which permits control of the 100V transmitter throughout all bands, yet the coupler requires but a single crystal! This simplification is brought about by the utilization of the transmitter v.f.o. output which is available and not otherwise used.

The basic frequency conversion circuitry of

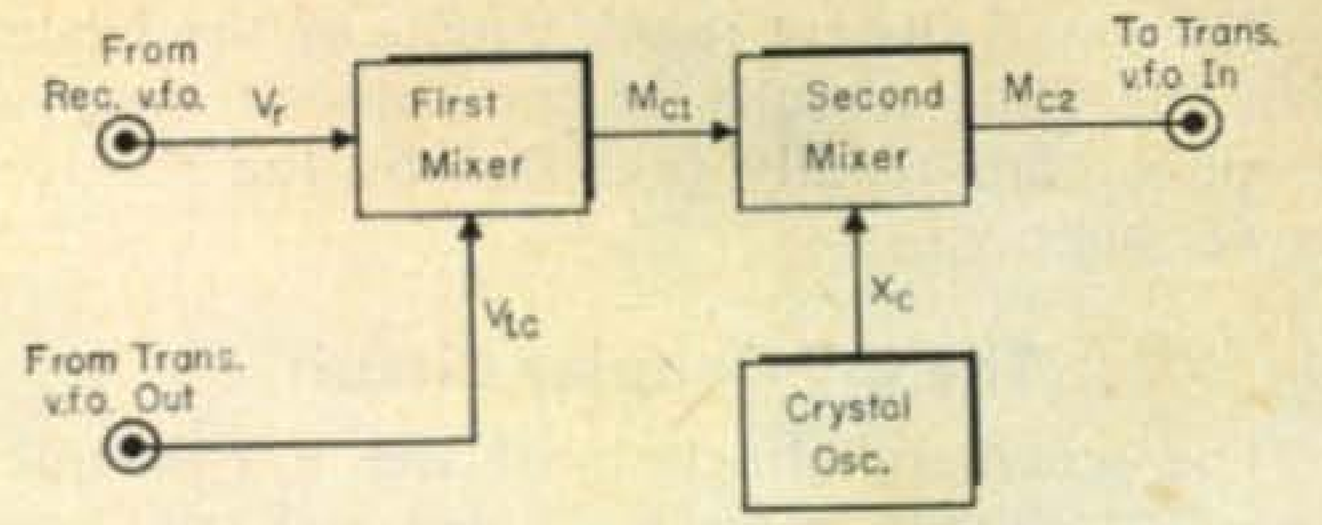


Fig. 3—Simplified block diagram of the R-T coupler.

the R-T coupler is shown in the block diagram, fig. 3. Referring to fig. 3, the output frequency of the first mixer is given by the relationship:

$$M_{c1} = V_r + V_{tc} \tag{14}$$

The output from the second mixer is given by:

$$M_{c2} = M_{c1} - X_c \tag{15}$$

Combining equations (14) and (15) yields the basic frequency equation for the R-T coupler:

$$M_{c2} = V_r + V_{tc} - X_c \tag{16}$$

In operation of the transmitter with the R-T coupler, the external jumper between the V.F.O. OUT and the V.F.O. IN terminals is removed and the R-T coupler is used in its place. Thus, the transmitter v.f.o. signal, V_t, is replaced in equations (3) and (9) by the coupler output signal, M_{c2}, yielding the new equations for the coupler-driven transmitter:

$$T = X_{t2} - X_{t1} - M_{c2} \tag{17}$$

and

$$T = X_{t2} - X_{t1} - 2\,M_{c2} \tag{18}$$

Equation (17) is for the lower frequencies and equation (18) is for 10 meters.

Combining equations (17), (16), and (12) gives the overall relationship between received frequency, R, and transmitted frequency, T, for the low frequency bands. The resulting equation is:

$$V_{tc} = R - T + X_{t2} - X_{t1} - M_{r2} - X_r + X_c \tag{19}$$

If the transmitter is to track the received frequency, R=T so equation (19) becomes:

$$V_{tc} = X_{t2} - X_{t1} - M_{r2} - X_r + X_c \tag{20}$$

The corresponding equation for the 10 meter band is, from equations (18), (16), and (13):

$$V_{tc} = \frac{X_{t2} - X_{t1} - M_{r2} - X_r + X_c}{2} \tag{21}$$

Equations (20) and (21) are, for the lower frequency bands and 10 meters, respectively, the relationships between the set transmitter v.f.o. output frequency, V_{tc}, and the coupler crystal frequency X_c for tracking R-T control.

Since the frequency range of V_t is 5 mc to 6 mc it is desirable, if possible, to select a value of the coupler crystal, X_c, so that V_{tc} falls within the available range for all bands. The choice of X_c = 2.555 mc is found to meet this requirement. This can be confirmed by substitution in equations (20) and (21) for each band. The results of this substitution are tabulated in the column V_{tc} of Table I.

On each frequency band the dial of the 100V is read in terms of V_t from 6 mc at the low frequency extreme to 5 mc at the high frequency end of the scale. Thus, the dial settings for the values of the V_{tc} settings can be tabulated so that these settings can be made directly on the dial. These reference settings are tabulated in Table I in the column headed V^1_{tc}. It is convenient to mark each of these dial settings on the dial itself for ready reference during band changes.

Since the transmitted frequency can be varied by changing the v.f.o. dial setting it will be seen that it is possible to transmit on a frequency other than the received frequency by merely shifting the v.f.o. dial. This method of operation is desired for working DX stations operating outside the amateur band of the R-T controlled station.

Summary

A double conversion R-T coupler has been developed which is suitable for controlling the frequency of a single-sideband transmitter from the oscillator output of a communications receiver. Features of the R-T coupler are all-band operation with but a single crystal and a minimum number of adjustments. Although the instrument was developed for a specific receiver-transmitter combination, the design is quite flexible and can readily be modified to accommodate most other modern combinations.

Block Diagram

The block diagram of the R-T coupler is shown in fig. 4. The settings of the transmitter v.f.o. for the various ham bands are reviewed in Table II.

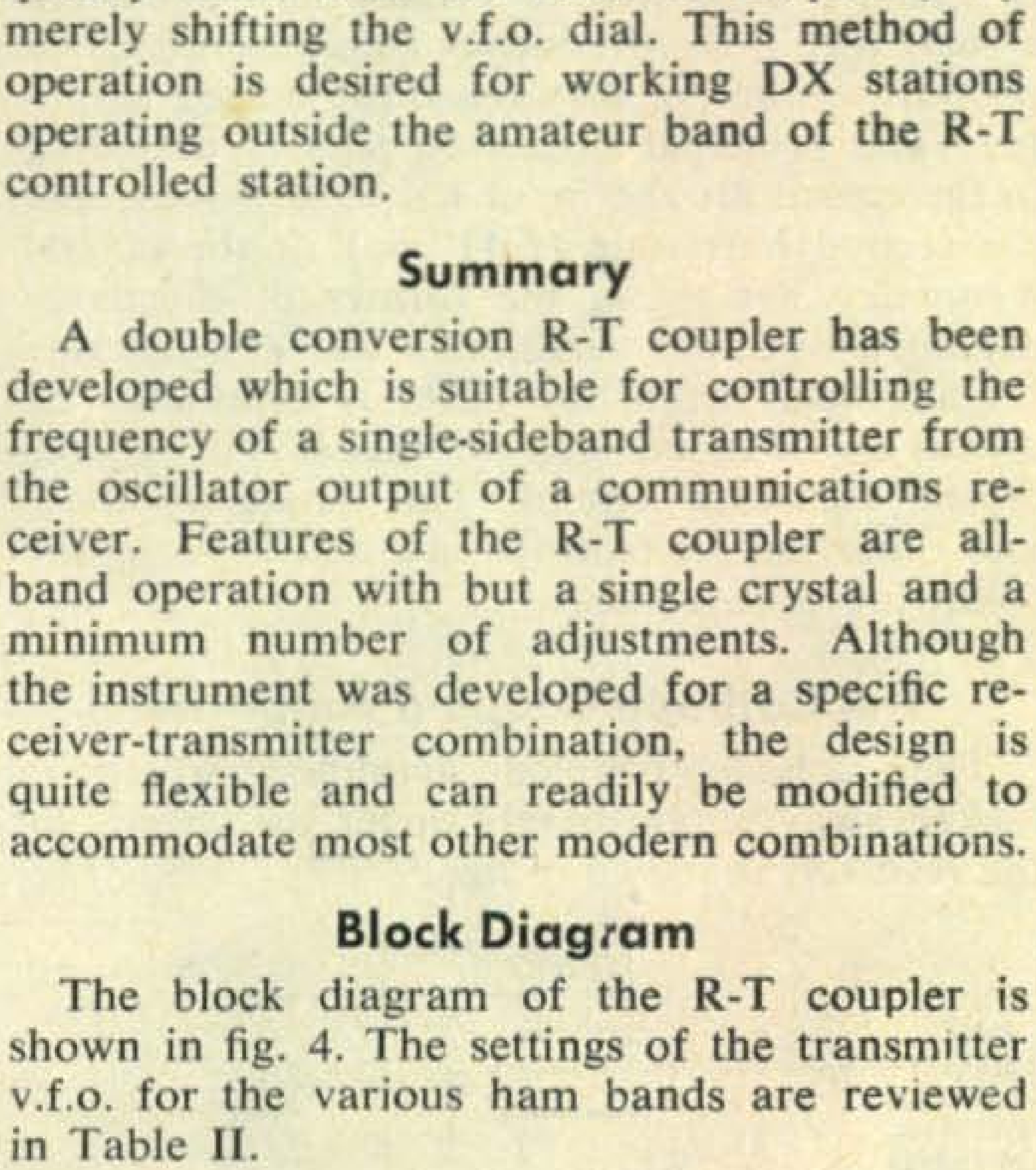


Fig. 4—Complete block diagram of the R-T coupler.

The cathode coupled amplifier provides sufficient r.f. voltage to drive the first mixer of the R-T coupler without appreciable loading of the receiver oscillator.

The frequencies in the R-T coupler are readily

TABLE II

Band	V^1_{tc}
10 m.	28.805 mc.
15 m.	21.2 mc.
20 m.	14.4 mc.
40 m.	7.2 mc.
80 m.	3.6 mc.

shown, from the theory given to be approximately as follows:

V_r —2 to 3 megacycles
V_{tc}—5 to 6 megacycles
M_c1—Near 8 megacycles
X_c — 2.555 megacycles
M_c2—5 to 6 megacycles

The arrangement shown provides tracking between received and transmitted frequencies with no adjustments or controls other than the simple permanent alignment normally required in heterodyne circuits.

The output frequency range from the R-T coupler is seen to be 5 to 6 megacycles. It is, of course, important to reduce any undesired signals within this frequency range to negligible proportions before they reach the output amplifier. The principal undesired signals occurring in the circuit are the input V_{tc} (5 to 6 mc), and the second harmonic (5.11 mc) of the crystal frequency. Of these, the former is effectively excluded by tuned circuits in the 8 megacycle i.f. amplifier, while the latter is eliminated by means of a tuned trap at the output of the crystal oscillator circuit. The details of these and other circuit features are described in the following paragraphs.

The Cathode Coupled Amplifier

The cathode coupled amplifier, which is tucked away unobtrusively under the chassis of the receiver, is shown in fig. 5.

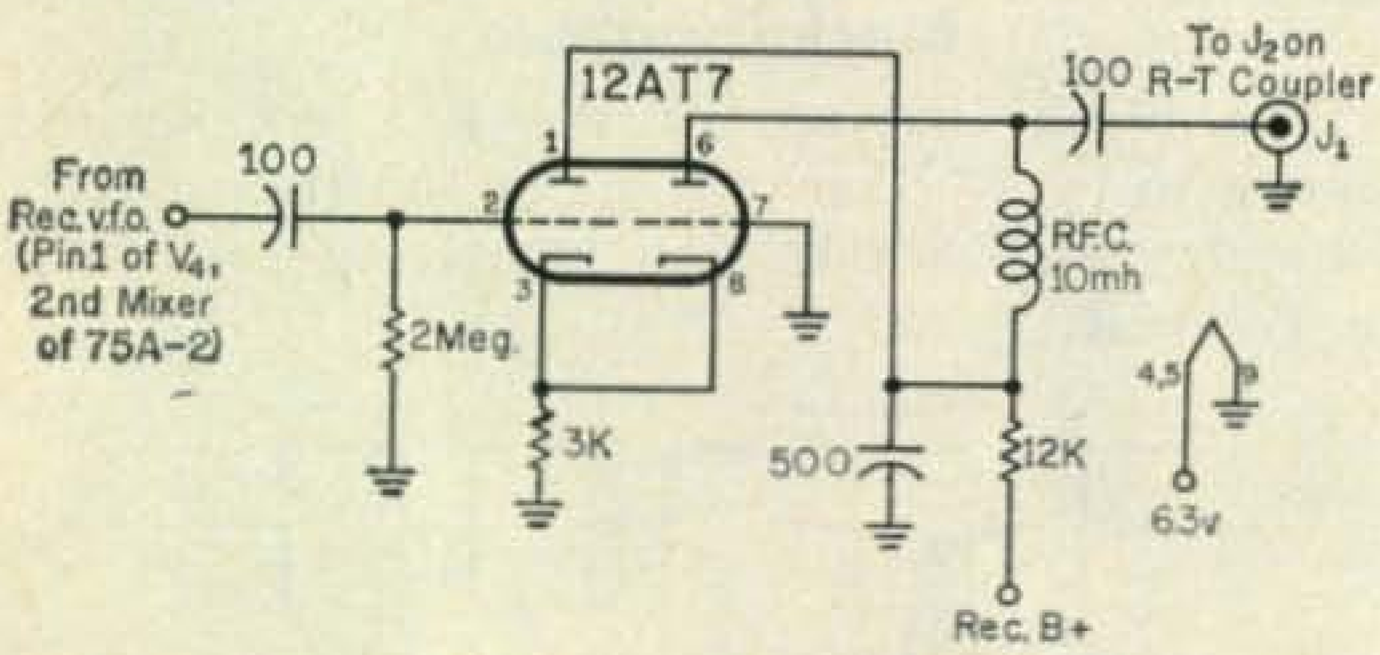


Fig. 5—Circuit of the cathode coupled amplifier located in the receiver. The input to the first half of the 12AT7 is high impedance and does not load the receiver v.f.o.

This circuit utilizes a 12AT7 dual triode tube to amplify the output from the variable frequency oscillator in the receiver. The grid of the first triode section is seen to be coupled to the oscillator output. This first triode section is cathode coupled to the second triode section which is used as a grounded grid amplifier. The grid circuit of the first triode section presents a very high impedance (negligible loading) to the receiver oscillator output since it is used as a cathode follower. The second triode section of the cathode coupled amplifier provides sufficient drive voltage for the first mixer of the R-T coupler even when several feet of coaxial cable is used between the receiver and the R-T coupler cabinet. The use of an r.f. choke in the load circuit of the second triode section, rather than a tuned circuit, permits constant output independent of receiver tuning.

The small current requirements of the heater and the plate circuits of the cathode coupled amplifier are readily provided by the receiver power supply.

The R-T Coupler Circuit

The schematic diagram of the R-T coupler circuit is shown in fig. 6. "Tried and true" circuits have been used throughout and no attempt has been made to utilize trick circuits for the purpose of decreasing the number of tubes. Because of this conventionality of design, the circuitry is easily constructed and readily adjusted.

A12BY7 tube, V_1 is used as the first mixer which provides the frequency addition of the amplified receiver v.f.o. signal and the set transmitter v.f.o. signal. The signal from the cathode-coupled amplifier in the receiver is applied to the grid of the first mixer, whereas the latter signal, from the transmitter, is applied through an adjusting potentiometer to the cathode of this mixer. The resulting frequency-added output is available across the 8 megacycle tuned plate circuit of the first mixer. This tuned plate circuit provides not only a high gain for the desired frequency near 8 megacyces but also it serves to attenuate the feedthrough of transmitter v.f.o. signal in the 5.5 megacycle region.

Following the first mixer is the two stage, 8 megacycle i.f. amplifier, utilizing the pentode sections of the 6EA8 tubes V_2 and V_3. These are tuned-plate amplifiers providing further amplification of the desired 8 megacycle signal while rejecting any residual 5.5 megacycle transmitter v.f.o. signal. In addition, this undesired signal is further rejected by means of the series tuned trap utilizing inductor, L_2, in the grid circuit of the first i.f. amplifier. The output of the second i.f. amplifier is inductively coupled to the cathode of the second mixer stage. (A few turns in the cathode are sufficient).

The crystal oscillator employs the triode section of the 6EA8, V_3, in a standard triode crystal circuit with the crystal connected between grid and cathode. The output of the tuned plate circuit of this oscillator is loosely coupled to the grid of the second mixer tube through a 50 mmf capacitor and a 1.2 megohm resistor.

The second mixer stage is similar to the first mixer, utilizing a 12BY7, V_4. It is the function of this stage to provide the frequency subtraction between the variable frequency 8 megacycle signal applied to the cathode and the fixed 2.555 megacycle signal applied to the grid. A series-tuned trap, employing inductor L_6 in the grid circuit of the second mixer, effectively eliminates the second harmonic of the crystal frequency which would fall within the pass band of the circuits which follow the second mixer. The plate circuit of the second mixer is tuned to the desired subtraction frequency of approximately 5.5 megacycles. This subtraction signal is capacitively coupled to the grid of the output amplifier.

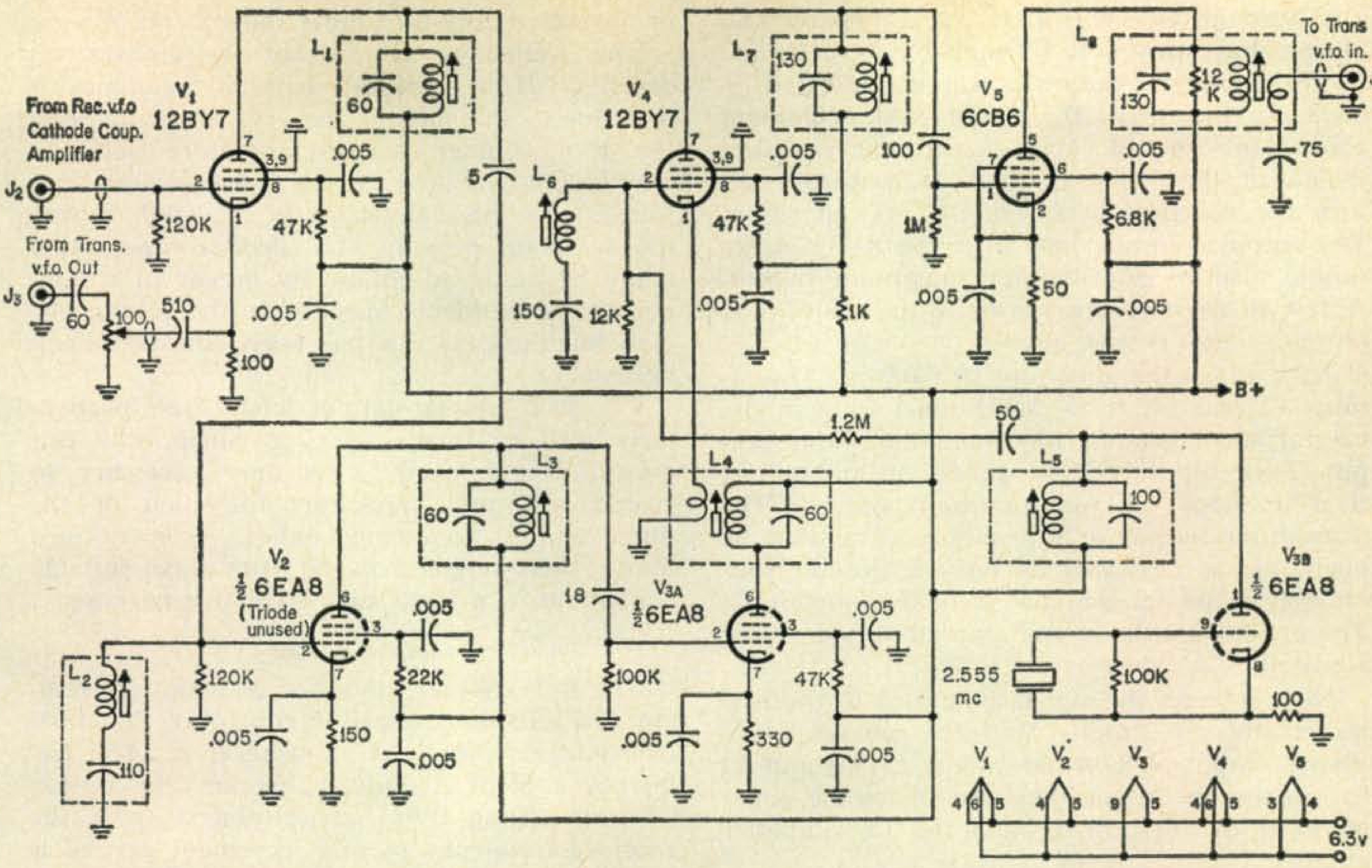


Fig. 6—Circuit of the R-T coupler. All resistors are ½ watt. Capacitors values greater than 1 are in mmf and decimal values are in mfd unless otherwise noted. All the .005 capacitors are ±20% disc ceramics.

L_1 L_2, L_3, L_4, L_6, L_7, L_8,—North Hills #100-D, 4.5 to 8.5 μh.

L_5 —North Hills #1000-H 29 to 55 μh.
Coil shields—North Hills #S-120

The output amplifier utilizes a 6CB6, V_5, with a tuned plate circuit, the bandpass of which is widened by a parallel resistance. The output of this amplifier is linkcoupled to the transmitter V.F.O. IN circuit. The reactance of the output coupling is reduced by means of the 75 mmf series capacitor.

Constructional Arrangement

The components in the cathode coupled amplifier were mounted on a vector turret socket and insulated against short circuits by plastic tape. This entire assembly was then mounted on its leads beneath the receiver chassis under the second mixer tube, V_4, so that a short lead could be run to its grid for coupling the v.f.o. signal. A two foot length of coaxial cable was threaded up through the chassis near the p.t.o. unit and out through the opening in the receiver cabinet, to conduct the amplified v.f.o. output signal to the R-T coupler. This arrangement is simple and has the advantage that no permanent modification of the receiver is necessary.

The components in the R-T coupler circuit proper were mounted in a 6″×6″×6″ utility cabinet with chassis (Bud No. C-1798). The r.f. leads to the receiver and the transmitter are brought in through three female phono connectors mounted along the lower part of the front panel. The heater and high voltage input leads enter through a small four-terminal male Jones connector also on the lower front panel. (In the author's station, these voltages were taken from a sideband slicer although any other suitable source could be used equally well.)

All components other than the connectors were mounted on or below the chassis. The inductors were mounted in shield cans (North Hills No. S-120). Normal wiring precautions were used to insure short r.f. and ground leads. Normal shielding between plate and grid circuits was provided and, in general, any r.f. leads more than one inch in length were shielded by the use of small size coaxial cable. Sufficient space was left available on the upper part of the front panel to accommodate a band switch in case retuning after changing bands becomes sufficiently annoying.

Adjustment and Operation

The alignment and other adjustments of the circuitry are simple and straightforward, and, after a little experience, only the indication of the cathode ray tube on the transmitter is needed to complete these adjustments. However, for the first time through, it is desirable to use an r.f. signal generator for the introduction of alignment signals of known frequencies.

For alignment, first connect coax from the R-T coupler output to the transmitter V.F.O. IN jack. Connect the output from an r.f. signal generator to the second mixer cathode, pin 1 of V_4. Set the generator frequency at 5.525 mc for alignment at a transmitted frequency of 3.975 mc. (See Equation (3), $T = 3.975$ mc.) With the transmitter output coupled to a dummy load through an s.w.r. meter, apply heater and plate voltages to the R-T coupler. Adjust L_7 and L_8 for maximum output power as indicated on the s.w.r. meter (or the 'scope). All alignment adjustments should be made with the emission switch of the 100V in the A.M. position and with the function switch in the MAN position. The output coupling link from the R-T coupler should also be adjusted for maximum output. A few turns here are normally optimum. The output section is now aligned.

Now adjust the generator to 8.08 mc. (Equations 12 and 14, R = 3.975 mc.) Plug in the crystal and adjust L_5 for maximum stable output. Turn off the signal generator and adjust trap inductor L_6 for minimum output. The transmitter output at this minimum should be negligible as indicated by only a circular spot on the 'scope screen (no vertical elongation.) The crystal oscillator and trap circuits are now adjusted.

Now connect the signal generator to the first mixer grid, pin 2 of V_1. With the generator supplying output at 8.08 mc, adjust L_1, L_3 and L_4 for maximum output. This completes the alignment of the first mixer and the i.f. amplifier circuits.

Remove the signal generator connection and connect the receiver v.f.o. and transmitter V.F.O. OUT signals by coax to J_2 and J_3 respectively in the R-T coupler. With the receiver turned off and the transmitter v.f.o. set at 3.6 mc, increase the pot for V.F.O. OUT injection until the transmitter shows output. Then minimize this feedthrough signal by adjustment of trap inductor, L_2. Reduce the pot setting until the transmitter output is negligible. (No vertical elongation of spot on 'scope.)

Now turn on the receiver and tune to 3.975 mc. Adjust the 3.6 mc setting of the transmitter v.f.o. for zero beat. You are now in transceiver operation! It is wise to repeak the tuning adjustments now under receiver injection and then to turn off the receiver and readjust L_2 and L_6, if required, for minimum output.

This minimizing of the undesired transmitter output with the receiver turned off can be achieved with greater sensitivity if a final amplifier is available. Set the 100V output power control to maximum and adjust the s.w.r. meter for maximum sensitivity. (*Caution*: Be sure to reduce the 100V output before turning on the receiver.) Some improvement in this null adjustment can usually be obtained by slight readjustment of L_7 and L_4 as well as by L_2 and L_6 adjustment.

The adjustment procedures for bands other than 80 meters are similar to that given above with obvious changes in the frequencies injected.

The R-T coupler has been in satisfactory operation now for several months and the results have been quite gratifying. In practice, the trap adjustment procedure outlined above has proven superior to the use of the receiver S-meter for this purpose. On-the-air tests on 80 meters, at a distance of about five miles, gave rejection of unwanted output of more than 55 db.

The frequency stability of the circuitry is excellent. The principal drift in frequency is that due to the shift of the crystal oscillator in the R-T coupler with temperature. This is readily compensated for by an occasional retouching of the dial setting of the 100V during the warm-up period. This drift compensation could be made automatic by means of a temperature dependent capacitor in the crystal circuit, but thus far this has been considered unnecessary.

The R-T coupler circuit lends itself particularly well to band-switching. Since only one crystal is employed, it is only necessary to switch trimming capacitors for each of the tuned circuits to change bands. As mentioned above, there is space on the front panel suitable for mounting a band switch for this purpose.

Conclusion

The R-T coupler described provides convenient and reliable "tranceive" control of the 100V transmitter from the Collins receiver. The frequency control is quite stable and the option of transmitting frequency displaced from the received frequency by any increment desired is readily provided simply by transmitter v.f.o. adjustment. This design is quite flexible and the basic circuit can be readily adapted to a large number of other combinations of transmitter and receiver.

The manifold advantages of receiver control of transmitter frequency are strongly recommended. However, a word may be in order regarding accuracy of zero beating any transmitter to the received frequency. A simple counter type frequency meter, such as that described several years ago[2], connected at the receiver output is of inestimable value. With modern receivers which tend to exclude the low audio frequencies, it is difficult to zero-beat aurally closer than 50 cycles. However, with the visual indication afforded by the frequency meter, it is easy to adjust reliably to zero-beat within approximately 10 cycles. ■

[2]Taylor, J., Bredemeier, H, "An Easily Built Frequency Meter for the Audio Range", *QST*, October 1953, p 46.

Write today to the United States Senate; attention Commerce Committee, concerning the adoption of Bill S. 2361.

A Tunable Converter For 6 Meters

BY CHARLES M. McCARTHY*, WA2IMT

Here is a two barreled project for the enterprising v.h.f. man. It consists of a tunable 50 mc converter and an optional i.f. strip to complete a double superhet receiver.

After several months of building and evaluating a variety of broad-band, crystal-controlled converters for 6 meters, I still couldn't shake the feeling that something had been compromised in each of them. One shortcoming, and the most annoying, felt in all of them in varying degrees, was their susceptibility to cross modulation in the presence of strong local carriers. It was finally decided to try a "home brew" tunable converter incorporating as many of the best features I could find in existing converters, both crystal and tunable, and if the results warranted, expand it into a complete v.h.f. receiver.

The description of the receiver is divided into two parts; first the r.f. unit and second, the balance of the receiver. The r.f. unit only may be constructed for use as a converter or both sections may be combined as a complete receiver.

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R.F. Circuit Description

The first r.f. amplifier is a broad-band cascode amplifier using a 6BK7. A manual r.f. gain control is located in the cathode of the first triode section. Output of this cascode amplifier is coupled to the grid of the second r.f. amplifier, which also employs a 6BK7, cascode connected. The grid circuit of the second r.f. amplifier is tuned by one section of a three gang tuning capacitor. Output from the second r.f. amplifier is coupled to the 6CB6 mixer. The grid circuit is tuned by the second section of the three-gang tuning capacitor. The output of the 6CB6 plate circuit terminates in a coaxial fitting.

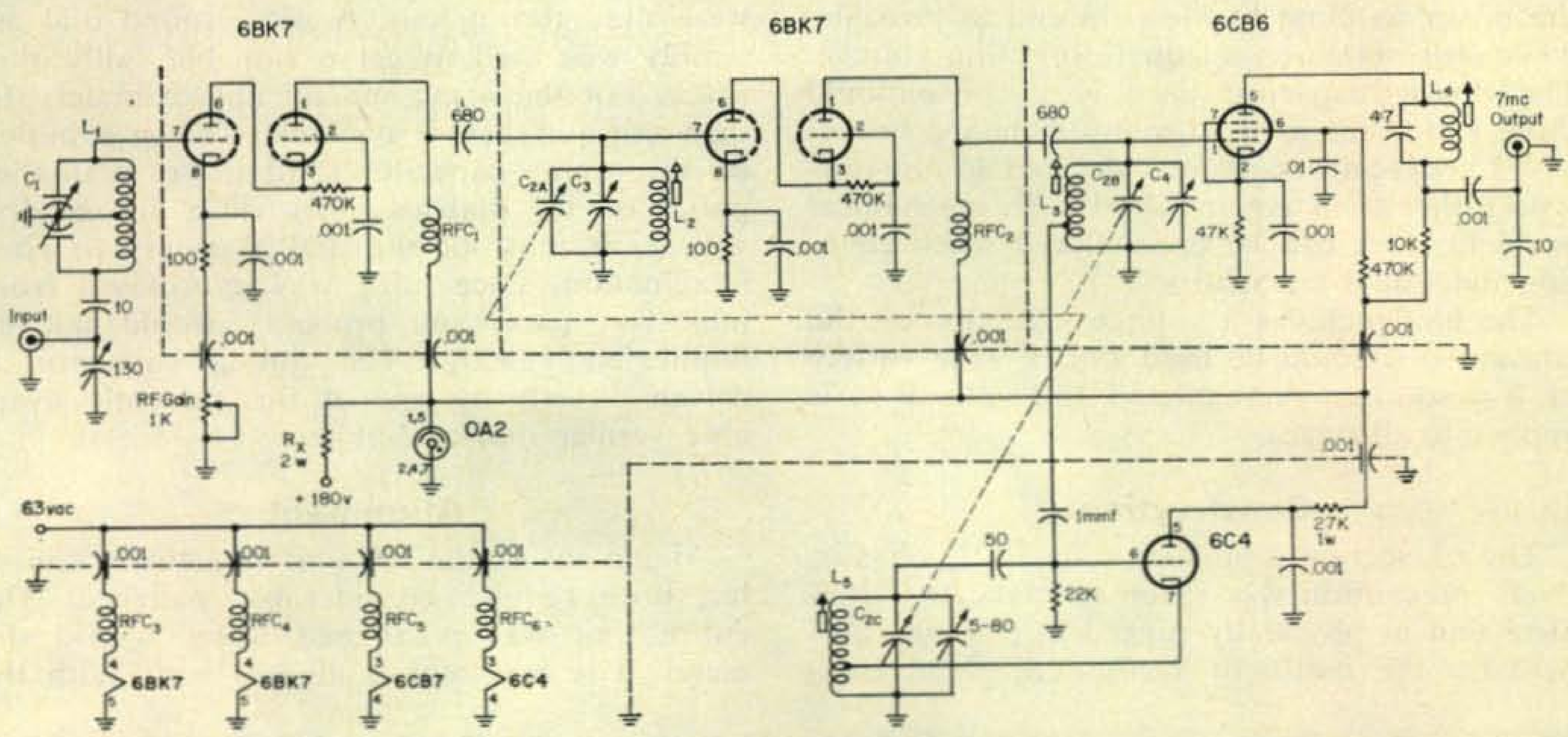


Fig. 1—Circuit of the r.f. section of the 50 mc receiver. The 7 mc output may be fed to the i.f section shown in fig. 2, or it may be fed to a communications receiver.

C_1—2.2 -8 mmf butterfly capacitor, Johnson 9MB11.
C_{2A}—15 mmf
C_{2B}—15 mmf
C_{2C}—20 mmf all ganged.
C_3, C_4—7-45 mmf Centralab #822 BN or equiv.
L_1—9 t of B & W #3007 coil stock.
L_2—4½ t of #22 tinned, spaced ¾" on a ⅜" slug tuned ceramic form.
L_3—4½ t of #22 tinned, spaced ¾" on a ⅜" slug tuned ceramic form. Tap approximately 1 turn from the cold end.
L_4—7 mc tank circuit. CTC # LSC-10 mc.
L_5—3½ t #22 tinned, spaced ¾" on a ⅜" slug tuned ceramic form. Tap is approximately 1 turn from the cold end.
RFC_1, RFC_2—Ohmite Z28
RFC_3 to $_6$—Ohmite Z50

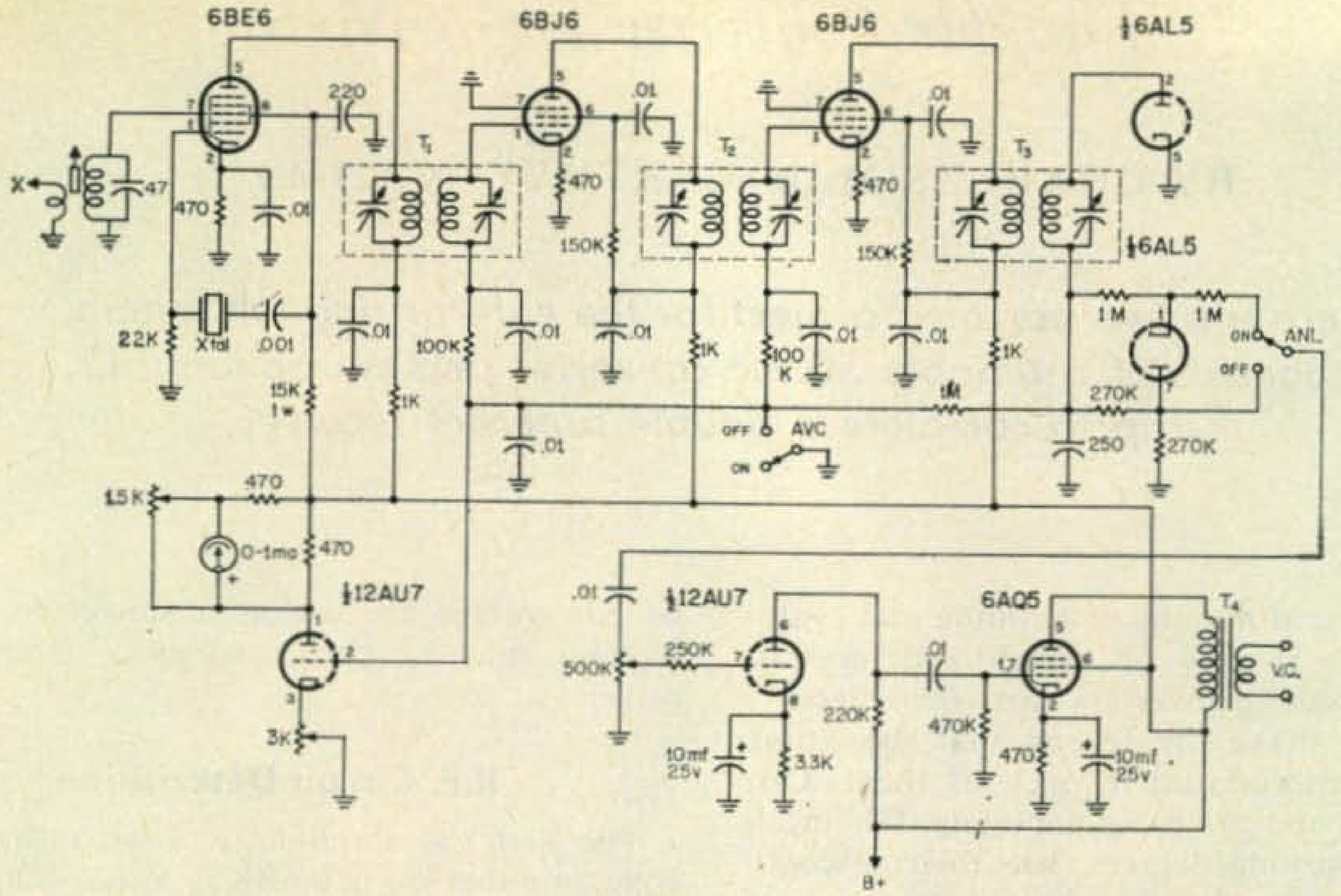


Fig. 2—Circuit of the i.f., detector and audio section needed to convert the circuit of fig. 1 into a complete 6 meter receiver.

L_6—7 mc tank circuit CTC #LSC—10 mc. Primary is 2 turns of #22 insulated wound at cold end.
T_1, T_2—262 kc input i.f. transformers.
T_3—262 kc output i.f. transformer.
T_4—5000 ohms to voice coil, 4 watts.
Y_1—6738 kc crystal (surplus)

The oscillator is conventional, and after a 15 minute warm up, is rock stable. The use of temperature compensating capacitors in this circuit would probably reduce this warm up time considerably if it proved to be annoying. Injection voltage is tapped into the grid coil of the mixer as close to the cold end as possible, while still obtaining adequate injection voltage. The tuning capacitor used is a conventional three gang unit used in many standard broadcast f.m. receivers. It was decided to use this type rather than get involved with mechanical problems that can be encountered when coupling individual capacitors.

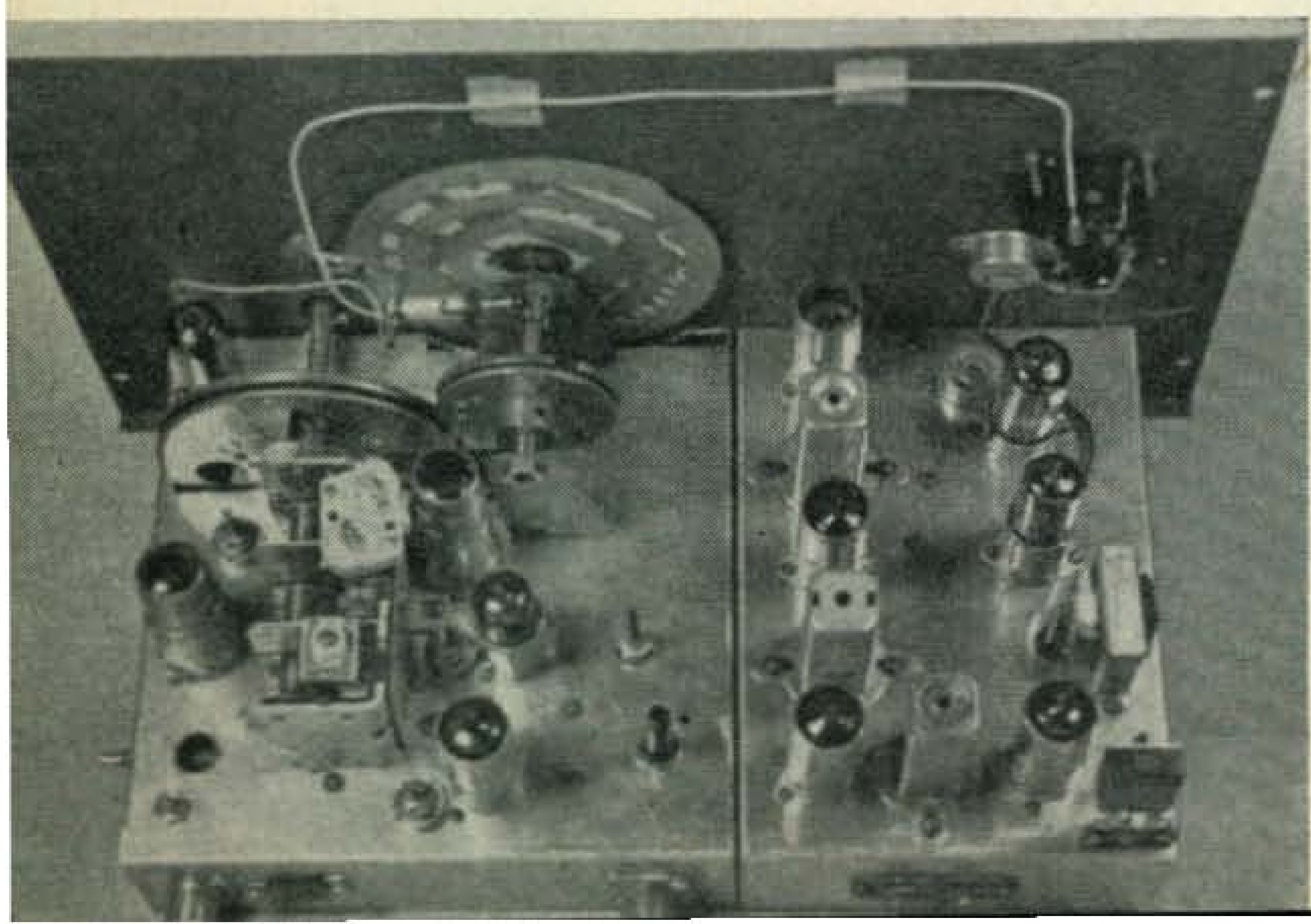
The unit includes a voltage regulator on the chassis so it could be used with a wide variety of B+ sources. A regulated 150 volts B+, is applied to all stages.

Construction

The r.f. section is built on a 7×7×2" chassis. Every precaution was taken to make the complete unit as physically rugged as possible, particularly the oscillator section. Shielded compartments made of brass were used for each stage with feedthrough capacitors for all power leads running from one compartment to another. The ceramic trimmer capacitors were mounted on top of the tuning capacitor sections. Three eighth inch slug tuned ceramic coil forms were used throughout. A 4½" round dial assembly was used to get reasonable calibration space. For the 4 mc spread, approximately 14 inches of dial scale is available. The large pulley on the tuning capacitor shaft drives a smaller pulley on the dial assembly via a dial cord. I will leave most of the dial assembly to your imagination, since mine was improvised from junk box parts and probably would not be duplicated exactly. The tuning capacitor is driven directly by one of the currently available vernier dial assemblies.

Alignment

Alignment of the r.f. unit is actually simple but does require considerable patience. The entire unit was prealigned using a grid dip meter. The oscillator is aligned first. With the



Top view of the 50 mc receiver. The r.f. section is on the left, constructed on a 7 × 7 × 2 inch chassis. The 6BK7 r.f. amplifiers are located on either side of the variable capacitor. The 6CB6 mixer is directly behind the second r.f. amplifier and the 6C4 oscillator is behind the mixer. The coil form for L_5 is just to the left of the 6C4. The 0A2 regulator is located in the front left corner of the chassis. In the left rear corner, C_1 can be seen projecting from the side of the chassis while the 130 mmf trimmer screw is on top. The i.f. strip, built on a 5 × 7 × 2 inch chassis is on the right. The strip starts at L_6, located in front of the crystal in the right corner.

tuning capacitor fully meshed, the slug in the oscillator coil is adjusted to resonate at 43 mc. The tuning capacitor is now moved to the high frequency end (fully open) and the trimmer capacitor adjusted to resonate at 47 mc. It will now be necessary to readjust the oscillator coil to resonate at 43 mc at the low end. This procedure may have to be repeated several times before the proper band spread is achieved.

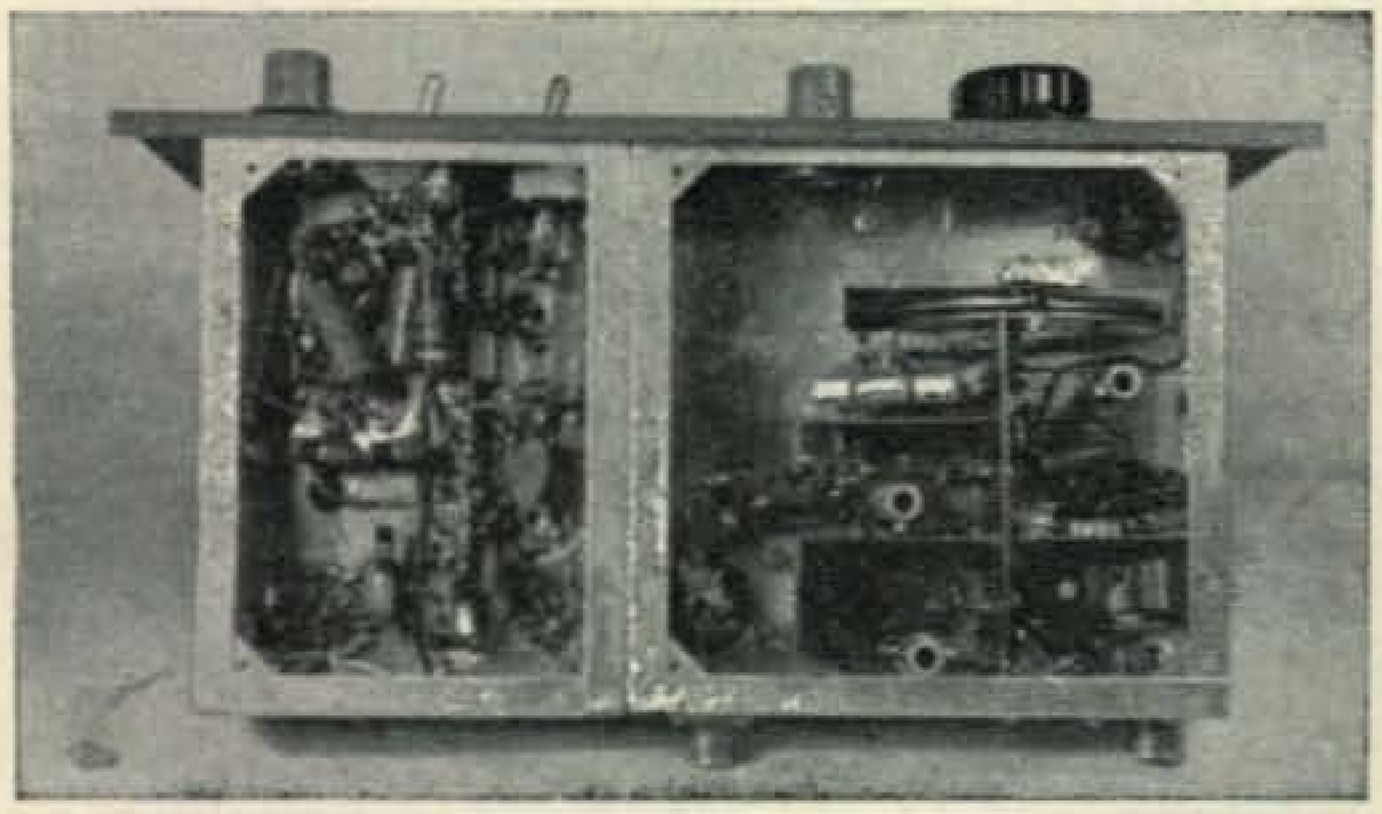
The mixer grid coil and second r.f. amplifier grid coil are aligned following the exact same procedure but this time the low frequency end will resonate at 50 mc and the high frequency end at 54 mc. With the tuning capacitor fully meshed, the grid dip meter should now indicate resonance at 50 mc at the r.f. and mixer grid circuits and 43 mc in the oscillator circuit.

In the original model, neutralization of the r.f. amplifier was unnecessary. If, due to different wiring techniques or chassis layout, the need for neutralization is indicated, any of the handbook methods of neutralizing cascode amplifiers may be used.

At this point the unit should be connected to the communications receiver and power applied. Use the grid dip meter to determine if the oscillator is working. If for any reason it is not, it may be necessary to relocate the cathode tap on the oscillator coil.

Once it has been established that the oscillator is working, tune the communication receiver to 7 mc and adjust the mixer plate coil on the converter for maximum noise. It should now be possible to receive 6 meter stations, and the r.f. amplifier and mixer coil may be touched up for perfect tracking. Final alignment and dial calibration will depend on the test equipment available. An a.m. generator and crystal calibrator may be used. On the original model the dial was marked at 100 kc intervals to 54 mc. Three scales were included—one reading 50-54 mc, one reading 144-148 mc and one reading 220-224 mc, the idea being to use crystal controlled converters ahead of the tunable at a later date to cover 2 and 1¼ meters.

At this point the unit may be considered complete and used as a tunable converter with any



Bottom view of the 50 mc converter. The compartmented r.f. section may be seen at the right. The right hand coaxial connector is for the antenna while the left connector is the 7 mc output when used as 6 meter converter. The 262 kc i.f. strip on the left hand chassis is conventional.

Front view of the 6 meter receiver. The controls are, from l. to r., Audio Gain, A.N.L., A.V.C., R.F. Gain and Tuning. The dial system, home brew, is driven by a vernier dial mechanism.

communications receiver, or as in the authors case, an i.f. strip may be added making the unit a complete u.h.f. receiver.

I.F. Amplifier Circuit Description

The i.f. amplifier is conventional in every respect and the only circuit worth noting is the crystal controlled second conversion oscillator. Crystals in the range required are readily available on the surplus market and the exact frequency is not critical. The i.f. frequency can be shifted over quite a range without effort if replacement type i.f. transformers are used. A value of 262 kc was chosen as the i.f. frequency. The crystal oscillator operates on the low side of the input signal. This puts the 8th harmonic of the crystal at 53.9+ mc. The activity in this portion of the band is nil and having the beat occur at this point is not at all annoying.

Construction

The complete i.f. unit is built on a 5×7×2" chassis, and when completed is bolted to the left hand side of the r.f. chassis. Interconnecting leads pass through holes in the two chassis. Layout is not critical but every effort is made to keep the wiring neat and physically stable.

Alignment

The first step in alignment is to calibrate the "S" meter so that it may be used as an alignment indicator. Remove the 12AU7 from its socket and adjust the 1500 ohm control shunting the meter, for full scale deflection. Re-insert the 12AU7 and ground the a.g.c. bus. (This can be done simply by turning the a.g.c. switch to the OFF position.) Now adjust the 3000 ohm cathode control for zero reading. Remove the ground from the a.g.c. bus and, using an a.m. signal generator, feed a 7 mc modulated signal to the grid of the 6BE6 and peak all of the i.f. cans for maximum output as indicated on the "S" meter. This completes the alignment.

This receiver has exceeded all expectations in actual use. During band openings the selectivity has really been appreciated and cross modulation problems, while not completely eliminated, are at an absolute minimum. ■

The W5BGP Teletype Terminal Unit

BY MORRIS GUZICK*, W5BGP

The author, unable to locate a CV-89A/URA-8A terminal unit on the surplus market, built his own. This unit contains some of the features of the URA-8A, the W2JAV TU and his own. Included is a 2AP1A scope for tuning purposes. This TU, with sharp filters, outperforms the URA-8A in the crowded ham bands and gives superior performance on weak, fading, distorted and QRMed signals.

THIS Terminal Unit was designed primarily to operate from the audio output of the 75A-4 (500 ohms). It can be used with any receiver as long as the proper matching transformer is used between the output and the TU. The reception of frequency shift transmissions are converted into audio frequency shifts and then into pulses which are used to key the d.c. loop circuit energizing the teletype printer.

I tried to find a CV-89A/URA-8A on the surplus market and was not able to do so. The next best thing to do was to build one. If one has the opportunity to look at the circuit of the CV-89A/URA-8A he will find the thing to have more filters than a package of filter tip cigarettes. The W5BGP TU is composed of some of the features of the W2JAV TU[1], CV-89A/URA/8A and of my own.

To help those just starting in radioteletype, the following paragraph might be in order. It attempts to give a better understanding of the receiver's functions when it feeds a teletype signal to the TU.

The frequency-shift method of communication is a system of automatic code transmission that shifts the transmitters carrier frequency back and forth between two distinct frequencies. The frequency shift used by amateurs and many commercial stations is a shift of 850 c.p.s. It is more or less standard for the transmitted signal when higher in frequency to be called the mark signal and when the signal shifts 850 c.p.s. lower in frequency to be called the space signal. Keep in mind, this is an immediate shift in frequency and not a gradual shift of 850 c.p.s. The system of reception to be described in this article involves the use of a radio receiver to change the r.f. carrier shift of the transmitter to shifting audio tones of 850 c.p.s. by the means of the receivers beat frequency oscillator. The carrier shift then becomes an audio shift of the same number of cycles per second. The mark signal should produce a tone of 2125 c.p.s. and the space signal should produce a tone of 2975 c.p.s. This tone is then fed to the TU from the receiver's output.

To accomplish this, one should have a basic idea of the use of the receiver's beat frequency oscillator. A good receiver with no drift would be desirable, since it would require less attention from the operator after the teletype station was tuned in. The b.f.o. should be in proper alignment. Proper alignment for the b.f.o. will be given in your receiver's instruction manual. One should be able to tell when the b.f.o. frequency is tuned off the center of the receiver's, i.f. frequency, either on its high side or low side by 2550 c.p.s. This is necessary to produce the tones of the proper mark and space signal from the output of the receiver. To gain a better understanding of how the tones are reproduced, let's assume the b.f.o. is tuned to its zero position which will put it in the center of the receivers band pass. Now if we tune in a continuous carrier on its center frequency, the b.f.o. would zero beat with the incoming signal and no tone would be produced in the output of the receiver. If we now move the b.f.o. off to one side of the center of the band pass of the receiver by 2550 c.p.s., the signal would produce a tone of 2550 c.p.s. in the output of the receiver. If the b.f.o. is kept in this position and we tune in a teletype station on its exact center frequency which is shifting 425 c.p.s. above the center of the receiver's band pass and 425 c.p.s. below the center of the receivers center band pass (total shift of 850 c.p.s.), two tones would be produced in the output of the receiver. Assuming the b.f.o. is tuned by 2550 c.p.s. on the high side of the receivers band pass and the shifting carrier

*1303 E. Richards St., Sherman, Texas

[1]Kretzman, B., "An Improved Radioteletype Converter", *CQ*, April 1958, page 42.

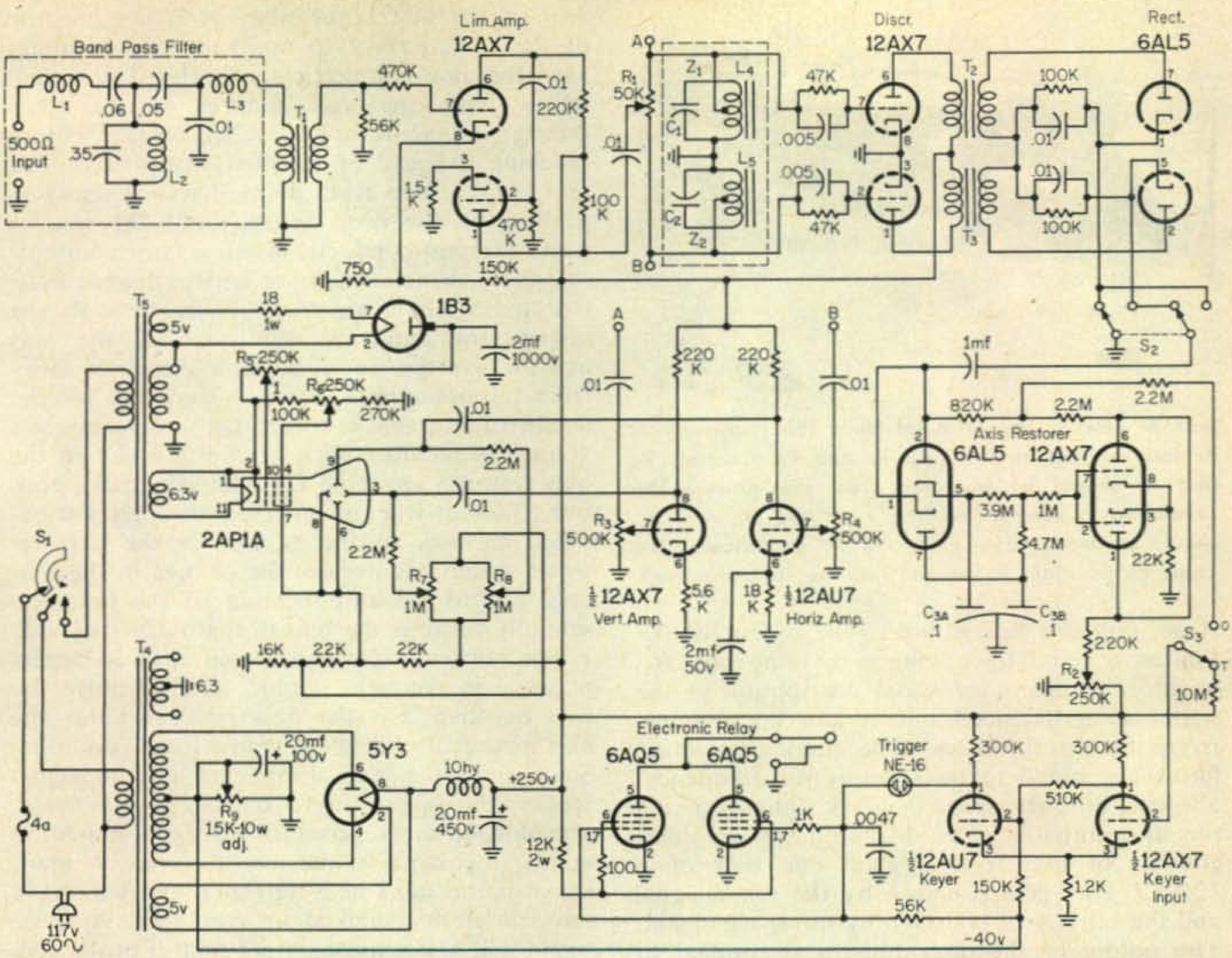


Fig 1—Circuit of the RTTY Terminal Unit designed by W5BGP. All resistors are ½ watt and all capacitors are in mf unless otherwise noted.

C_1—0.066 mf as explained in the text under Alignment.

C_2—0.03 mf as explained in the text under Alignment.

C_3—.1 mf Sprague Orange Drop Difilm Mylar type.

L_1, L_3, L_4, L_5—88 mhy toroids consisting of two 22 mhy windings on a core, connected in series aiding.*

L_2—12 mhy toroid consisting of one 22 mhy winding with 13 feet of wire removed. Remaining winding remains open circuited and unused.* *All toroids are available from DaPaul Co., 309 South Ashton Ave., Millbrae, California

T_1—500 line to 100K. Stancor A4352 or equiv.

T_2, T_3—20K to 20K (may range from 1:1 to 1:3) Surplus Magnovox type 16C70-62 or Stancor A4774 wired for 1:1 Transformers T_2 *and* T_3 must be identical.

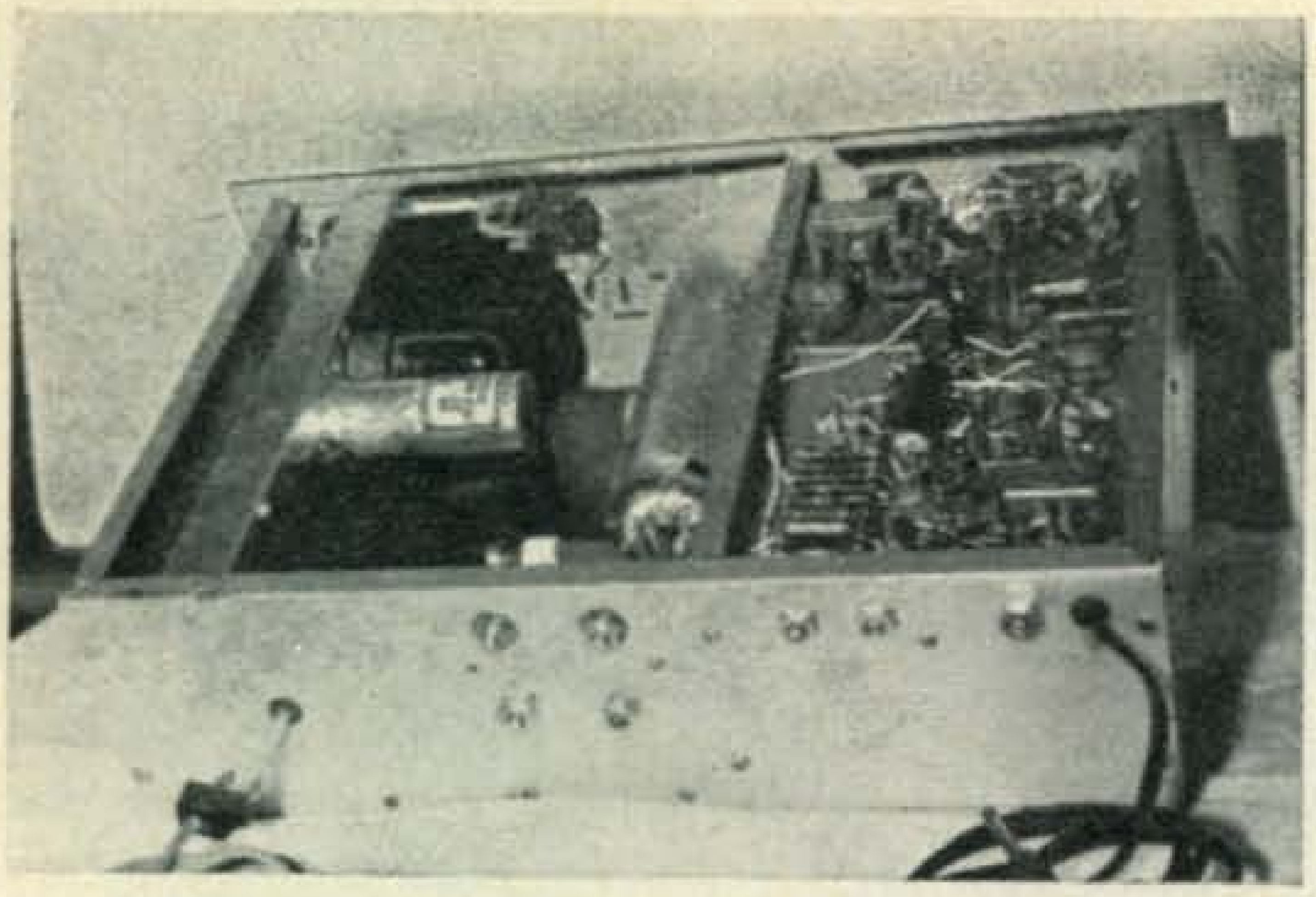
T_4—350-0-350, @120 ma, 5V@3a, 6.3 v.c.t. @4.7a Thordarson 24R05 or equiv.

T_5—325-0-325 @ 40 ma, 5v @ 2a, 6.3v @ 2a. Merit P3150 or equiv.

frequency was at its mark frequency, the signal would fall 425 c.p.s. on the high side of the band pass and at this point be 2125 c.p.s. from the b.f.o. frequency. When the carrier frequency shifted to its space frequency, the space signal would fall 425 c.p.s. on the low side of the band pass of the receiver and at this time would be 2975 c.p.s. from the b.f.o. frequency. One can see that if the b.f.o. was shifted to the other side of the receivers band pass, the same signals would also reproduce the same two tones but be in reverse. The mark becomes a space and the space becomes a mark signal. This is a useful function and becomes necessary, with the use of the NORMAL-REVERSE switch in the TU, to copy a station shifting in the opposite direction than that described above.

Circuit Operation

The circuit of the TU is shown in fig. 1. The frequency shift signal from the receiver is first fed into the bandpass filter which cuts off below 1900 and above 3200 cycles. This allows only the useful frequencies to pass through to the TU. The filter is peaked at the mark and space frequency with a dip appearing in the middle. The loss through the filter is negligible. The signal is then fed into the line to grid transformer (T_1), primary 500 ohms and the secondary 100,000 ohms. The signal from T_1 is fed into a 12AX7 limiter amplifier which consists of two resistance coupled stages. The limiter is designed to apply a constant signal voltage to the discriminator. The second stage of the limiter functions the same as the first



Bottom view of the Terminal Unit. The four controls behind the c.r.t. are R_5, R_6, R_7 and R_8. Controls R_5 and R_6 should be insulated from the chassis. The remaining 3 controls on the right, R_4, R_3 and R_2, should be mounted to clear the TU sub chassis. The cable on the right is plugged into the TU loop circuit.

stage, but at a higher level. The output of the limiter is fed into a voltage dividing pot, R_1, to allow a means for equal distribution of the signal so a balanced output can be obtained from the discriminator. The mark and space filters are tuned to their respective frequency, allowing only the space or mark signal to reach the discriminator. The discriminator amplifier consists of two triodes, each one half of a 12AX7. One grid is driven by the mark signal and the other grid is driven by the space signal. The output of the discriminator is coupled to the rectifiers by two interstage transformers T_2 and T_3. The primary to secondary ratio of the two transformers can be in the order of 1:1 or 1:3. The rectifiers consist of two halves of a 6AL5. One half of the 6AL5 will rectify the mark signal and the other half will rectify the space signal. The d.c. voltage at the output of the rectifiers will vary in polarity and magnitude corresponding to the difference in the audio input to the rectifier. The output of the rectifier is fed to the NORMAL-REVERSE switch, S_2, which will ground out either the mark or space signal while allowing the other to pass on to the following stage.

Either the mark or space signal is now fed to the axis restorer. The function of the axis restorer is to produce optimum signal output when the received signal is weighed heavily on one side or the other, either mark or space, and to key the weakest portion of a fading signal. The axis restorer also contains a circuit which locks up the teletype circuit (closes the loop) whenever there is a prolonged space and/or no signal condition. When no signal is received by the TU, the circuits of the 6AL5 and the 12AX7 come to rest with a small positive voltage at the output of the circuit. This positive voltage produces a mark signal output from the keyer tubes in the TU. The level of this voltage is adjusted by the threshold control R_2. The proper setting of the threshold for a low level symmetrical signal will produce a bias or operating axis at the grid of the first keyer tube. It is the purpose of the axis restorer to maintain this optimum axis for non-symmetrical signals. The signal pulses from the axis restorer rectifier pass through an 820K and a 2.2M resistor before reaching the grid of the first keyer tube. The grid is prevented from being driven excessively positive by the drop across the 2.2M resistor when the grid conducts. When a non-symmetrical signal, which has more and/or higher positive pulses than negative, passes through the system, the tendency would be for the bias axis to average in a positive direction away from the optimum value if it were not for the action of the axis restorer. The excess positive voltage is rectified by half of the 6AL5 in the axis restorer, charging C_3 relatively more positive. This charge is reflected through the resistor network to the 12AX7 in the axis restorer which counteracts the change in the axis and, due to the amplification of the tube, essentially restores the bias to that occurring with a symmetrical signal. A signal that is largely negative in character would tend to move the axis negative, but the axis restorer holds the axis practically at the symmetrical condition. Since only the a.c. component of the signal reaches the axis restorer from the discriminator, a prolonged mark, space or no signal condition appear the same to the axis restorer. A mark signal is the same as a no signal and will leave the printer in a locked up condition. A space signal will key a space output and, if prolonged, will shift over to the same condition as the mark or no signal condition. The time of this lock up action varies with the setting of the threshold pot R_8 and with operating conditions. The threshold setting should be set under noisy conditions at the point where negative peaks will not key the teletype printer.

Keyer Circuit

The keyer circuit consists of one half of a 12AX7, 12AU7 and a NE-16 in a conventional flip-flop circuit. The firing of the NE-16, in turn, operates the paralleled 6AQ5's in the electronic relay circuit. The 6AQ5's receive their plate voltage from the d.c. loop supply, and the electronic relay action will key the loop circuit. (The loop circuit and its d.c. supply are not shown in the wiring diagram) The loop circuit is set to draw the conventional 60 ma during the mark, no signal and/or lock-up condition. During this condition the plates of the 6AQ5's will be drawing the pre-set 60 ma and the loop circuit will be closed. Under the above condition the keying voltage is approximately one volt negative. Under the space condition the keying voltage is approximately 38 volts negative causing the 6AQ5's plate current to drop to zero, giving the loop circuit an open condition. This keying action in the loop circuit will key the loop in the same manner as the polar relay.

The switch, S_3, between the axis restorer and the first keyer tube is a means for manually locking up the loop circuit in a closed condition for tuning and while transmitting. When the switch is moved to the tune position the signal pulses are disconnected from the keyer circuit and a small positive voltage is applied to the grid of the first keyer tube. This has the same effect as a mark or no signal condition and will keep the loop in a closed condition until the switch is moved back to the operate position.

Oscilloscope

The other halves of the 12AX7 and 12AU7 are used as the vertical and horizontal amplifiers employed in the monitoring scope. (Keying circuit) Each amplifier has its gain control, R_3 and R_4. The output of the amplifiers are fed to the scope in the conventional manner. The scope employs two pots, R_7 and R_8, used for vertical and horizontal centering of the pattern on the scope tube. Controls R_5 and R_6 are the intensity and focus controls. The scope draws very little current and any power supply capable of 500 to 750 volts at 5 ma will do.

Power Supplies

The main supply should be capable of supplying 250 volts d.c. with at least 60 ma. Keep in mind that approximately 40 volts of bias is being produced through the drop in the resistor, R_9 between the secondary's high voltage center tap and ground. The 6.3 volt filament should be capable of handling the filament current plus the pilot light. The scope tube filament has its own filament supply and should not be operated from the same supply as the other tubes in the TU.

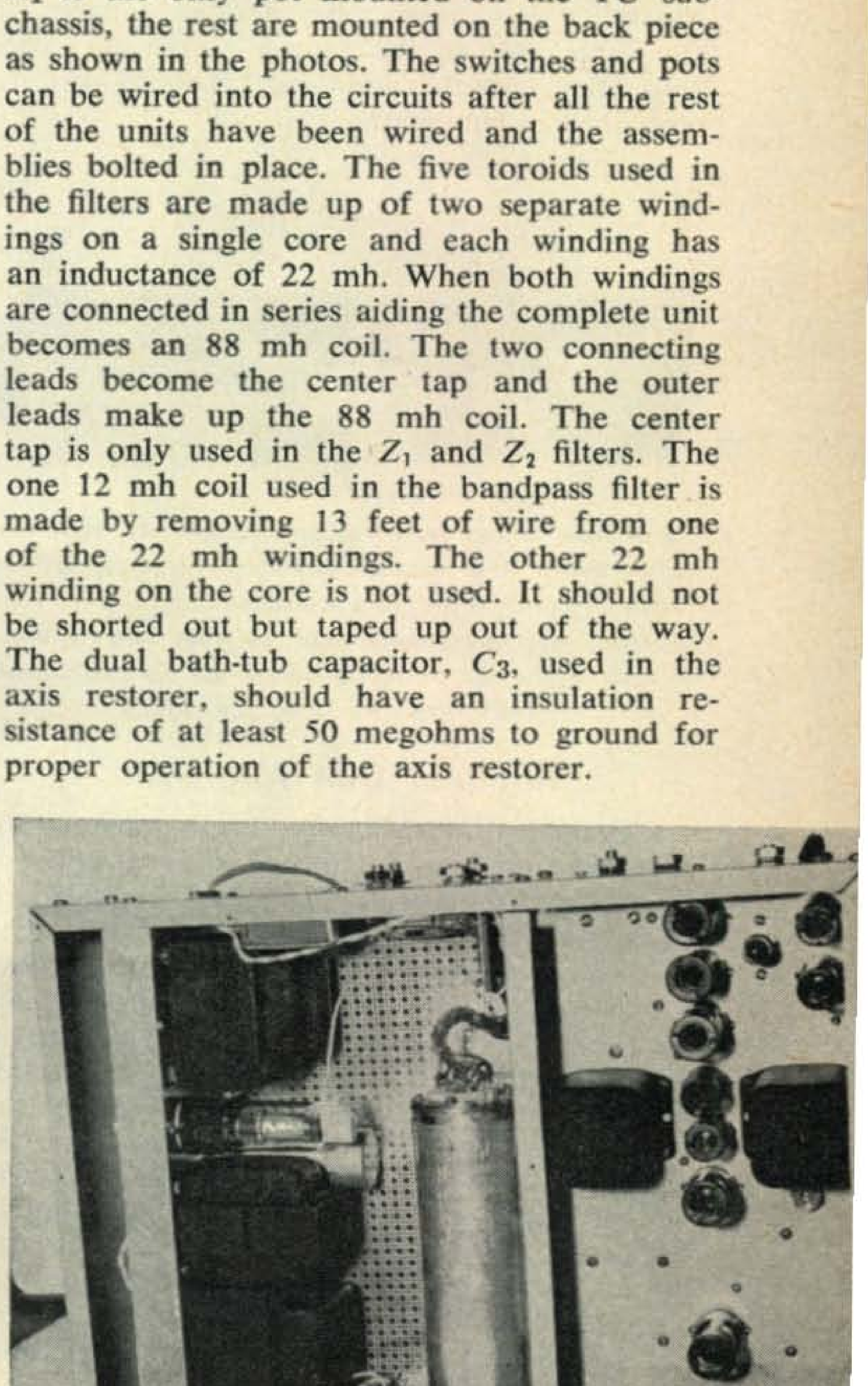
The TUNE-OPERATE switch, S_3, can be wired in such a manner as to incorporate the transmitter control wiring. Placing the switch in the tune position while transmitting will feed your own signal, picked up by your receiver, back into the TU for monitoring on the scope.

Construction Details

All the circuits in the TU are of the audio nature and the exact construction or placement of parts shown in the photographs do not have to be adhered to which simply means "to each his own." The TU shown in the photo uses the standard aluminum panel 5¼" × 19". The two end pieces are made from aluminum plates 5" × 12" containing the necessary flanges for mounting the front panel and back piece. They also contain flanges for mounting the top and bottom covers. The back piece is made similar to the end pieces but 5" × 17" in size. A 1" deep sub-chassis is formed to fit as shown for housing the two power supplies. Another sub-chassis is formed 6¾" × 12" with a ½" flange for the main TU section. A partition 5" × 12" with a ½" flange on all four sides is made to help support the TU sub-chassis and for mounting the scope tube as shown. All the pieces should be put in place and drilled for bolting together. Provisions should be made for terminal boards in the rear of the scope tube to mount the resistor network for the scope. The power supply and TU sub-chassis can be removed for mounting of parts and wiring. One should make provisions for bringing out the necessary interconnecting wiring between the different sub-chassis.

Components

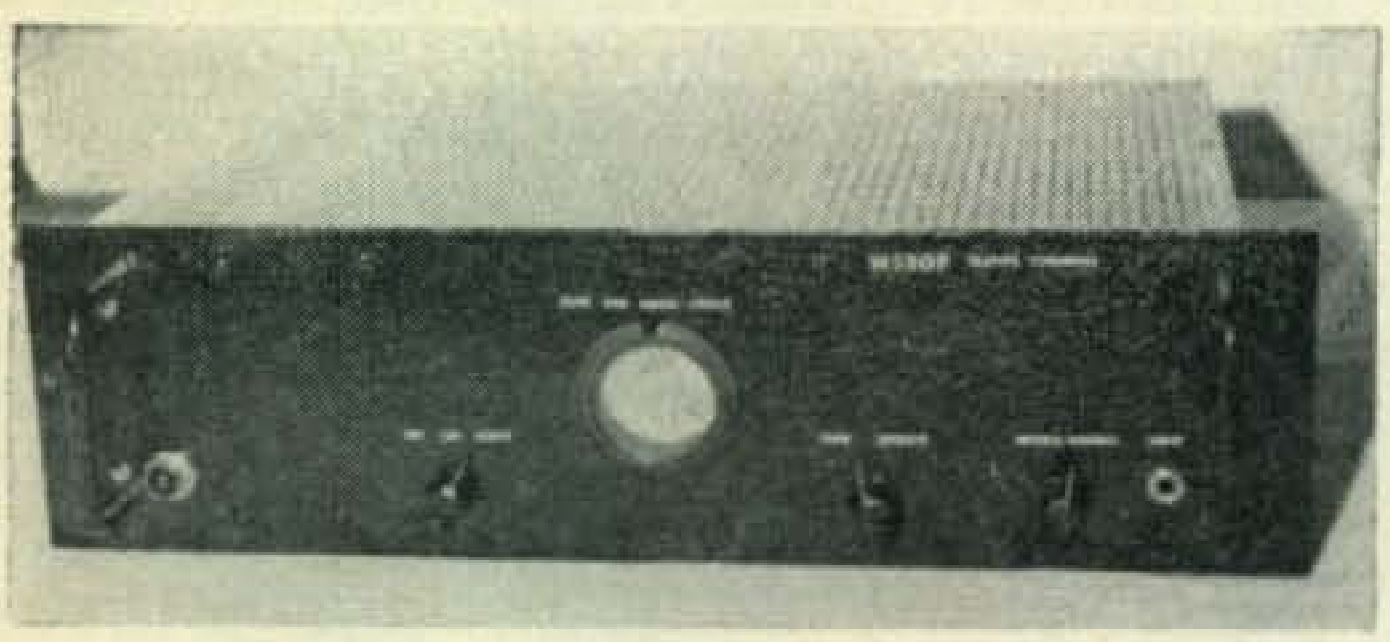
All the switches are the Centralab small general purpose type and take up little space. All pots are 2 watts wire wound. Potentiometer R_1 is the only pot mounted on the TU sub-chassis, the rest are mounted on the back piece as shown in the photos. The switches and pots can be wired into the circuits after all the rest of the units have been wired and the assemblies bolted in place. The five toroids used in the filters are made up of two separate windings on a single core and each winding has an inductance of 22 mh. When both windings are connected in series aiding the complete unit becomes an 88 mh coil. The two connecting leads become the center tap and the outer leads make up the 88 mh coil. The center tap is only used in the Z_1 and Z_2 filters. The one 12 mh coil used in the bandpass filter is made by removing 13 feet of wire from one of the 22 mh windings. The other 22 mh winding on the core is not used. It should not be shorted out but taped up out of the way. The dual bath-tub capacitor, C_3, used in the axis restorer, should have an insulation resistance of at least 50 megohms to ground for proper operation of the axis restorer.



Top view of the Terminal Unit showing chassis locations. The scope shield is frabricated from .16" galvanized metal and is fastened to the chassis by brackets soldered to the shield. The tube lineup, from bottom to top, is 12AX7 limiter, 12AX7 discriminator, 6AL5 rectifier, 6AL5 axis restorer, 12AX7 axis restorer, 12AX7 first keyer and scope amplifier, 12AU7 second keyer and scope amplifier. To the right is the NE16 trigger and the two 6AQ5's. The transformers T_2 and T_3 are alongside the two 6AL5's.

The bandpass filter is assembled on a piece of ⅛" thick phenolic in a rectangular shape just large enough to place three of the toroid coils in a triangular position. Leave enough space for standoff terminals to afford tie-points for the coils and capacitors used in the filter. Cut three circular discs the size of a half-dollar, from 1/16" thick phenolic or some suitable substitute. Drill a hole in the center of each disc to pass a 6/32 screw. Place a disc over the top of each coil and mark and drill a corresponding hole in the mounting base. A 6/32 screw can now be passed thru the base, the center of the coil and then thru the disc for fastening the coils to the base. All capacitors used in the filters are mylar, known as the Sprague Orange Drops. They are small enough to be placed over the coils and soldered to the mounting terminals.

The Z_1 and Z_2 filters are assembled on a single base similar to the bandpass filter. The filters should require less space than the band pass unit since the total amount of coils and capacitors are less. After the coils and mounting terminals have been installed on the mounting board, solder a 0.06 mf capacitor across one of the coils and a 0.03 mf capacitor across the other coil. This is not enough capacity to tune the coils to the proper mark and space frequency and the additional capacity will be added when tuning the two coils.



Front view of the Terminal Unit completely assembled with covers. The controls are from l to r, Off-On-Scope, Tune-Operate and Reverse-Normal. The Tune-Operate and Reverse-Normal switches are mounted in such a manner as to be below the TU sub chassis. The input jack is on the right.

Terminal Unit Alignment

After all the wiring has been checked, the terminal unit can be left on the work bench for the preliminary adjustments. The only test equipment needed will be a v.t.v.m. and an *accurate* audio oscillator. First remove the two 6AQ5's from the TU and connect the audio oscillator to the input of the TU. Set the v.t.v.m. on the 5 volt a.c. scale, connecting one lead to chassis ground and the other lead to the hot junction of transformer T_1 and the bandpass filter output. Tune the audio oscillator to 2125 c.p.s. and set the oscillator output level for a two volt reading on the v.t.v.m. Tune the oscillator through a range of 1800 to 3200 c.p.s. You should notice two peak readings on the v.t.v.m., one at 2125 c.p.s. and the other at 2975 c.p.s. A pronounced dip should appear between the two frequencies. If the two peaks fall higher in frequency, the 0.35 mf capacitor will have to be increased in value and if they fall lower in frequency the capacity will have to be decreased. The v.t.v.m. reading should drop to zero below 1800 c.p.s. and drop to zero above 3200 c.p.s.

Disconnect the v.t.v.m. and set pot R_1 to its approximate center position. Connect one lead of v.t.v.m. to chassis ground and the other lead to the center tap of the Z_1 coil. At this point it is a good idea to have a small assortment of the mylar capacitors in the range of 0.001 thru 0.006 mf on hand for the final tuning of the filters, Z_1 and Z_2. Now tune the audio oscillator slightly above 2125 c.p.s. until the peak voltage is read on the v.t.v.m. Jumper a 0.006 mf across the 0.06 mf capacitor and the peak reading on the v.t.v.m. should then be at 2125 c.p.s. If it is still high in frequency, more capacity will have to be added and if now too low in frequency less capacity should be added. Follow this procedure until the filter is tuned to 2125 c.p.s.

Remove the VTVM lead from the center tap of the Z_1 filter and connect it to the center tap of the Z_2 filter. Keep in mind the Z_2 coil has a 0.03 mf capacitor already soldered across the coil. Tune the audio oscillator slightly above 2975 c.p.s. until the peak voltage is read on the v.t.v.m. Now connect a 0.003 mf capacitor across the 0.03 mf capacitor and the peak reading on the v.t.v.m. should be at 2975 c.p.s. If not, tune it in the same manner as the Z_1 filter until the peak reading is at 2975 c.p.s. If one does not have access to an accurate audio oscillator it would be wise to just use a 0.066 mf across the Z_1 coil and a 0.033 mf capacitor across the Z_2 coil. The filters would be closer to the desired frequency than by guessing with an uncalibrated audio oscillator.

At this point you probably noticed an unbalanced reading of the two voltages taken off the center taps of the Z_1 and Z_2 filters. This will be taken care of next by the proper setting of the pot, R_1.

With the v.t.v.m. still connected to the center tap of Z_2 (scale at 5 v.a.c.) observe the reading carefully. Move the v.t.v.m. to the tap on Z_1 and tune the audio oscillator to 2125 c.p.s. and note the voltage reading. If there is any difference, set the pot R_1, so the same voltage will be read in each position when following the above procedure. When this has been accomplished the output from the mark and space channels will be balanced and R_1 should not require further adjustment. Remove the test equipment from the TU and replace the two 6AQ5's. Insert the plug from the TU into the loop circuit. Be sure the plug tip is connected to the 6AQ5 plates and the sleeve to ground. Leave the power off the scope. The plug should be inserted in the loop at a point where the negative side of the loop power supply will be connected to the outer sleeve of the jack. This will place the tip of the plug at a positive potential. This is necessary or the 6AQ5's will not draw plate current. Most loop supplies are in the vicinity of 120 volts d.c. and if you can't make the loop draw the required 60 ma it is a good sign the bias for the 6AQ5's, as set by R_9, is too high. At this point the bias should be set at –40 volts and the fine adjustment of the bias will be accomplished later. Now would be a good time to remind one that the current adjustment pot in your loop circuit will require a higher setting than you were accustom to if you were using a polar relay in the loop for receiving. This is due to the higher resistance of the 6AQ5's plate circuit being in series with the loop circuit.

Connect the audio oscillator to the input of the TU and place the TU switch to the OPERATE position. Tune the audio oscillator to the mark frequency of 2125 c.p.s. (The loop current has been preset to 60 ma.) Now tune the audio oscillator quickly to the space frequency, 2975 c.p.s. The loop current should drop to zero for a fraction of a second and return to the preset 60 ma. It will not stay at zero due to the action of the axis restorer. If the current in the loop does not fall to zero, the 6AQ5 bias voltage is too low and should be increased slightly. Anytime the bias is changed, the loop current will also be changed, so reset the loop current back to 60 ma. If the bias is set at too high a voltage it will be impossible to make the 6AQ5's and the loop circuit draw the necessary 60 ma. The idea then is to set the adjustment tap on R_9 to obtain the necessary bias for the loop current to drop to zero on the space signal. This method of adjusting the bias might be a little bit longer in doing, but should be easier than tuning in a teletype signal and trying to make the proper bias adjustment on the loop current meter under such a varying condition.

Operation

Disconnect the audio oscillator from the TU and now connect the output of the receiver to the TU. Place the TUNE-OPERATE switch, S_3, in the TUNE position and tune in a teletype station; one running at 60 w.p.m. and with 850 c.p.s. shift. For beginners, it would be well to reread the first section of this article which covers your receiver tuning. When the station has been properly tuned in, the NE-16 will be flashing. Turn the TUNE-OPERATE switch to *operate* and you should start printing. If the copy is all garbled, try touching up on the receiver tuning a little. If the printer keeps trying to stay in upper case it is a good sign you are trying to copy in reverse with the switch in the normal position or vice-versa. Remember we have not used the scope for tuning yet so the tuning might seem a little touchy. After you have gotten the hang of it, as they say, let's set the threshold pot R_2.

Pot R_2 is set in the following manner[2]. Tune in a RTTY signal, then tune the receiver off the RTTY signal to a point where noise only is received. Adjust R_2 so that the noise will key the printer and then back it up until a point is just reached that will not key the printer. Pot R_2 can be set at different times for varying noise conditions.

Tuning Alignment For The Scope

After the receiver has warmed up and no drift is noted, a commercial RTTY station should be tuned in. UPI can be found during the daylight hours at 14,745 kc and during the dark hours at 7,745 kc. Other good commercial stations can be found close to 14,700 kc and at 14,395 kc. Of course there are many more stations using 60 w.p.m. and 850 c.p.s. shift.
Turn the power switch over to the scope position. Turn the receiver gain all the way down to cut out the signal going to the TU. Now adjust the intensity and focus pots, R_5 and R_6, for a small spot. Center the spot with R_7 and R_8 the vertical and horizontal centering adjustments. Turn the gain back up on the receiver and a cross of some sort should appear on the scope. Place the TUNE-OPERATE switch in the OPERATE position and start printing. Tune the receiver off to one side until you just reach the point where the print starts to garble. Remember this position on the receivers dial. Now tune the station back in and then tune the receiver off in the other direction until the print just starts to garble. Tune the receiver back to the center between these two points on the dial. This should be the best receiving position. (Similar to setting the range on the printer.) Now adjust the horizontal and vertical gain pots, R_3 and R_4, until the lines in each cross are about one inch long. You will probably have to rotate the scope tube for the proper position of the cross. Retouch the other scope adjustments as necessary. Due to the difference in gain of the 12AX7 and 12AU7 used as the scope amplifiers and the difference in gain at the tie-in points of the amplifiers at the filters, it might be necessary to interchange the A and B connections at the filters to obtain a better balance of the signal to the scope. In the future all you have to do is tune for the cross and you are in business.

The Teletype Loop Circuit Used By W5BGP

Several teletype terminal unit circuits have come out with the loop supply and the transmitting circuit or polar relay for keying the frequency shift circuit, built into the terminal unit. I have tried this and found it to be satisfactory, but for more than one TU, I have found it to be cheaper and less complicated to

[2]The threshold pot, R_2, was found to be so useful in normal operation that in subsequent units it was made a front panel control. It should be placed between the Tune-Operate switch and the Reverse-Normal switch.

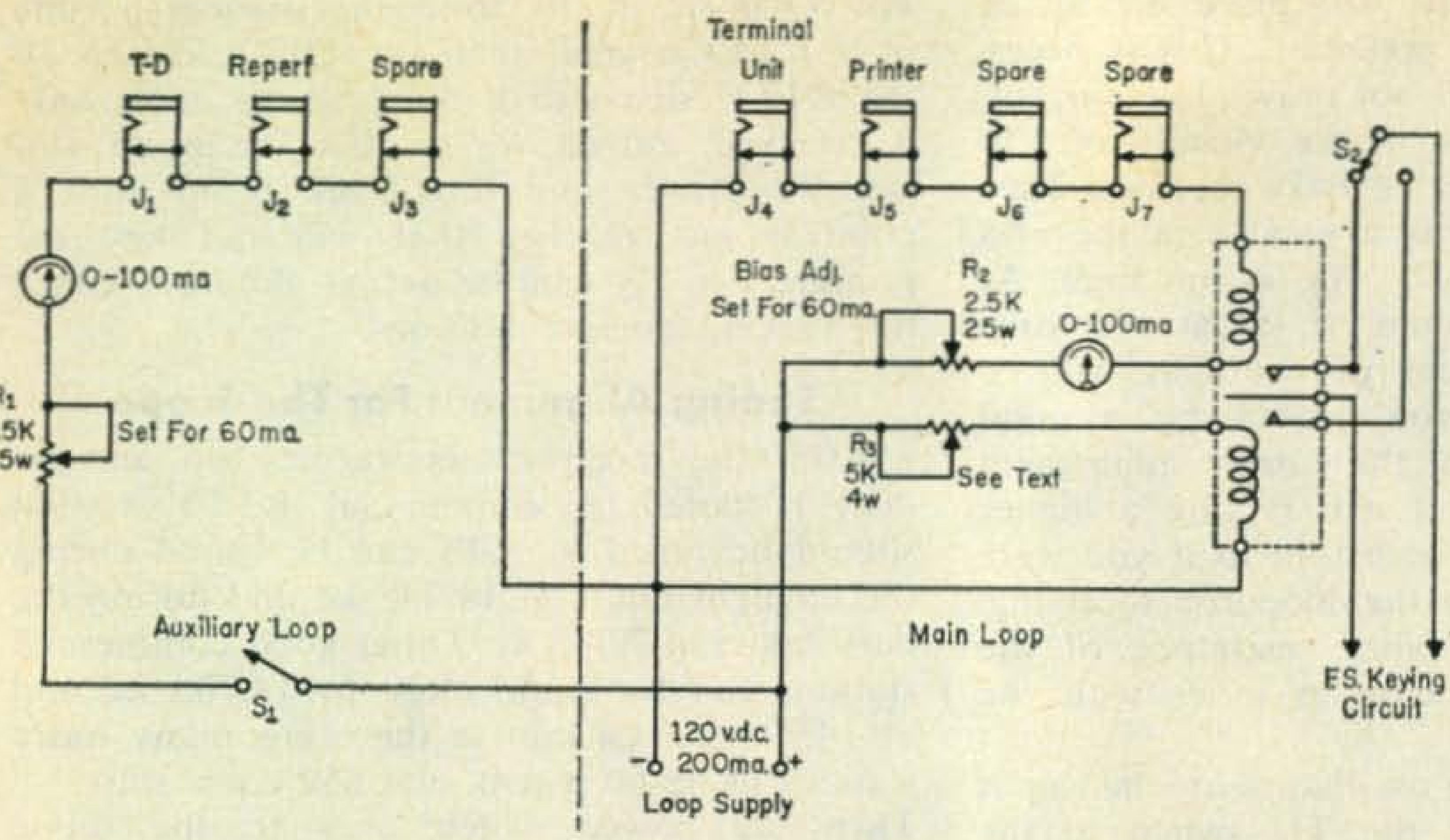


Fig. 2—The loop and transmitting keying circuit in use at W5BGP.

have one loop and transmitting keying circuit built separate. The flexibility of the circuit becomes greater.

The circuit (fig. 2) actually shows two loop circuits using the same power supply. The handbooks will show several methods of building the necessary power supply, but keep in mind the better the regulation the better the supply. A word of caution: It is much safer to use an isolation transformer in the supply than coming straight off the power main and just using a rectifier and filter. The auixliary loop can be put in use by the operators who are blessed with a typing reperforator. One can be cutting tape while the other loop is tied up in receiving or some other function. The relay connections are not shown due to the various types of polar relays available. I have found the bias current to be in order of 30 ma for the large type relays such as the 255 and in the order of 10 ma for the small type polar relays (such as the ones manufactured by Sigma).

The spare jacks in the main loop can be used to connect the transmitter-distributor for transmitting tape and the reperforator for making tape. Switch S_2 is used as the NORMAL-REVERSE switch for the frequency shift keying circuit and S_1 is used to break the circuit in the auxiliary loop when it is not in use. ■

A Rotatable Dipole For 40 Meters

JOSEPH NELSON*, K6SXT

General concern over the worsened conditions on 10, 15 and 20 has led to a great deal of effort on the lower frequency bands. Now K6SXT has devised a rotatable dipole for 40. Its simplicity and ease of construction will be of interest to the many 40 meter men.

With the inevitable sunspot cycle on the downgrade the 40 meter band is the logical choice for continued operating pleasure. With the 10 and 15 meter bands practically gone plus some quiet periods on 20, the lower frequency bands are all that's left for those of us that enjoy cross country and DX contacts.

Like many others, while operating, I've often said, "Wait till I get the beam on you." Perhaps the several years on 10 meters made it a habit. Even with a fixed dipole I sometimes find myself reaching for the rotator control box. Rather than kick the habit I decided to give in and try a rotatable dipole on 40 meters. The results have been well worth the effort.

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A trip out back to my antenna graveyard yielded a reflector from my former 20 meter beam. This served nicely as the dipole element. I then had to find a way of making this element electrically resonant at 7.2 megacycles. Borrowing from mobile experience I decided to try loading coils and lumped capacity. The final coils and capacity loop when added to the element gave me a total length of 50 feet. The number of turns on the coils was found by supporting the assembled dipole on a ladder and holding a grid dipper parallel to the coil at the end toward the element center. Trying to dip on the capacity side gave many erroneous readings. The coil stock needed only a little pruning to show resonance at 7.2 mc. The capacity loop was arbitrarily made two feet in diameter and stiff enough to prevent sagging. Keeping both ends of the element symmetrical made the tuning job easier than I had anticipated.

The next big item was the type of feed. I decided on a gamma match for one reason; the gamma capacitor allowed me to set the v.s.w.r. to a minimum at my favorite spot in the band.

Construction

The element consists of three lengths of aluminum tubing. The center section of 1½" diameter is 16 feet long and the two outside sections are of 1⅜" diameter and 12 feet long. Each end of the center element contains several saw slits to permit clamping and two hose clamps are required for locking the outer lengths of the element in position. In spite of the length there is very little sagging when 1½" diameter element stock is used. A smaller diameter stock would probably result in a "drooping dipole".

Now for the coil and capacity loop. For the coil I purchased a B&W #3905-1 standard inductor coil stock which contains six turns per inch and is sufficient for both coils. Make a pigtail by removing one turn. Count 14 turns and cut this point. Unwind the last turn for the other pigtail. Make both coils the same.

The dielectric spacer is a 12" length of polystyrene rod 1¼" in diameter. This rod fits into a four foot length of 1⅜" aluminum tubing as shown in fig. 1. Drill two holes through the tubing and dielectric. Also drill two holes on the other end where the dielectric rod is inserted in the element. The two bolts nearest the dielectric rod are used to support the coil.

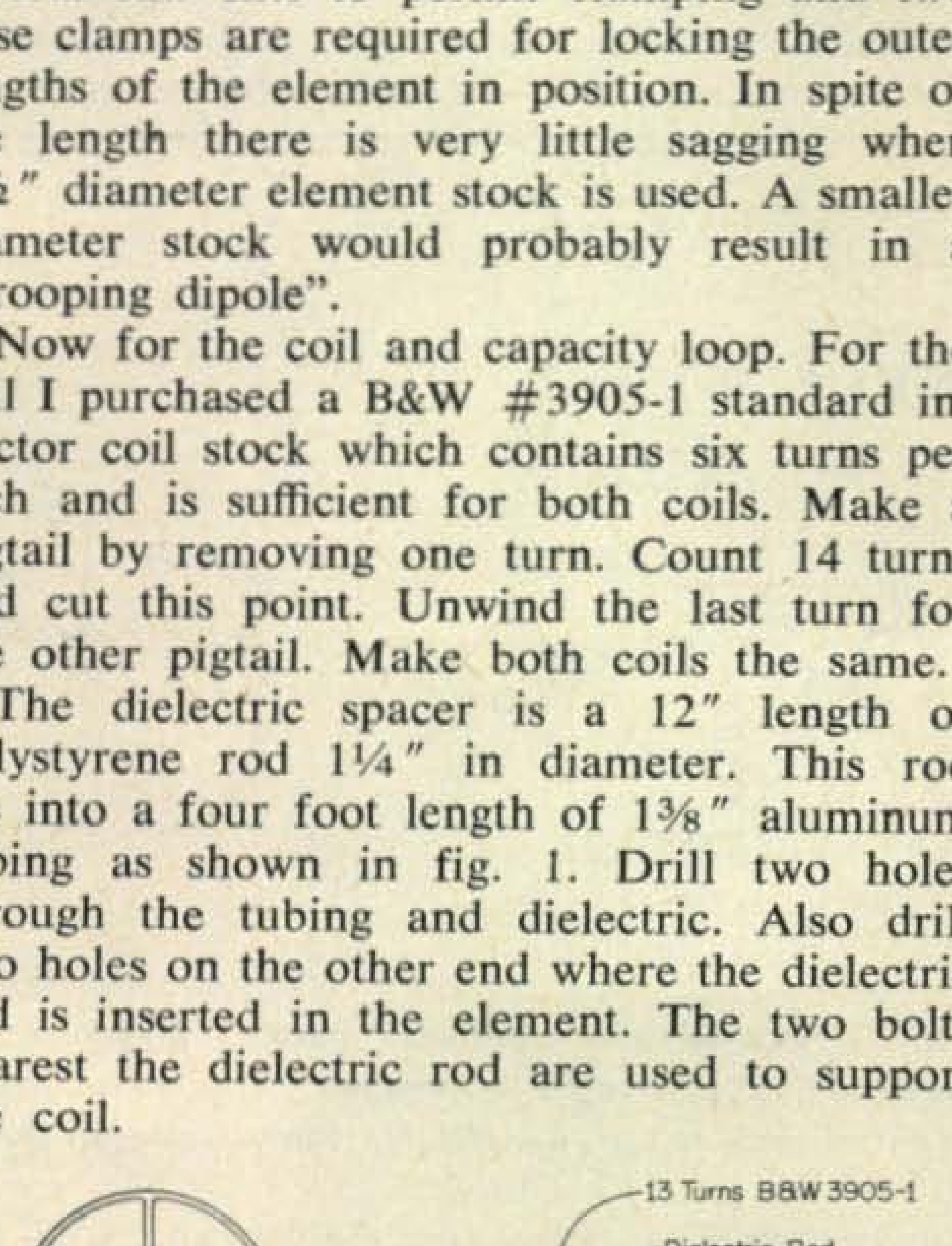

Fig. 1—Details of the capacity hat and loading coils. That hat is fashioned from #12 Copperweld and the coil from standard B&W stock. The dielectric rod is 1¼" polystyrene.

Capacity Loop

The capacity loop is made of #12 Copperweld but any good stiff wire will do. Form the loop as shown in fig. 1. One end of the four foot length of aluminum tubing is flattened to receive the ends of the capacity loop. Use plenty of solder where the loop ends come together since this end will be inserted in the flattened end of the four foot length of tubing. Insert the end of the capacity loop into the tubing and drill a single hole. When secured with a nut and bolt this serves to hold the loop in place and also insures good electrical contact.

Gamma Match

Only the gamma match remains. From past experience I selected a six foot length of ¾" aluminum tubing for the gamma rod. A six inch length of aluminum strap fastened with self-tapping screws secures the outer end of the rod to the element. The 200 mmf variable capacitor is mounted on a 10" length of plastic sheet (wood coated with wax would also work). This plastic sheet is fastened to the dipole with a single "U" bolt. It hangs down from the element and the capacitor is bolted to the lower end as shown in fig. 2. At the center of the plastic sheet drill a hole and mount a

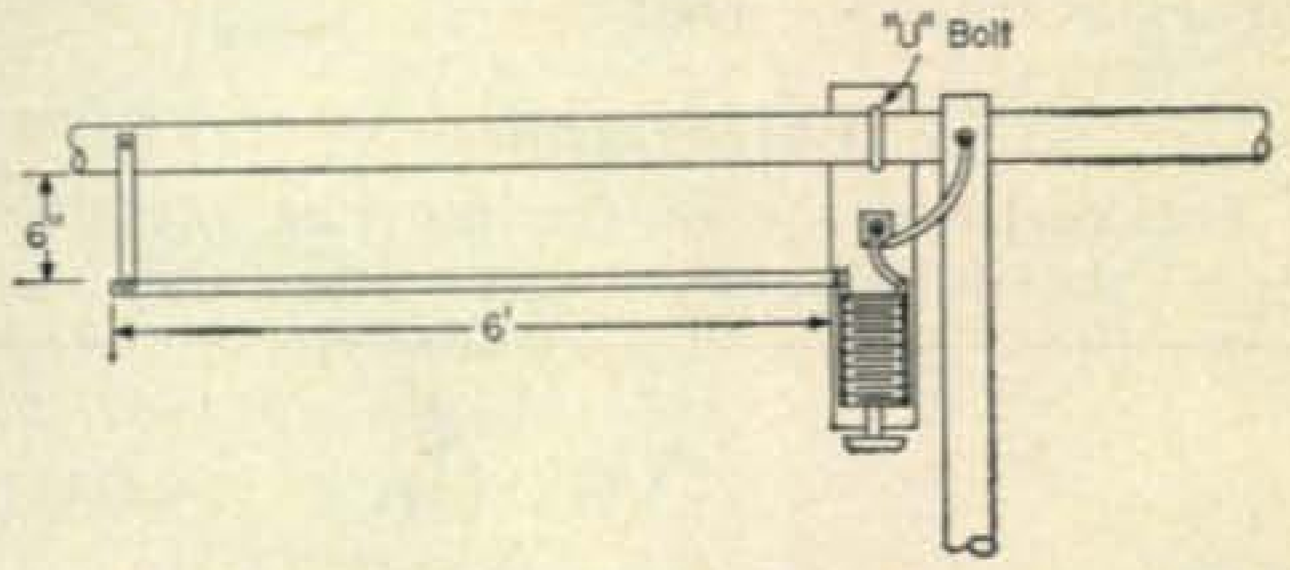

Fig. 2—Details of the Gamma match. The capacitor is a 200 mmf variable mounted on a plastic sheet. Coax feedline connector is mounted above the capacitor.

coax bulkhead fitting. This will be the point of attachment for your feedline. Finally bolt the inside end of the gamma rod to the capacitor frame. Use #14 buss wire and solder a short length from the stator of the capacitor to the coax fitting center conductor pin. Run another piece of buss wire from the coax fitting ground side to the center of the dipole. Use a solder lug and a self-tapping screw to make this connection. Be sure the tuning shaft of the capacitor points downward and is fitted with a knob. (Note: If a permanent installation is planned a weatherproof housing should be built to protect the capacitor).

Adjustment

The antenna is now ready for mounting. Because of the size and turning torque I suggest that the element be mounted as close to the rotator as possible. Any try for extra height might prove disasterous. Tuning is easy and only consists of adjusting the gamma capacitor for minimum s.w.r. at your favorite spot in the band. At a height of 25 feet I stood on a roof-top ladder and adjusted the capacitor for a minimum (1.2) v.s.w.r. at 7225 kc. If the v.s.w.r. drops as you increase capacity and doesn't rise above a minimum with full capacity it may be necessary to parallel the variable with a 100 mmf fixed capacitor. When you reach the best minimum you are ready to

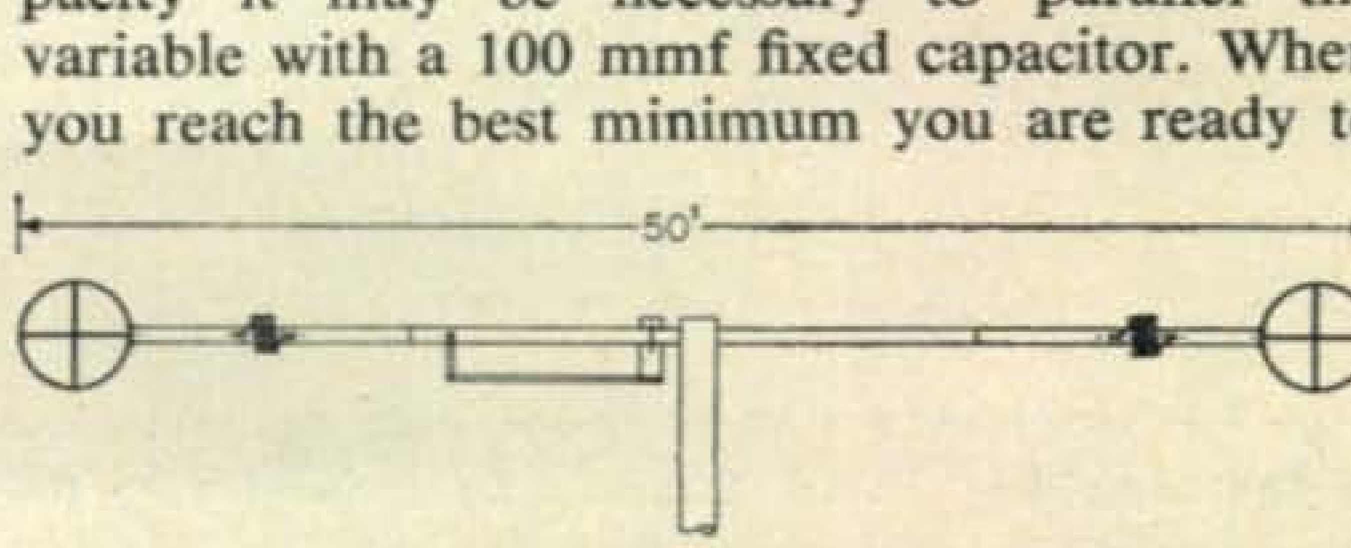

Fig. 3—Overall view and dimensions of the beam.

raise to full height. Try to get at least 40 feet if possible, however even at 25 feet you'll have a lot of fun. At full height check the v.s.w.r. again. You may find it changed. Before you haul it down, rotate to 4 points of the compass and check the v.s.w.r. at each point. You'll probably find, as I did, that it changes as you rotate. I attribute this to surrounding buildings and trees and since 40 feet was my limit on height there was nothing I could do about it. At full height the v.s.w.r. increased to 1.4 at 7225 kc. and I considered this satisfactory. For those who insist on an absolute minimum a long pole can be rigged to adjust the gamma capacitor from the roof-top.

Performance

The performance of the antenna measured up to my initial objective: to place the main lobe of a dipole in any direction desired. To compare the performance I erected a half-wave fixed dipole at the same height. Several contacts off the side of the reference dipole resulted in equal signal strength when the rotatable dipole was turned parallel to the fixed antenna. The maximum and minimum signal strength as the antenna is turned 90 degrees was 18 db. This front to side ratio was an extra bonus that helped cut down on QRM. It is difficult to set any gain figure for this antenna. However, there were several contacts in which a 5-9 report was received and a change to the fixed dipole resulted in dropping our signal into the QRM.

For those who build a rotatable dipole of this type and enjoy the ability to pinpoint their contacts, a 14 foot boom and a second similar dipole makes a nice two element beam. ■

Another Neutralizing Method

BY E. H. MARRINER*, W6BLZ

Some of the manufactured transmitters can be more easily neutralized by feeding a signal into the antenna output terminal and detecting it in the grid circuit. This is just the reverse of normal neutralizing methods but works quite well, and is advantageous especially when the driver and final output tube are operated from the same plate supply switch. Under these circumstances it is easier to feed a v.f.o. exciter into the antenna output terminal rather than dig into the transmitter and unsolder wires to disconnect the final output circuit from the driver.

The little device needed to do the job is shown in the photograph and fig. 1 and consists of two r.f. chokes, a capacitor and a diode. It is placed across the grid coil of the final amplifier tube (fig. 2) and connected to a 0-200 μa meter. The v.f.o. exciter signal is fed into the antenna output terminal of the final. When this is done, the filaments of the transmitter should be energized but *no plate voltage should be applied.* Assuming the grid and final have already been tuned to the v.f.o. frequency, an indication should be apparent on the meter, M_1. If there is no indication, change the neutralizing capacitor slightly and rock the grid tuning capacitor back and forth to obtain a maximum reading. To neutralize, simply tune the neutralizing capacitor for a minimum of reading on M_1 and the amplifier is neutralized. It is always best to neutralize on the highest frequency you anticipate using. ■

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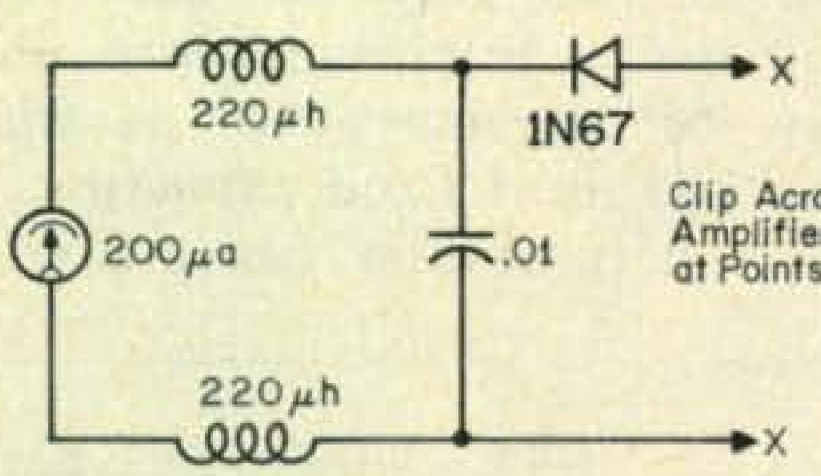


Fig. 1—Circuit of a simple device used to neutralize a final amplifier. Points X should be connected to the final amplifier grid tank (fig. 2) with the shortest possible leads.

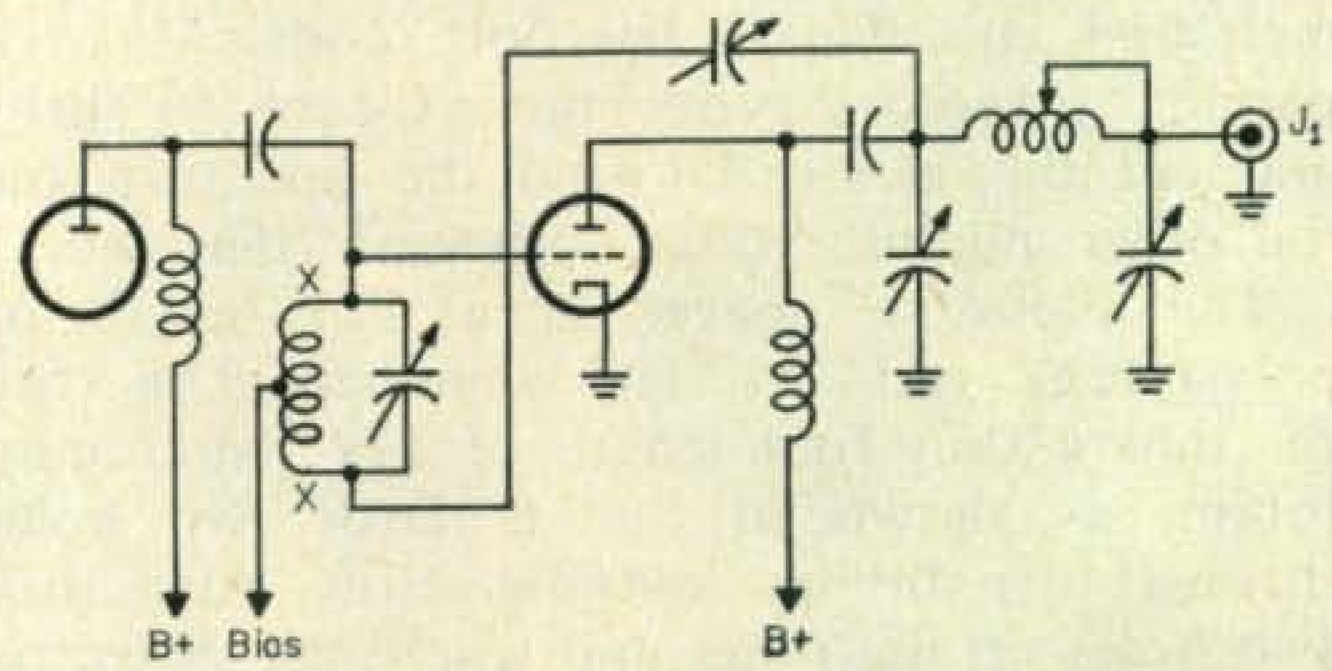
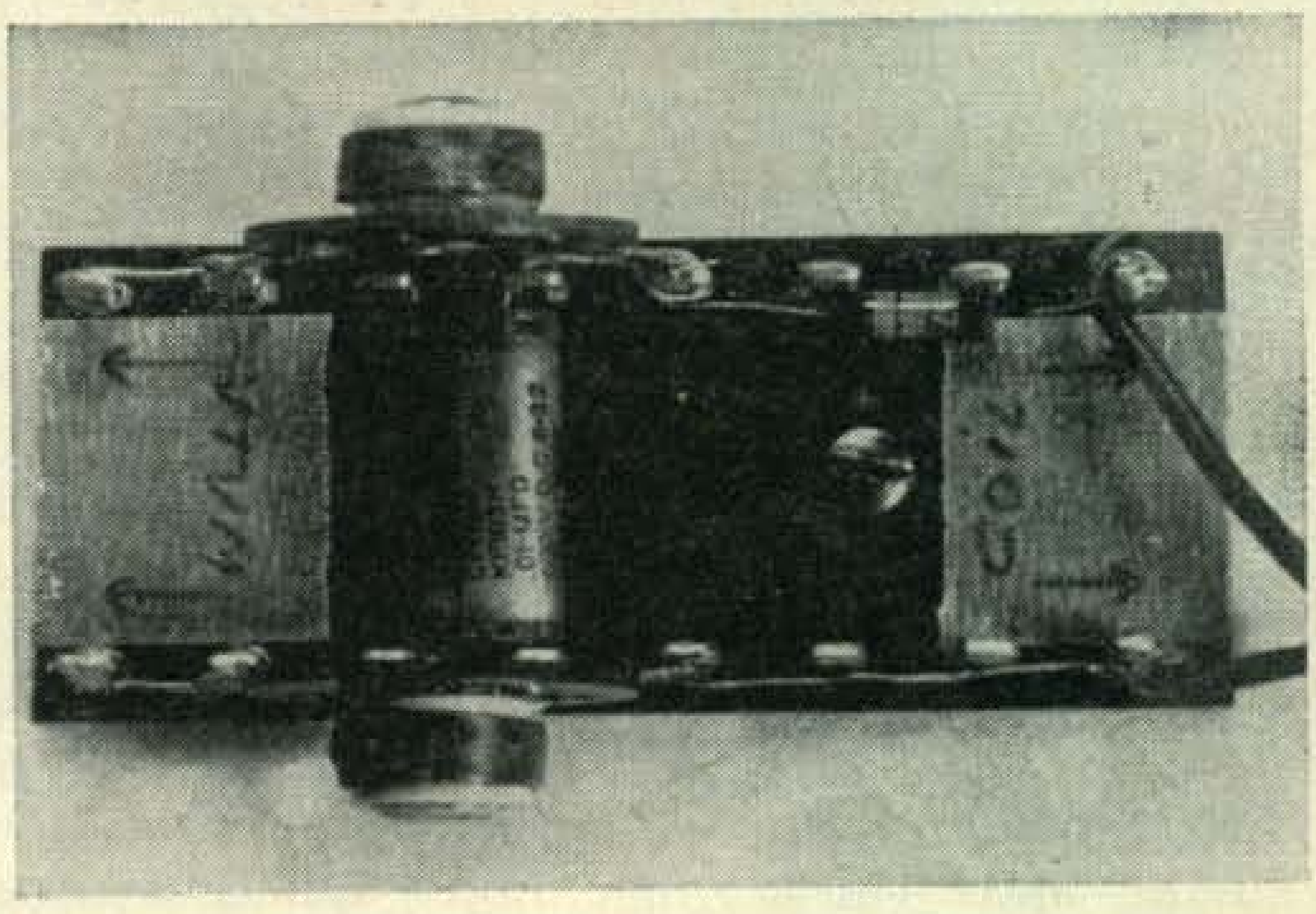


Fig. 2—Typical r.f. amplifier illustrating where the neutralizing device is connected. The v.f.o./exciter input is fed to J_1. *CAUTION:* Plate voltage should be OFF.



Parts layout for the neutralizing device has been made on a phenolic terminal board. A paper capacitor is shown but a disc ceramic is preferable.

I Broke The Language Barrier

SUMNER WEISMAN*, W1VIV/4

TODAY is my birthday. You know how it is when it's your birthday—you get to thinking, "What was I doing last year at this time?" Well, a year ago I was a reasonably happy man. I had a nice home with the usual mortgage, a loving XYL who enjoyed ham radio, and three fine harmonics, all with novice tickets. I was content with my job, head ham handler at the local electronics emporium. That's the reason that I'm writing down all the details of my horrible experience. Someday, perhaps, it may keep some other poor, unsuspecting fool from going through what I did.

As a matter of fact, my birthday was the cause of the whole thing. Ever since my family received their tickets, I had been loudly bemoaning the fact that I could never get at the rig. On weekends the kids would take turns at it, and evenings the XYL had to exchange recipes with the YL net. I was forced to hold my ragchews with the locals on the landline instead of on seventy-five. To top it off, if she happened to be running a patch I couldn't even do that!

Rectification

To rectify the situation, my loving family gave me what they thought at the time was a wonderful birthday present. They made the downpayment on a tabletop kilowatt and a fine receiver, all for me. As I said before, I was exceedingly happy. No more of this 50-watt local stuff for me. I was now ready to graduate to the rarest DX available, and watch the QSLs fly! As a final touch I built a 20-meter rotary rhombic, and was then prepared to take on all comers.

Although I had no experience with DX, it was with a knowing smile and a gleam in my eye that I boldly but carefully tuned across the DX portion of 20. And there he was! A weak but clear signal, calling CQ DX with a prefix that I had never heard of. Looking him up—I had to make sure he was far enough away to really be a contact I could proudly boast of at work the next day—I found that he was in a little country in Asia that the biggest DX men in town had been trying to work for years. None had succeeded.

Rapidly rotating my rhombic, I gave him a short three-by-three call like an old pro. And there he was, after a pause, coming back to me. I was surprisingly calm. "Just wait till I see the boys tomorrow." I gloated.

My gosh, this fellow was sure hard to understand. Compared to him, Scratchi was an English professor. After several repeats, it finally came through to me that he was trying to explain that his English was so poor that he seldom came back to American or English stations. It was obvious that I wasn't getting through to him any better. And all the time I thought that just about all hams spoke English. That's what comes of just working locals all your life. I awkwardly signed, feeling that he certainly would understand a friendly 73.

Tragedy

Anyone else would have merely chalked it up to experience, sent a QSL in hopes of receiving one in return, and let it go at that.

Because of a tragic flaw in my personality, I could not. You see, I am the most stubborn person that I have ever had the pleasure of knowing. I reasoned thusly: Since there were obviously many times more English-speaking hams in the world than those of this small Asian country, it was logical and only fair that he should learn to speak English.

Feeling very magnanimous indeed, I promptly sent him a large American dictionary. Enclosed was a note suggesting that he could now work all the Americans he desired, by simply looking up anything he did not understand, and thereby obtaining a concise, lucid definition. What could be simpler?

During the next month, I was quite successful in working a most impressive list of DX stations. However, I couldn't help but think often of my foreign friend on the other side of the globe, and I wondered how he was faring with the dictionary. I mentally patted myself on the back a few times, and the halo over my head was of the angellic rather than the 6-meter variety. Finally I received this letter, written through an interpreter:

"Dear OM,

Thank you so much for the fine dictionary. I am most indebted to you, but am now more puzzled about your language than ever."

He enclosed this copy of a QSO he had with an American, as translated from his new dictionary:

"Thanks for the call OM. That part of an object intended to be grasped with the hand in lifting or using is Charlie. The horse and vehicle here is entirely home made my fermentation, as ale or beer. I have a 16 subway tunnel recipient, and the part of a telephone into which a person talks runs a full 231 cubic inches on all flat flexible strips used for binding. Hope my new insect sounds good. I just won it at the annual thigh of

*1274 South Alhambra Circle, Coral Gables 46, Florida an animal convention. Had trouble with my v.f.o. being carried along as on a current, but I hope that now it is a building for lodging horses or cattle. Well, must QRT now because it is time for a breed of dogs of Northern China. 73."

"Good gosh! What have I done?" I asked myself. Suppose he were to pass the word to some of his buddies, and they started actually using language like that? This could spread, and conceivably might ruin ham radio forever. It's bad enough on phone, but this QSO was on c.w.! At 18 words-per-minute, it would take a whole minute just to give your name. A QSO would take hours.

Something had to be done, and fast. But how in blazes do you explain American slang? How do I tell this fellow that a handle is just a name, and not something that you use for lifting or grasping with the hand? What will he think of us when I tell him that a gallon means a kilowatt and not 231 cubic inches? What a situtation!

Well, I sat down and wrote a long, air-mail letter, explaining things as well as I could. I took the QSO apart word for word, and tried to make it as clear as possible. It took three hours, six pages, two aspirin tablets, four cups of coffee, and several handfulls of hair from the rapidly dwindling supply on my aching head. I was a nervous wreck, but I felt that I had done my duty.

You know, somehow after that DX just wasn't the same. It actually ceased being a pleasure and started becoming a chore. I found myself constantly checking and doublechecking everything I said to make sure that it was clear. I'd study each sentence, polish it, remove any slang, rearrange it, and finally speak it into the mike. On c.w. I had more BT's than I had words. On phone some people I worked fell asleep at their receivers. Why, I found that even in my everyday connections at work I spoke so carefully, clearly, and distinctly that nobody had the patience to listen to me. People avoided me as if I were the east coast distributor for halitosis.

Finally, just as my life was at its lowest point,

[*continued on page 104*]

K3NKX Wins Washington Group Scholarship

The Acting Chairman of the FCC, Robert T. Bartley, recently conferred a scholarship on a Baltimore radio amateur now studying at Johns Hopkins University—the first such scholarship to be financed by fellow amateurs, members of 17 amateur radio clubs in the Washington-Baltimore area.

Alexander F. Burr, K3NKX, received the John Gore Memorial Scholarship offered for the first time by the Foundation for Amateur Radio, Inc., of Washington, D.C. The Foundation is a non-profit organization of trustees representing the radio clubs in the two-city area.

Mr. Burr is working toward his doctor's degree in physics at Johns Hopkins, where he is also an instructor. During the summer, he has been instructing in physics at Drexel Institute, Philadelphia.

Commissioner Robert T. Bartley, Acting Chairman of the FCC (center) has just awarded Alexander Fuller Burr, K3NKX, the John Gore Memorial Scholarship. Major Scott, W4PVR, President of the Foundation For Amateur Radio Inc., which offered the scholarship is shown on the right.

Commissioner Bartley told the recipient of the $250 scholarship that many of the early radio pioneers were amateurs, and that again today, the amateur is "part and parcel of the new frontier of technological development."

"You have only to monitor the amateur frequencies to realize that these men and women are serving in the farthest-out frontiers of scientific development—for you will hear them literally from pole to pole, on ice islands and in jungles, and in practically every country in the world," Commissioner Bartley said.

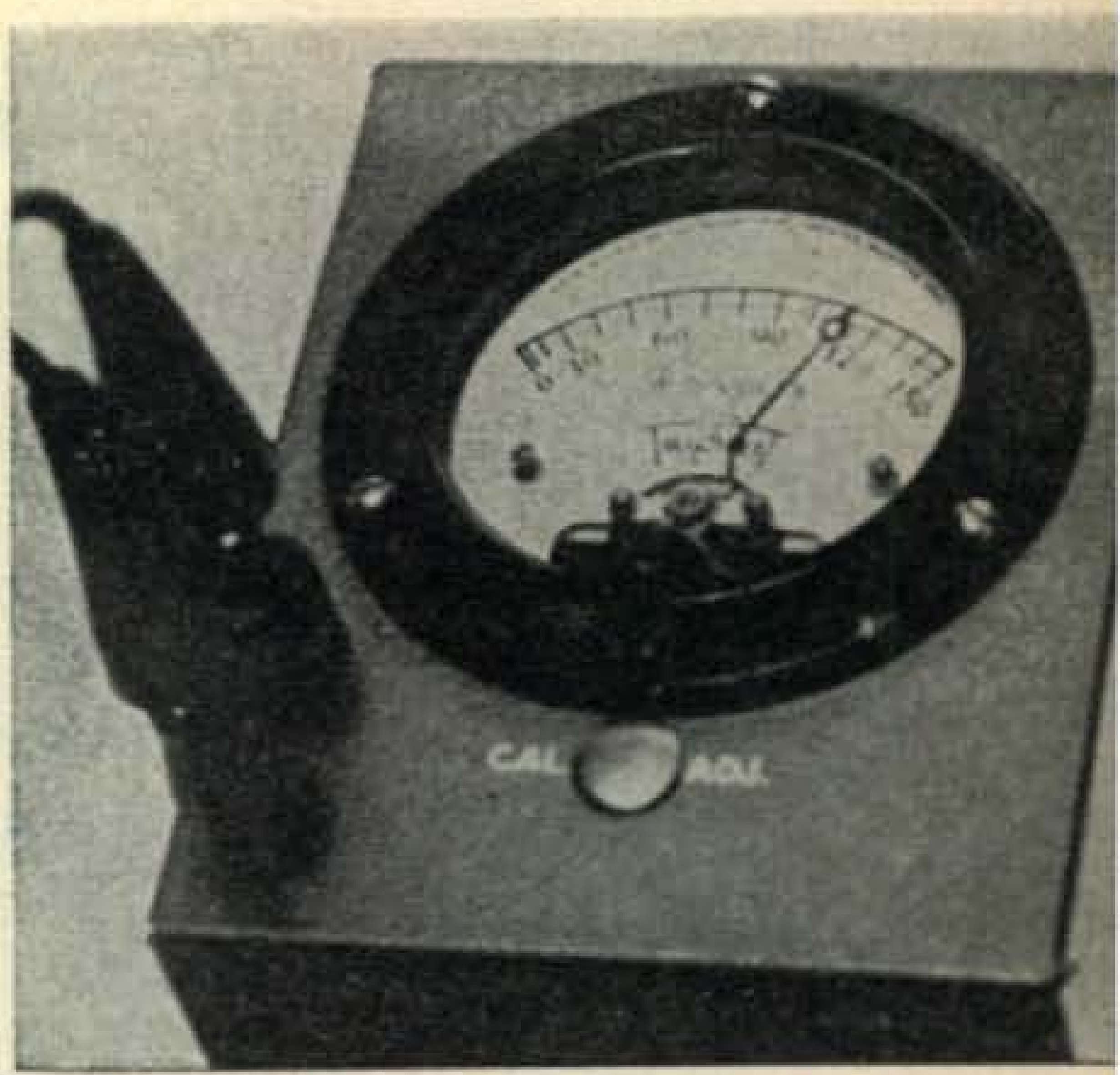
Mr. Burr has received a number of awards in DX contests, and for the construction of equipment. He studied at Jamestown College, at Jamestown, N.D., from which he was graduated with honors, and also attended the University of Edinburgh, Scotland. He intends to continue his teaching career.

The scholarship was named for John Gore, a former president of the Foundation for Amateur Radio, and a native of Baltimore, who died last year. He had been a prominent amateur most of his life, and was Electrical Superintendent of the Bethlehem Steel Company's Key Highway Yard in Baltimore, one of the nation's largest ship repair facilities.

Present at the ceremony was Major William L. Scott, W4PVR of the U.S. Army Signal Corps, president of the Foundation for Amateur Radio, Inc. Major Scott said that the object of the scholarship was to encourage young radio amateurs in college who had chosen electronics or similar work as their chosen profession. ■

New Uses For Old Meters

BY JAMES A. FRED*



Many junk box meters can be overhauled and put to good use around the shack. The author describes his methods for doing this.

MULTI-range ammeters and voltmeters can be quite expensive, frequently beyond the range of the amateur not "too well heeled." Looking through the junk box should turn up some kind of an old meter or surplus device that could be rebuilt into a useful instrument. I found an old Jewel a.c. voltmeter, a fairly late model Weston d.c. milliameter and a Triplett a.c. milliameter in my junk box.

A.C. Voltmeter

I decided first, to try to rebuild the a.c. voltmeter. It was connected into the circuit shown in fig. 1 and found to have a full scale reading of 30 volts. By connecting a wirewound

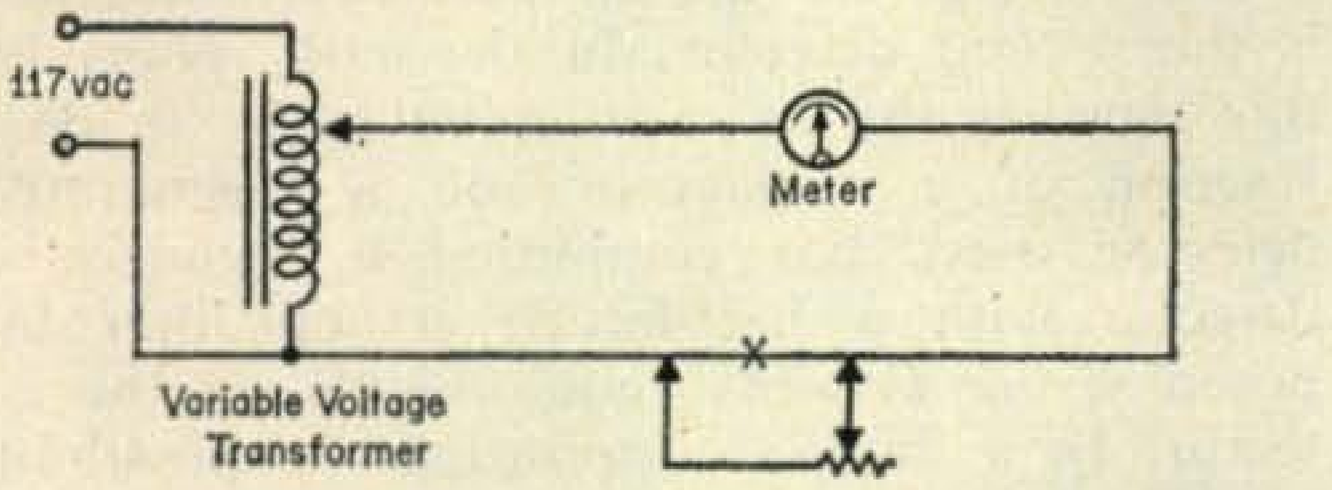


Fig. 1—Circuit for determining the proper multiplier resistance for use with a meter whose characteristics are unknown.

variable into the circuit at point X, I found that 5000 ohms would increase the range to 150 volts. A new 0-150 volt dial scale was obtained and the meter was mounted in a 3×4×5" box along with a 7.5K 4 watt pot and 2 binding posts. The meter may be calibrated against any available standard, the more accurate the better.

A.C. Milliameter

The a.c. milliameter was the next item worked on. It had a scale reading from 0 to 50 ma so I decided to make a 3 range a.c. ammeter out of it. The ranges would be 0 to 50 ma, 500 ma and 5 amperes.

To determine the value of the shunt resistors it is first necessary to know the internal resistance of the meter. To determine this, connect the unknown meter in series with a battery and rheostat and adjust the resistance for a full scale reading on the meter. Now connect a rheostat (we will call it #2) across the meter and adjust it so that the meter reads half scale. Now, disconnect rheostat #2 and measure its resistance very carefully. This value is equal to the internal resistance of the meter.

*POB 54, Russiaville, Indiana

Now use this formula to calculate the resistance of the shunts:

$$R = \frac{r_m}{(n-1)}$$

Where R is the shunt resistance, r_m the meter resistance and n the scale multiplication factor.

For example, let us convert the 0 to 50 ma meter to read 500 ma. The scale multiplication factor is then 10. If the internal resistance in 100 ohms:

$$R = \frac{100}{(10-1)} \text{ or } 11.1 \text{ ohms}$$

The 11.1 ohm shunt would have to carry 450 ma at full scale and therefore should have a 10 watt rating. A 15 ohm 10 watt adjustable slider type resistor would do nicely. If the shunt resistance calculates to under one ohm then it may be made from copper or nichrome wire.

Borrow an ammeter to act as a standard. If it is not available use the basic movement as your standard. A four position single pole switch can be used to select the meter range as shown in fig. 2.

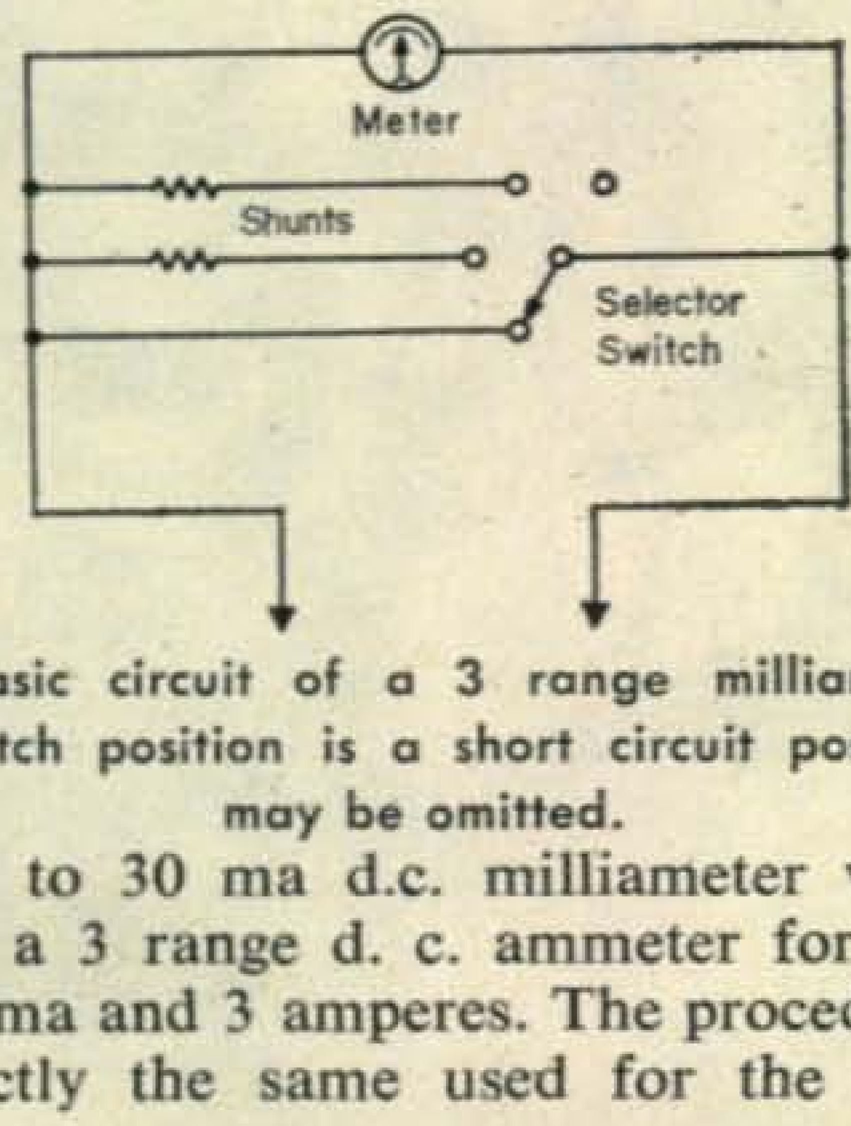


Fig. 2—Basic circuit of a 3 range milliameter The fourth switch position is a short circuit position and may be omitted.

The 0 to 30 ma d.c. milliameter was used to make a 3 range d. c. ammeter for 0 to 30 ma, 300 ma and 3 amperes. The procedure used was exactly the same used for the a.c. milliameter. ■

A 40 Meter C. W. Station For Novice or Mobile

FRED STANLEY HOWELL*, W6MTY

A simple 40 meter station has been designed that can satisfy both the Novice and old timer. It makes use of a crystal controlled regenerative detector in the receiver.

How small, compact, inexpensive, dependable and simple can a complete station be built and yet have good performance? This is the question that has been asked by many beginners over the years. Also, recent trends toward mobile c.w. have made this question important to a lot of old timers (particularly if they are driving a compact car.) The accompanying circuit diagram and photographs show a combination transmitter and receiver for 40 meter c.w. that will fit in any compact and the performance will be a surprise to old timers too.

Circuit

The transmitter consists of a grounded plate Pierce oscillator driving a conventional 2E26 amplifier. The keying is arranged to cut off the oscillator so the whole transmitter is quiet during key up to allow the receiver to work. The 10,000 ohm resistor across the key raises the voltage on the NE-2 keying monitor oscillator to about 100 volts, which is enough to stop the monitor oscillator, but not enough to exceed the cathode to filament limits of the 2E26 or the 12AT7 oscillator. The 15 ohm resistor in series with the key is part of the key click filter and protects the key contacts from too rapid discharge of the 0.2 mf capacitor across the key.

The receiver consists of ½ 12AT7 T-R switch which also acts as a broad band r.f. amplifier, 6BE6 converter, ½ 12AT7 detector and ½ 12-AT7 audio amplifier. The 6BE6 converts from 7 megacycles to 4 megacycles (the frequency of the heterodyning oscillator is 3 megacycles) and a high signal to noise ratio is obtained through the use of a half-lattice crystal filter. The important contribution this receiver makes to the state of the art of receiver construction is the second detector. In the early plans for this receiver the i.f. was going to be made a fraction of a megacycle and a regenerative detector used, but combining a regenerative detector with a half-lattice crystal filter imposed severe stability requirements on the detector. In a flash of inspiration the possibility of reflexing a grounded plate Pierce was suggested and although there were some difficulties in coupling into it, the final circuit that was arrived at is extremely stable and sensitive. This detector also, solved the problem of images, since the i.f. could be put on a high enough frequency to eliminate images.

The i.f. frequency that was selected was 4035 kc because it was outside of any ham band, was high enough in frequency to get

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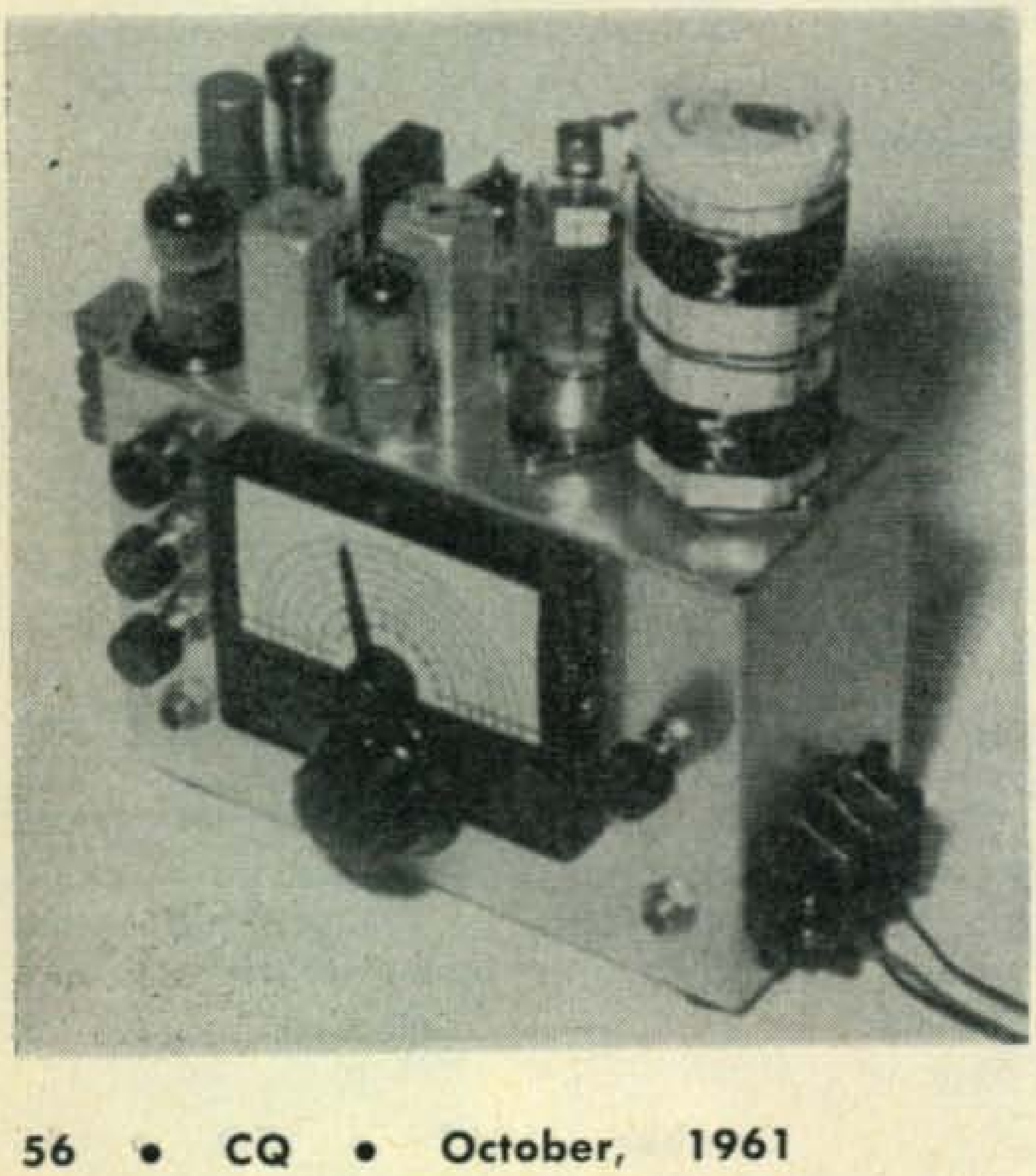


Three quarter view showing front panel and top chassis layout. The front left tube is V_4, a 12AT7, and to the right of it is the 6BE6. The power input connections are made through the terminal strip on the right chassis lip. The dial tunes the 15 mmf capacitor. To the left of the dial are the Volume and Regeneration controls with the phone jack just below. To the right of the dial is the final plate capacitor with the key jack below. The extra knob on the left was for a padder in the reflex detector circuit but was found to be unnecessary.

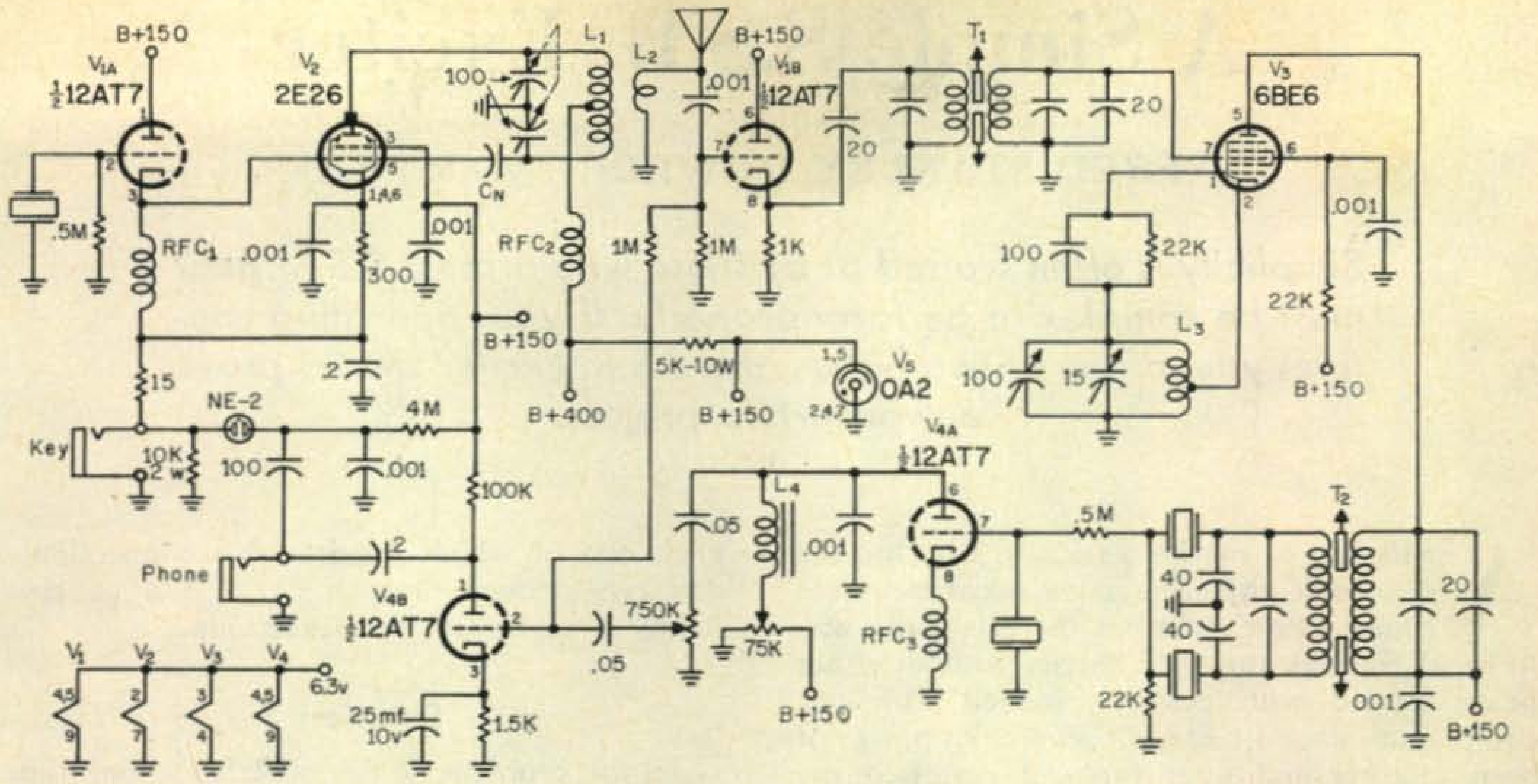


Fig. 1—Circuit of the 40 meter transmitter and rece'ver. All resistors are ½ watt unless otherwise noted. Capacitor values over 1 are in mmf and under 1 are in mf unless otherwise noted.

C_N—Insulated wire from the grid of the 2E26 cemented with Duco to the insulation of C_4 at a location that provides neutralization.

L_1, L_2—B&W MCL 40

L_3—40t #24E on a 1″ diameter form, tapped 8 turns from the bottom.

L_4—10 Henries, 10 ma audio choke. (Actually may be from 8 to 500 henries with an adequate current rating.)

RFC_1, RFC_2, RFC_3—2.5 mh.

T_1—Miller 10.7 mc i.f. transformer

T_2—Miller 4.5 mc i.f. transformer

rid of any image problems and crystals on this frequency were available for fifty cents apiece. So, for $1.50 the three crystals were obtained for the half-lattice filter and the reflex-Pierce detector. As an aside, this filter-detector combination is extremely effective in receiving s.s.b. signals and the author is contemplating combining a simple s.s.b. rig with a receiver like this for an s.s.b. mobile installation.

The reflex-Pierce breaks in at 25 volts on the plate and experience indicates that with the regulated 150 volts the regeneration control could be a screwdriver adjustment because it is seldom touched.

Crystals

When the three crystals that were obtained were checked for frequency, two of them were almost zero beat and the other was about 1 kc away from the other two. One of the two that were together was used for the reflex-Pierce detector and the other two were used in the filter. This resulted in a receiver bandwidth of slightly over 1 kc with the beat frequency at one side of the pass band. If, on checking crystal frequencies, they do not all fall within 1 kc then I would suggest trying others until three are obtained within 1 kc, otherwise the receiver pass band will be too wide for good c.w. reception.

I.F. Transformers

The i.f. transformer is a standard 4.5 mc transformer that has been padded down to

[*Continued on page 106*]

Rear view of the unit shows the 3 crystals, on the right lip, for the reflex detector and ½ lattice filter. The tubes are, from l to r, 2E26, 12AT7 osc. and TR and 0A2. The final plate tuning capacitor is just under the final coil on the left and the bandset capacitor is just under the bandspread unit in the center.

A Simple S.S.B. Exciter

FRED STANLEY HOWELL*, W6MTY

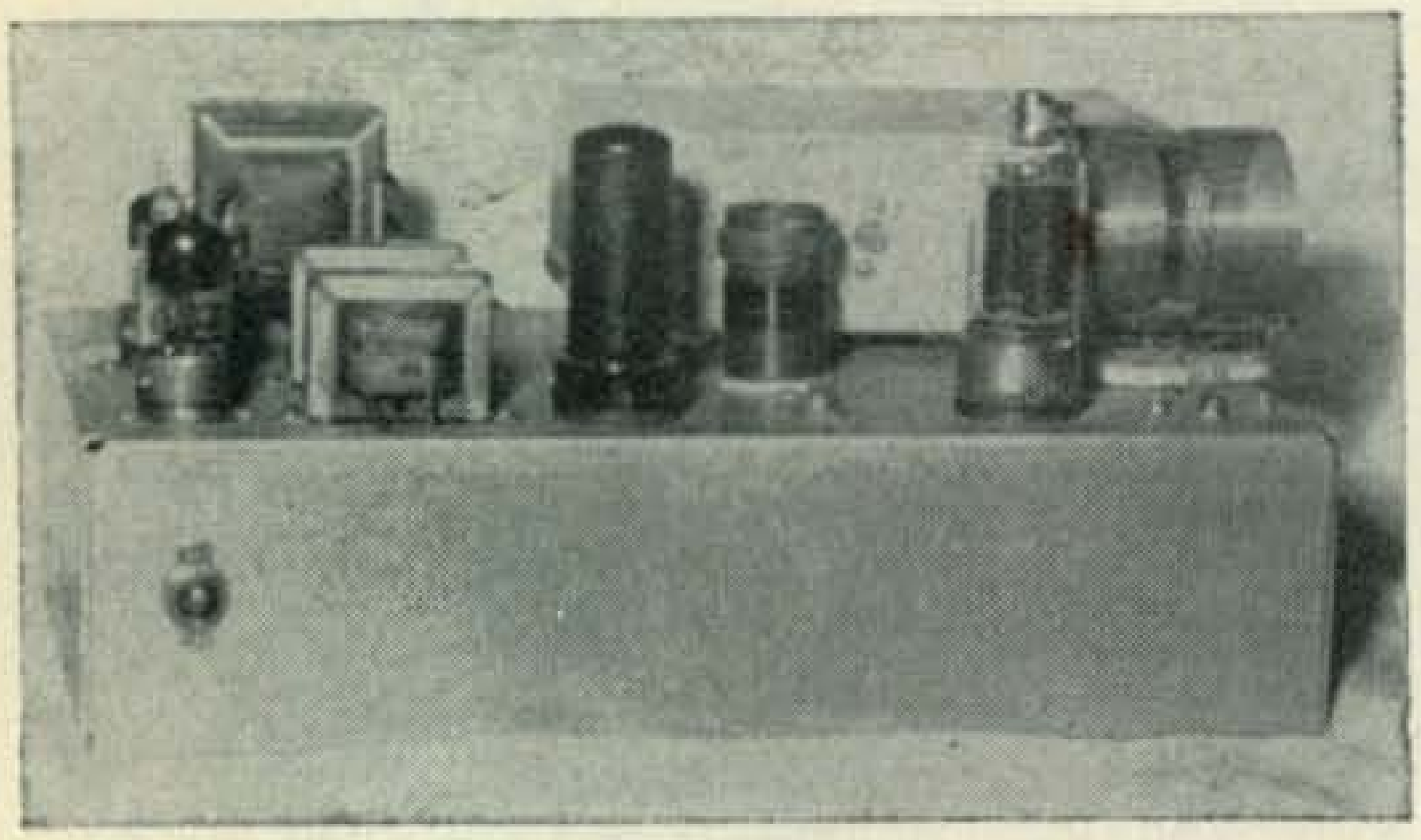
Simplicity is often scoffed at by those who profess S.S.B. gear must be complex to perform properly. If your operating confines you to one or two bands, this S.S.B. exciter should prove a worthwhile project.

A NUMBER of my ham friends, who are not electronic engineers, have asked me, from time to time, whether there is some way to break through the s.s.b. barrier without either being loaded with cash or loaded with test equipment. Since I had built several s.s.b. rigs of both phasing and filter types, I reviewed my experiences and came to the following conclusions:

A filter type exciter is not suitable for average home construction, because the filter is either expensive or hard to build and characteristically a filter type exciter must be carefully adjusted to prevent spurious radiations.

A phasing type exciter can have the same spurious radiation problem as the filter rig if mixing is used to change frequencies.

If you attempt to bandswitch with a phasing exciter and work straight through on each band, you end up with two coils on each band, each one of which requires five connections and rebalancing on each band. Not a very handy thing to try, bandswitching.



Front view of the simple s.s.b. exciter. The 12AT7 is at the front left with the 2D21 directly behind it. Behind the 6AG7, 2E26 and coils L_1, through L_4, can be seen the plug in balanced modulator unit. The driver and amplifier plate tuning capacitor shafts can be seen just in front of their respective coils.

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Solution

I let the problem lie dormant for a long time until one day, while discussing the situation with WØCUG, it occurred to us that if the two coils were combined into a single housing, only two audio and two r.f. connections would be required for the package. In less time than it normally takes to dream up the plans for an exciter I had built the unit shown in the photograph.

The circuit diagrams for the audio, balanced modulator and r.f. amplifiers are shown in figs. 1 and 2. A separate balanced modulator is used for each band and the unit, as shown in the photo, plugs into a four prong socket in the main chassis and has two coax connectors.

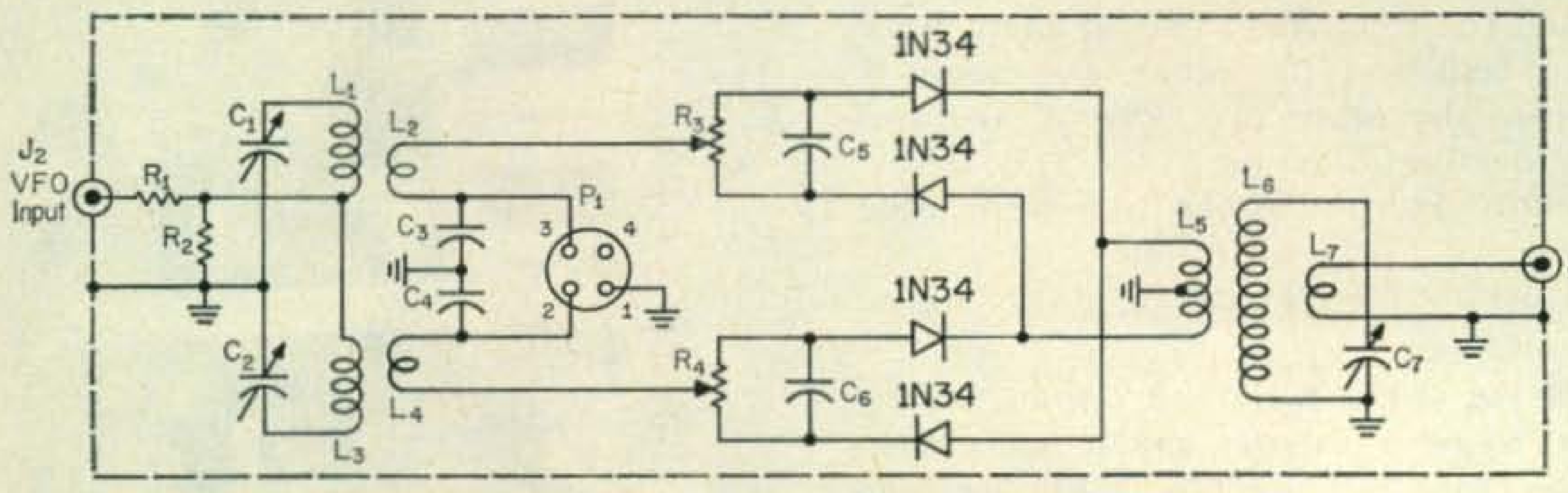


Fig.1—Circuit of the balanced modulator. For simplicity, each band utilizes its own plug-in balanced modulator. In this way complicated switching and adjustments are eliminated. See Table A for coil data.

$C_{1, 2, 7}$—80-40M—100 mmf variable
20M—50 mmf variable
15-10M 35 mmf variable
$C_{3, 4}$—.001 mfd mica
$C_{5, 6}$—.005 mfd mica
$R_{1, 2}$—See text
$R_{3, 4}$—1000 ohm potentiometers

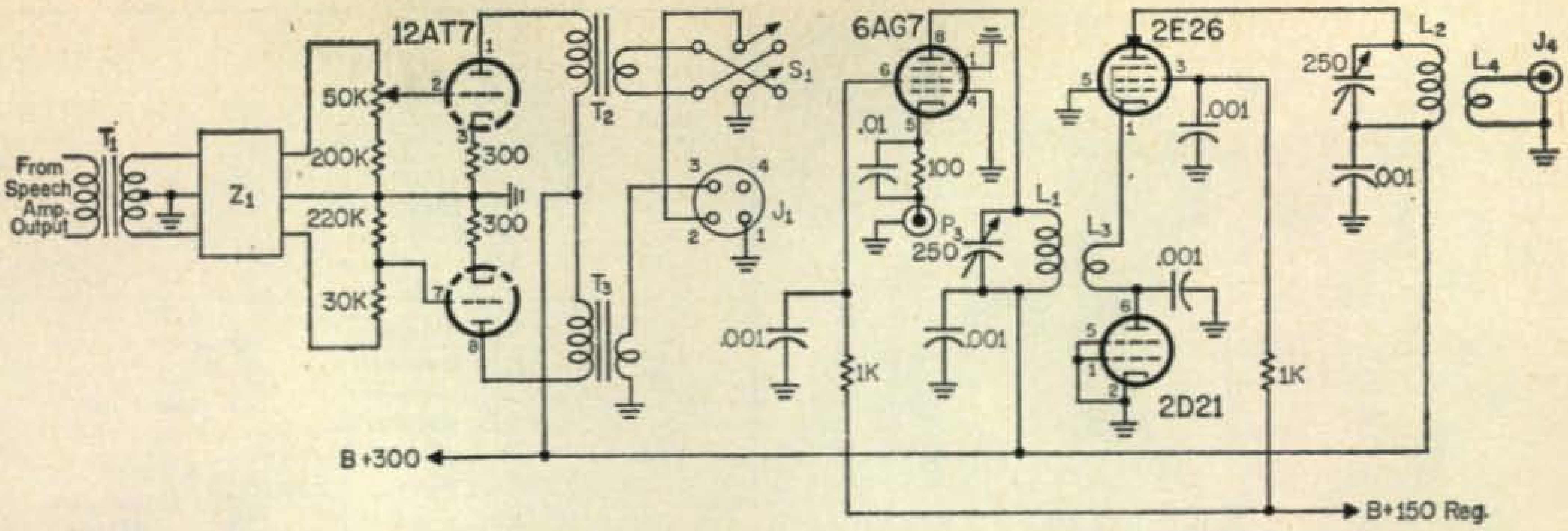


Fig. 2—Circuit of the audio and r.f. amplifiers. No actual connection exists between the two sections until the balanced modulator is plugged into J_1 and connected to R_3. See Table B for coil data.

T_1—Thordarson 21M68 or equiv.
$T_{2,3}$—Plate to 4 ohm voice coil output transformers

Z_1—Audio Phase Shift Network, B&W 350-2Q4 or equiv.

Circuitry

A word should probably be said about floating tank circuit L_6, C_7 of fig. 2. The output impedance of the balanced modulator is quite low, is two wire balanced, and it feeds a coax line output. Rather than build a balun I elected to have a floating tank to couple the low impedance input and output.

Table A

	L_1, L_3, L_6	L_2, L_4, L_7	L_5
80	28 Turns #22 Enameled 1" Diameter Form	5 Turns #20 Soft Copper D.C.C. Wound Over Cold End of L_1, L_3 or L_6	10 Turns #20 Soft Copper D.C.C. Wound Over Cold End of L_6
40	14 Turns #20 Enameled 1" Diameter Form	4 Turns # 20 Soft Copper D.C.C. Wound Over Cold End of L_1, L_3 or L_6	8 Turns #20 Soft Copper D.C.C. Wound Over Cold End of L_6
20	10 Turns #16 Enameled 1" Diameter (Miniductor #3015)	3 Turns Miniductor #3017 Slip Fit Over End of L_1, L_3 or L_6	6 Turns Miniductor #3009 Slip Fit Inside Cold End of L_6
15	8 Turns #14 Enameled 1" Diameter (Miniductor #3014)	2 Turns Miniductor #3017 Slip Fit Over End of L_1, L_3 or L_6	5 Turns Miniductor #3009 Slip Fit Inside Cold End of L_6
10	6 Turns #14 Enameled 1" Diameter (Miniductor #3014)	2 Turns Miniductor #3017 Slip Fit Over End of L_1, L_2 or L_6	5 Turns Miniductor #3009 Slip Fit Inside Cold End of L_6

When one coil is wound over another, a layer of insulating tape should be used to prevent arcing between coils.

The audio phase shift network shown in the diagram of fig. 2 which was used in this rig was home built, but it is recommended that one of the commercial units be used instead. The r.f. amplifier also shown in fig. 2 was included just so the exciter could be put on the air by itself with a p.e.p. of about ten watts. The output of the balance modulator is in the order of about 100 milliwatts p.e.p. and may be used directly if there is a linear exciter available to amplify it from this level to the desired and radiated power.

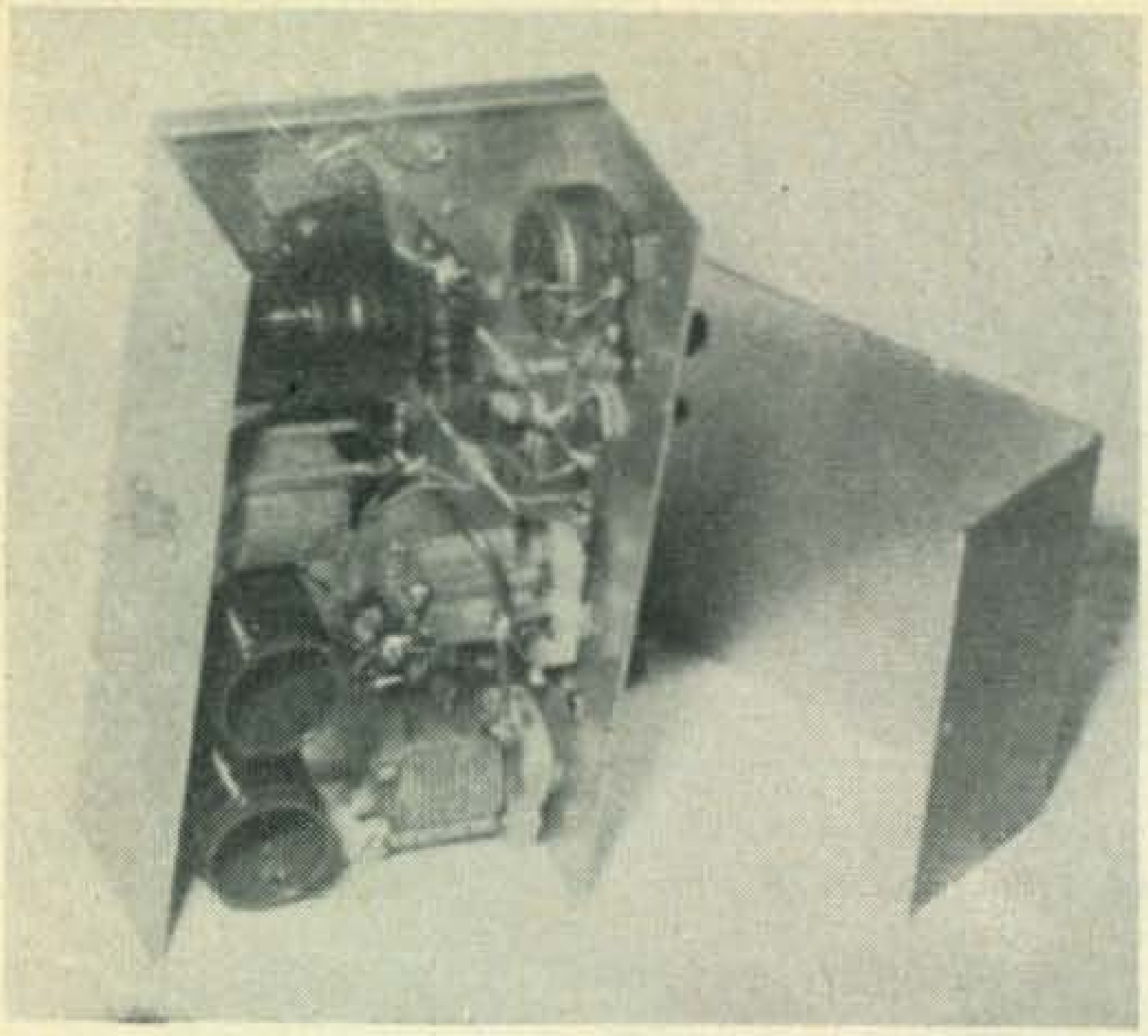
The resistors R_1 and R_2 of fig. 1 must be selected to match the v.f.o. which will be used to drive the balanced modulator. They should be selected so that the total series resistance equals the output impedance of the v.f.o. and the total wattage must be able to absorb the output power. The ratio of R_1 to R_2 must be sufficiently high so that when the balancing potentiometers are completely at one end of their travel, excessive current does not flow in one of the diodes. In the case of the Sonar CFC used to drive the original model, the ratio of R_1 to R_2 was 4 to 1. Resistor R_1 was 40 ohms and R_2 was 10 ohms.

Adjustment

Before describing the adjustment of the exciter, I will make the assumption that anyone interested enough in s.s.b. to get to the adjustment stage has read a good deal of theory of operation of phasing type exciters and is well aware of amplitude and phase requirements of the four inputs to a balance modulator.

Two steps required in the adjustment of each balance modulator are:

1. With the balanced modulator unplugged from the chassis, connect the v.f.o. to the r.f. input and a load to the r.f. output J_2. Connect a 0-1-50 milliammeter between pins 1 and 2 of the 4 prong plug, P_1. Turn on the v.f.o. and by adjusting R_4, zero the milliammeter first on the 0-50 scale and then on the 0-1 scale. Repeat with the other pair of diodes with the milliammeter connected between pins 1 and 3 and by adjusting R_3.



View of one of the plug in balanced modulator units. On the rear edge (far side in photo) are pots R_3 and R_4 capacitors C_1 and C_2. Directly behind C_1 and C_2 are coils L_1-L_2 and L_3-L_4. On the front edge are C_7 and L_5-L_6-L_7. The four 1N34 diode modulators are located between the two pots.

2. Plug the balanced modulator into the chassis, apply all power supply voltages, turn on the v.f.o. and drive the audio phase shift network with a 1000 c.p.s. audio tone. Couple the output of the balance modulator or one of the amplifying stages directly to the vertical plates of an oscilloscope so that a rectangular pattern is obtained. Adjust C_1 and C_2 of the balanced modulator and R_1 of the audio section until the modulation is observed to be a minimum and the pattern is observed to be a rectangle with straight sides.

Table B

Band	L_1, L_2	L_3, L_4
80	10 Turns #16 Enameled 1" Diameter Plug-in Form	4 Turns #16 Enameled Wound Over Cold End of L_1 or L_2
40	6 Turns #14 Enameled 1" Diameter Plug-in Form	4 Turns #14 Enameled Wound Over Cold End of L_1 or L_2
20	4 Turns #14 Enameled 1" Diameter Plug-in Form	3 Turns #14 Enameled Wound Over Cold End of L_1 or L_2
15	3 Turns #14 Enameled 1" Diameter Plug-in Form	2 Turns #14 Enameled Wound Over Cold End of L_1 or L_2
10	3 Turns #12 Enameled 1" Diameter Plug-in Form	2 Turns #12 Enameled Wound Over Cold End of L_1 or L_2

When one coil is wound over another, a layer of insulating tape should be used to prevent arcing between coils.

The oscilloscope used to adjust the original unit was a Heath OM-3 which is about as inexpensive as oscilloscopes come, and it worked quite satisfactorily.

I hope that this description of a really simple s.s.b. exciter will open the door to many of the gang who haven't been able to enjoy the benefits of s.s.b. yet, because they thought it was too complicated or too expensive for them. ■

Simple Power Supply Protection Circuit

JACK MYERS*, W5KKB

Having sent many rectifiers to Valhalla due to accidental overload the author developed the inexpensive overload relay described. Surplus relays are employed throughout.

AFTER several years of obtaining voltages necessary for checking out various items by tapping into power supplies intended for other purposes, it was decided that it was time to build a special power supply for the workbench. The power supply built was a rather conventional dual variable supply using 5V4 rectifiers, a 6AS7 regulator, and 6BH6 control tubes. It has two outputs that are variable from 150 to 350 volts at up to 100 ma. The first version of this supply used a pair of 6X4 rectifiers, but after accidental shorting or overload had burned out four of these tubes, the rectifier sockets were changed so that more common types of rectifiers (5V4, 5U4, 5Y3, etc.) could be used. At the same time, it was decided that some foolproof system of protection was necessary. The supply was fused, but the rectifiers seemed to be just a shade faster in reacting than the fuse. The protective circuit to be described is not intended to be copied exactly, but rather to be adapted to the particular needs (and junk boxes) of the reader.

*443 Centenary Drive, Baton Rouge 8, Louisiana

Circuit Operation

As many overload relays are needed as there are circuits to be protected, so in this case two were needed. The relays used were type BK-5 surplus relays, which had been scrounged some time ago. Basically, any sensitive relay will do, provided that it has a pair of normally closed contacts. The BK-5 is ideal, since it is adjustable, and can therefore be set to trip at a predetermined current level. Resistors R_1 and R_2 are used to shunt the relay coils to determine the approximate load current at which the relays will trip. The value of these resistors can be determined from the following formula:

$$R = R_r\left(\frac{I_r}{I_L}\right)$$

where R is the resistance value needed, R_r is the coil resistance of the relay, I_r is the current needed to trip the relay, and I_L is the load current at which the relay is to trip. In the supply shown, the maximum supply current was to be 100 ma, giving a shunt resistance of R=4000(1/100)=40 ohms. The closest 10% value, 39 ohms, was used. Some people may want to go one step further and make this resistance adjustable. If this is done, it would be wise to put the relay coil and resistor in the grounded side of the output, since most controls will arc over when a considerable voltage (such as the output voltage of the supply) is applied between the element and the housing.

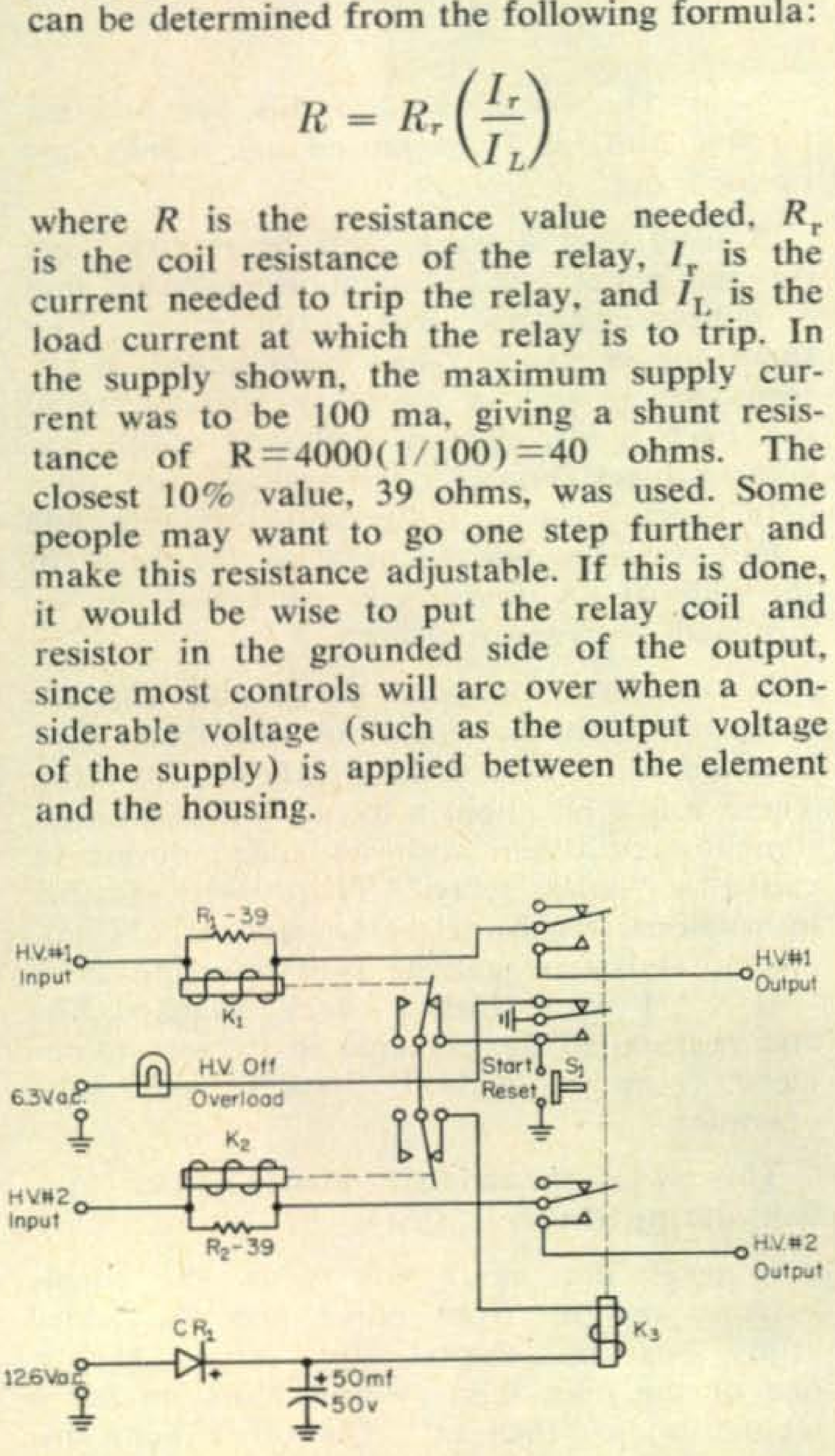


Fig. 1—Circuit of a power supply overload protection circuit for two voltage outputs. The shunts for K_1 and K_2 must be computed for each relay and load as explained in the text.

K_1, K_2—Surplus relays type BK-5, 4000 ohms, s.p.d.t.
K_3—Surplus relay, 12 v.d.c. coil, 3 p.d.t.
CR_1—Selenium Rectifier, 250 ma.

The contacts of each relay (K_1 and K_2) are connected in series with each other and with the coil and a normally open contact of the power relay (K_3) as shown in fig. 1. A pushbutton switch connected across the normally open contact serves as the START-RESET button. When it is initially pressed, the power relay (K_3) closes and seals itself in through its normally open contact which shorts out S_1. If an overload occurs, the power relay will drop out because K_1 or K_2 contacts will open the K_3 coil circuit. A pilot light is connected to indicate the high voltage off or overload condition. The power relay is not critical, and almost any relay that will handle the load current needed and has the necessary contacts will do the job. The one used was obtained from a 99¢ surplus relay assortment.

Conclusions

The protective circuit has been in use for several months, and not one tube has been blown although the output of the supplies have been shorted out literally hundreds of times to demonstrate the circuit. The protective circuit eliminates the need for a standby switch. There are two methods of putting the unit on standby. The first consists of slapping the power supply. A light slap will jolt the overload relay contacts apart for a split second, which is long enough to drop out the power relay. The second method is to have a ground wire clipped in the circuit being worked on. To put the supply on standby the ground lead is shorted to the high voltage lead, causing an overload which again drops out the power relay.

It was thought at one time that it would be convenient to have a voice-controlled relay which would reset the circuit with a whistle or yell. Although the idea worked fine, it is not recommended since most people have a tendency to yell when shocked, and this would reset the supply thus causing a second shock, etc. One further point should be mentioned. When the power supply is on standby, the pilot light is on; when the supply is on, the light is off. This seemingly backwards operation is consistent with the labeling on the light, but will prove confusing until one gets used to it. ■

Write today to the United States Senate; attention Commerce Committee, concerning the adoption of Bill S. 2361.

I Don't Ham Much Lately

BY PAUL C. AMIS*, W7RGL

Does your rig need an overhaul? "Don't let anyone touch it!" advises Paul because when they finish it might—well, read his humorous tale of woe and be advised.

SOME time ago, give or take a sunspot cycle, I purchased a commercial phone-c.w. all-band transmitter of modest power and wondrous complexity. For several tranquil years it gnawed through the pile-ups on the lower end of twenty, surmounted the roar of QRM on 75 meters, and dredged up more than its share of contacts in several contests. In due time, however, as must come to all things, man and machine, ailments began to creep through its electronic bloodstream; it developed a slight tic over its left meter; a touch of arthritis in its bandswitch; and a shortness of breath on the higher bands. Its keying reflexes were subject to scrutiny, and it suffered from a touch of lower-plate wobble on a.m. I wrung my hands over this crumbling of a once steadfast companion, and shed a bitter tear over its contemplated hospitalization.

I was nervous about ripping into its splendid innards so a frantic bleat on 75 meters for someone who could restore the halting tongue, the lilting note, etc., got me the address of an amateur across town.

The next evening I introduced myself to this worthy and recounted my desires regarding the rehabilitation of the rig. While he examined it, I strolled about his shack and noted that he was actively engaged in radio teletype, since several printers and keyboard were lined up along the side of his main operating position. Shelves over this equipment were groaning with myriads of boxes crocheted together with multiconductor plugs and skeins of cable, with a fiine sprinkling of black knobs, toggle switches, and red pilot lights on everything. The faint whir of motors filled the shack atmosphere which, from its odor, consisted of equal part sof stale cigar smoke and typewriter oil.

At length he unscrewed a small magnifying glass from his eye, adjusted his green eye-shade, and inserted my transmitter into a spare foot of space on a side shelf.

"Yep—needs a little overhaul" he said. "There isn't much inside that beastie—nothing but the bare essentials." He looked thoughtful as he sucked on the end of his screwdriver. "Got a couple of improvements in mind — — —." The far-off look in his eye told me I'd lost him, so I murmured my thanks and tip-toed out.

A little over a week later he returned my rig and a cursory examination disclosed that a noticable change had taken place. Two small toggle switches had been added to the front panel, with a matching pair of small red pilot lights. A new outboard utility box with a black knob, toggle switch, red pilot light, and a large multiconductor plug and cable assembly was secured to the back of the cabinet. A fine sheen of typewriter oil glistened everywhere.

He explained, in great detail and with obvious relish, the modifications which had been installed, but I missed the significance of them. There was a bit about a toroid, which worked, somehow or other, with an added device he called a "polar relay." There were further instructions regarding relay settings, "Cam" angles, and some gak he kept referring to as "MUX." I wrote him a check, thanked him and re-installed the prodigal in its accustomed niche. "Now," thought I, "back to some solid operating."

This sweetness-and-light phase limped to a halt during the first QSO.

I never did figure out what the toggle switches on the front panel and the added utility box did. Periodically, during keying, one of the pilot lights would blink on for a second or so, then off. The other light discommoded me by winking on and off as I received, and I began to get complaints over the air that my frequency shifted back and forth in jerks as I keyed. In addition, during the time the rig was on I kept hearing what I imagined was a faint whine of a motor and even fainter clicking of a relay somewhere. On a.m. my audio seemed to consist mainly of two tones which gave me a peculiar sing-song voice most difficult to copy, and I couldn't get rid of the smell of typewriter oil—so I took to smoking cigars to hide the aroma.

Regardless of how thin you sliced it, the rig was NOT back to par so again, one evening, I carefully wrapped the patient in a

*Route 1, Box 438, Poulsbo, Washington

clean sheet to keep out the night air and trundled it over to a Ham friend who had leaped over the fold, so to speak, and had become a staunch s.s.b. addict. His station contained quantities of home-brewed equipment, and he talked like a man who knew his way through a test bench or three.

Gently I set the sufferer on his table and recited its miasmias whilst my friend peered suspiciously into the works. After considerable jabbing of test prods into the chassis and thumping of smaller organs with a soldering aid he set down his longnose and wiped off his hands in a singularly somber manner.

"The modulator (ahhh-h) isn't balanced; the carrier (ahhh-h) rejection isn't (umm-m) all that it (ahhh) should be (ahhh-h) and the filter (umm-m-m) system (err-r) seems a (ahhh-h) trifle loose" said he, ticking the points off on his fingers. "It looks like a (ahhh-h) major (umm-m) overhaul. (Ahh-h)drop back in a (um) week." I departed, feeling like one of the bereaved leaving a funeral parlor.

A week later I returned, manfully prepared for the worst. He pointed out my rig, sitting in recuperative splendor on his bench.

"There it is, (ahh-h) better than (ummm-m) new" he said, patting it affectionately behind its meters.

There was a splash of solder on one of the knobs, and a scratch on the lid, but otherwise all seemed sound. I paid for the new parts he had used, thanked him profusely and departed.

But again, operating disclosed debatable improvement. On phone it was not particularly happy on 75 meters. On the other bands, the audio sounded like I had an oriental accent, and I noted the rig was its cheeriest on the high ends of the twenty and fifteen meter bands. Then too, there was the difficulty in getting the rig switched over after a transmission—I usually had to fill the gap with "ahhh-h—" until my carrier finally shut off. On c.w., the rig worked reasonably well except that, despite all the loading I could shovel into the tank, the carrier seemed somewhat puny and stunted. With a heavy heart, I realized that instead of curing the rig's original ills, these "specialists" had inserted idiosyncracies of their own. A more straight forward repair appeared to be in order by someone not so deeply immersed in such sophisticated modes as r.t.t.y., s.s.b. and the like.

Among the stalwarts at the Radio Club was a man whose c.w. DX accomplishments with his homebuilt kw was legion. True, there was considerable comment afoot regarding his keying and his tendency to perch precariously on band edges, but I felt, DX hog or not, he might be able to straighten out my transmitter so it would operate in a more rational manner.

The streetlights were blinking as I drove into Hog's driveway, so I knew he was home. As I carried the rig into his shack, he adroitly kicked a large variac back to a red mark on the dial. "Surely," I thought to myself, "a man with such a firm grasp on technological advancements and electronic acumen can solve my meager problems."

"You've come to the right place" he boomed. "We believe in home-brew around here. This here rig of mine is without a doubt the finest piece of circuitry in town" he said, sweeping aside the jungle of wire, transmission line, and dangling filter components which festooned the back of his transmitter rack like Spanish Moss. We chatted about my rig as he cautiously lifted the lid. "Whats this garbage?" he inquired, prodding the grid-block keying circuit. I told him of the benefits to be derived from well-shaped keying.

"Hog-wash!" he oinked. "All this stuff will do is to drain off drive. If you want to get the most outa an amplifier, you gotta feed it good —lots of drive, I always say. Give it sumptin' to work with. I see you got all sorts of gunk hung unto your speech amplifier also. Bad—very bad." I hastened to the defence of my speech-clipping circuit, but to no avail.

"You go to work to amplify the be-jabbers outa your mike circuit, and then clip the liver outa it—a poor way to run a railroad, I must say." Dropping his mixed metaphors long enough to pick up his diagonals, he commenced snipping and slicing at a great rate. This frontal attack on the very skeleton of my transmitter was not exactly what I had in mind, so I tried to stop him—I tried to make this human parasite understand that some of us more deluded amateurs wanted speech-clipping and shaped keying, but he was lost in a frenzy of destruction and my protestations affected him as strongly as if he had never heard them. As I watched, futilely plucking at his sleeve, he altered the circuits, referring occasionally to my schematic, his rusty v.o.m. and a private collection of rumpled scratch paper schematics he had fished out of a drawer. After a brief smoke test, he brushed off my fevered clutch and buttoned up the rig.

"There—thats considerably better—acts more like a transmitter ought to act. You try her now—should work FB." He developed a reminiscent look in his eye. "I ain't seen a rig as gutless as that one since I flung a phono oscillator with a chopped-down tank on twenty during one of the DX contests. Figured I'd give the boys a thrill." He leered at me as he fractured my floating rib with his elbow. "Used a ZE8 call and that rusty wire for the BC set upstairs for an antenna—" he chortled, "—racked the boys up fer a megacycle." I slipped out the door as he started rummaging through a closet looking for that insufferable phono oscillator.

[*Continued on page 104*]

DX DX DX DX DX DX DX DX

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

FLASH! ***The FCC has announced that Laos has officially been removed from the banned list. American amateurs may now resume operations with XW8 stations.***

The following certificates were issued between the period July 12th, 1961 and August 12th, 1961:

WAZ

1568	G3JLB	L. A. Belger
1569	W6BAF	H. E. Spaulding
1570	DJ3XK	Harry Steffan
1571	CN8IF	Earl Ritchie
1572	W2TP	H. G. Mustermann
1573	OK1GL	Ladislav Hlinsky
1574	W6ABA	Jack P. Burke
1575	K4RPK	Buford L. Foster
1576	DJ2MN	Manfred Vogt
1577	SP3DG	Jerzy Gorski
1578	DL1FZ	Dr. Fricko von Rautenfeld
1579	DJ4SP	Richard Blunck
1580	I1UA	Vieri Alamanni

PHONE WAZ

89	DL7AD	Fritz Woletz
90	SM5TR	Bo Lyregard
91	SM3AZI	Sture Richtner
92	SM3EP	Gosta Westerlund
83	I1UA	Vieri Alamanni

SSB WAZ

7	ZL3IA	Syd J. Langrope
8	G6LX	R. L. Glaisher
9	VK3AHO	Bill Hempel

CW WPX

188	W1WLW	Joe Watson
189	K5LZO	Chuck Coleman
190	DL1IA	Heinz Guettner
191	SL5AB	Kungliga Upplands Signal regemente
192	K8LSG	Dr. Roger W. DeBusk, M.D.
193	OK1MP	Milos Prostecky
194	KP4CC	Juan B. Castanera

SSB WPX

69	K4ASU	Robert C. Webb
70	ZS7P	Peter J. Lamont

Good Will

Every so often the opportunity presents itself to become a part of something in which we feel proud. The following letter from Herbert, YA1AO/DL1AO is a case in point. Let me quote from Herbert's letter:

"Today I wish to thank you for the publication of K6BX's good will program and my letter in *CQ* for July, 1960.

"In the meantime, I have already received a lot of handbooks, *CQ*, *QST* and other magazines from U. S. hams, which I was able to distribute to young Afghan boys who are very keen to learn about ham radio and radio in general.

"These Afghan boys, who are attending a technical school here in Kabul are practically unable to buy any of these books because there is nothing available here and also the average Afghan boy is very poor and would never be able to spend the necessary money to order books from foreign countries.

"So I guess that K6BX's good will program is working very well and all these generous gifts of American hams are appreciated here very much.

"Thank you for your kind assistance in getting this program started and working well.

73's, good luck and DX."

The letter is signed by Herbert and over 25 Afghan boys. They would especially like to thank K9JXH, W1BDF, W5PQA, and W7BTH who alone sent 15 handbooks and other technical books.

Herbert is about to start a new class and could use about 18 copies of the *Radio Amateur's Handbook* as well as any *CQ*'s, *QST*'s, or any technical magazines. How about a little ham good will where it will do some good?

Herbert's address is: Herbert W. Schostok, c/o International Civil Aviation Organization, T. A. Mission to Afghanistan, Box 5, Kabul, Afghanistan.

Thanks to Clif Evan, K6BX, and his good will program for making all this possible.

The Banned List

The following timely topic comes from the West Gulf *DX Bulletin*, and I must admit I have not been explicit enough about this point myself.

"From time to time we in the U.S. refer to a certain country or prefix as being on the 'banned list' or 'banned by the FCC.' Loosely speaking, this is not an incorrect statement, but certainly all U. S. Amateurs should understand the full background. When such a statement is made by one of our foreign friends or a foreign publication, it can easily mean to some of them that we in the U. S. are subject to official censorship or worse.

"A case in point was the 3W8AA of North Viet Nam, who was quite active in 1956, heard more than once, telling amateurs in other countries how bad it was that the United States officials prevent American amateurs from talking to him.

"Let it be known as the facts: Our communication laws permit us to QSO *any* country in the world. What we talk about is limited only by rules of good taste, which means we usually avoid religion and politics, plus the ordinary restrictions on classified military information. When the FCC tells us not to QSO Indonesia, for example, it means that Indonesia, through the International Telegraphic Union, has requested that other amateurs not communicate with amateurs of their country. Most countries who signed the treaty make no attempt at compliance. The United States, as a party to the ITU, keeps its agreement."

Here and There

EL Liberia: EL4A has returned to Liberia after his trip to the states. His XYL is now licensed as EL4YL and already has 65 countries worked. They will operate EL4A on odd calendar days and EL4YL on even calendar days. They will both operate all bands, 10 through 160 and, possibly, 6 meters to boot. A kw as well as sideband will soon be added to the shack equipment. Some goodies recently worked include ZD7SE, UM8KAD, 5U7AC, and a few stateside stations on 40 meters. You may remember that Ken made 160 meter history last year with the first EL/W 160 meter QSO. The QTH for Ken and his XYL is listed under QTH's.

FF7 Mali: Josef, 7G1A will be returning to Mali for a short stay some time in October. QSL's, as usual, via the OK bureau. (Tnx WGDXC)

FP8 St. Pierre: Charlie, W2EQS, reports that because DL9KR's vacation was transferred, they will be operating from St. Pierre as FP8AS for the first three weeks in October instead of the last three weeks in September as reported last month.

FS7 St. Martin: Regi, FS7RT, usually operates on 14347 kc and listens for s.s.b. or a.m. calls between 14250 and 14255 kc. (Tnx WGDXC)

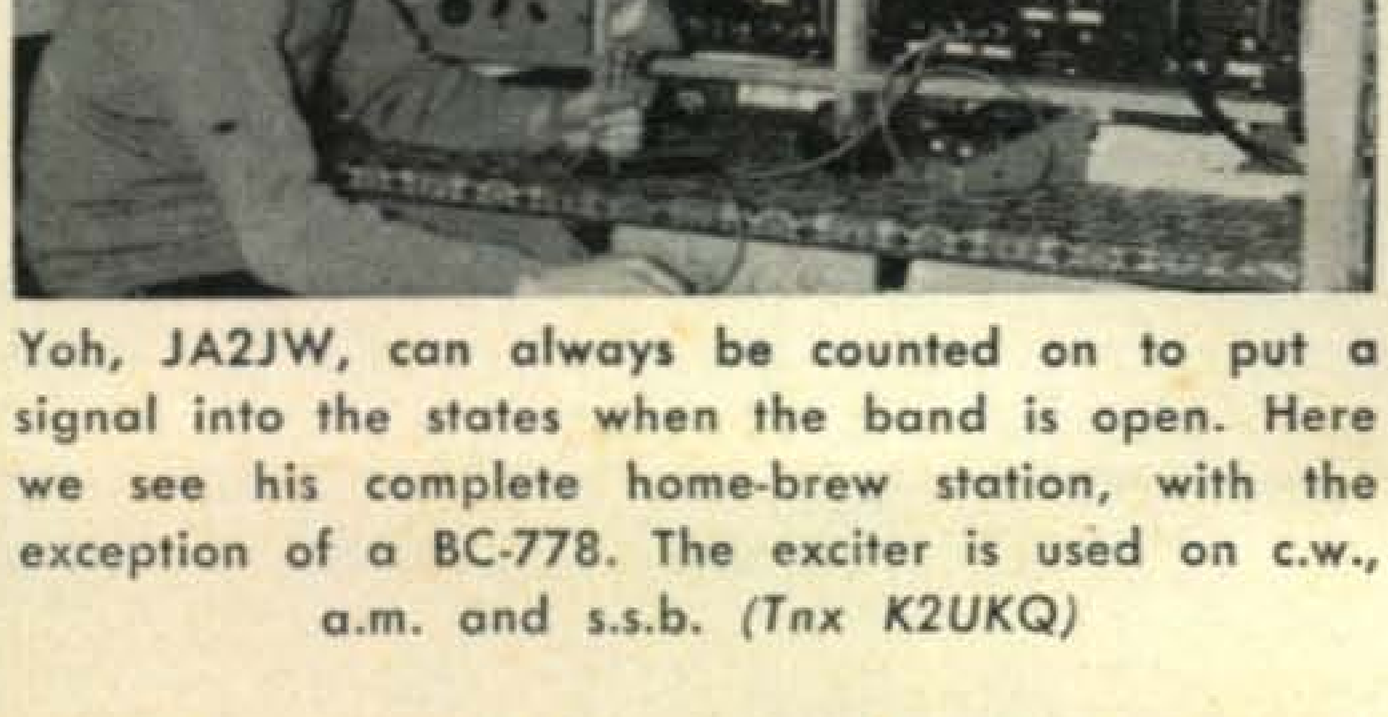
KS4 Swan Island: The gang that was going to operate from Swan Island as KL4BC unfortunately had their license cancelled at the last minute. All amateur radio operations from Swan Island are temporarily prohibited. The KS4BC license had to be returned to the FCC for cancellation. The fellows will try and make it again when the licensing ban is lifted. (Tnx WGDXC)

MP4 DXpedition: ZO4CT is planning a DXpedition in November. Colin will operate using the calls MP4BDK, MP4MAL, MP4QAU and MP4TAP. Operation will be mainly c.w. for three or four days, at each spot. Equipment now available is a Geloso G-209 and a DX-40U. (Tnx K2UYG)

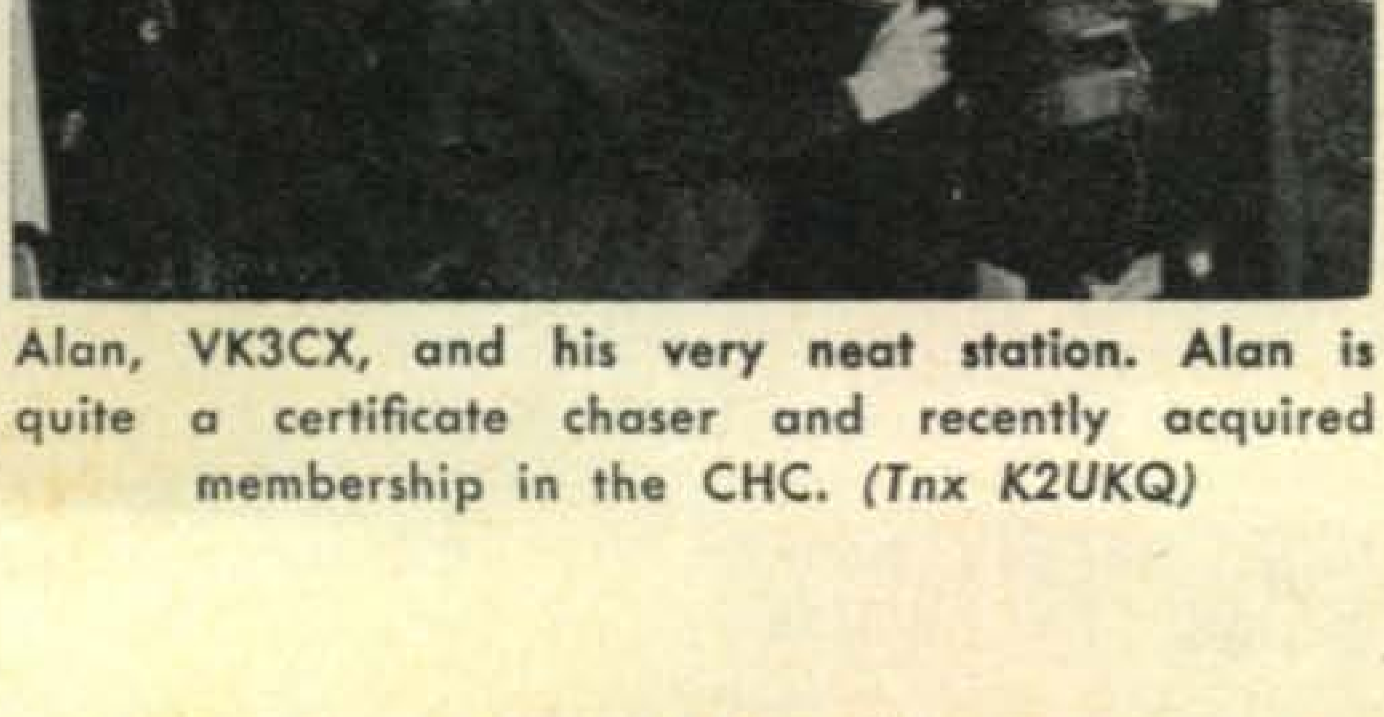
PYØ St. Peter and St. Paul Islands: DXpedition to St. Peter and St. Paul Islands this fall by PY1CK and PY4ZS is now in the making. Calls will be PYØXA and PYØZS on phone and c.w. There is no doubt that this will constitute a new country so be on the lookout. (Tnx K2UYG)

TG5 Guatemala: Father Joseph McNeill is a Maryknoll Missionary in Hushustenango, Guatemala. His call down there is TG5FJ and he is the third TG5 to be licensed. He will be active on 80 and 40 meter c.w. and possibly some 75 meter a.m. phone. The rig will be a TCS-12. K2DDK will be his QSL manager. Please use GMT on all cards.

UA1 Franz Josef Land: Leo, UA3CR, reports that UA1KED will remain active for a



Yoh, JA2JW, can always be counted on to put a signal into the states when the band is open. Here we see his complete home-brew station, with the exception of a BC-778. The exciter is used on c.w., a.m. and s.s.b. *(Tnx K2UKQ)*



Alan, VK3CX, and his very neat station. Alan is quite a certificate chaser and recently acquired membership in the CHC. *(Tnx K2UKQ)*

Lambert, ZS6IF on the right and his chief assistant on the left with a few of the local populus in between.

Lambert at the operating position of ZS6IF/9. The rig consists of Geloso, and National equipment.

two-year period. The station is on the air between 0700 and 0900 GMT and 2300 to 0100 GMT on 20 meter c.w. daily. He has asked for an s.s.b. rig and one will probably be sent to him before the end of the year. Ernst, RAEM, has the UA1KED logs for the period March 3 to April 30th. (Tnx WGDXC)

VK4 Willis Island: Crews are changed in June of each year and a three man crew is used for twelve months. They are radio men and a meteorologist. Crew changes for 1961-62 include no licensed amateurs. There is no chance of Willis activity until the next crew change in June, 1962 unless there is a DXpedition to this isolated spot, which is very unlikely as the area is highly classified.

VK9 Norfolk Island: VK9GP is on every day, conditions permitting, around 0530 GMT on 14065 kc c.w. Both his transmitter and receiver are powered by battery. Two IRC's will bring forth an air mail return for stateside delivery. (Tnx WGDXC)

VQ8 Mauritius: Fred, ex-VP5FP, is now in Mauritius and should have his license and be on the air by the time this appears in print. He will be working in the Indian Ocean area for an extended period of time aboard a Project Mercury tracking ship. While there, he expects to make several DXpeditions to various islands in the Indian Ocean as much as his off-time will permit. There will be a VQ8 going on a DXpedition to Rodriguez in the late fall or early winter and Fred has been invited to go along. Fred has W6UOU's permission to pick up the Argonaut and will be on s.s.b. depending on whether or not he can find the Argonaut and what condition it is in. W2DGW will be Fred's QSL manager for all stops. (Tnx WGDXC)

VQ8 St. Brandon: VQ8AP will not be going to St. Brandon until December or January when he will become VQ8APB for a short period. (Tnx WGDXC)

ZD8 Ascension Island: G3NRD will be returning to Ascension Island as ZD8JP in three months time. (Tnx WGDXC)

ZS9 Bechuanaland: Have just received a note from Mal, ZE3JO, (whose story about his trip to ZD6 land last year, I am sure you will remember) and he reports that ZE3JJ and he will be making another DXpedition around the end of October or the beginning of November. They are going to ZS9-land. They will have an 813 rig which will be used on c.w. only.

VK9AM Nauru Island: The following letter from VK9AM was received by K6CQM, and our thanks to him for letting it be reproduced here.

". . . The island of Nauru is a U. N. Trust Territory administered by Australia, New Zealand and Britain are joint trustees. The island is about 3 × 2 miles and has a population of 4,500. It is a coral island, but has rich phosphate deposits. About 1,500,000 tons of phosphate are exported each year. There are about 2,500 indigenous Nauruans.

"Although we are about on the Equator, the climate here is pleasant, and fairly constant. The temperature ranges from 75 degrees minimum to 86 degrees maximum most days; humidity 70% and an annual rainfall of 80 inches.

I am the Government Medical Officer on Nauru. I am 31, married with 2 daughters. I have been licensed since 1958 (VK3AMK) and have been active here since February 1961. I work 20 meter phone only. I am interested in s.s.b. and if I stay here more than one term (2 years) I may get some s.s.b. equipment. I am no good at c.w.

"All of my gear is home-brew, being from surplus equipment. The transmitter uses parallel 807's and will work all bands. Modulation uses class B 807's. The receiver is a d.c. super with plug-in coils. Antenna is a dipole on 20 meters. Other equipment built—frequency meter, 5" CRO, Grid dip Osc., Aerial coupling unit.

"I operate most nights about 0700-0330 GMT. I hope the above information may be useful to you. I would like to send you some photos of the island, but I am a lousy photographer and I haven't got any . . ." (Tnx NCDXC)

Bechuanaland

Thanks to Lambert, ZS6IF, for this short story on his ZS9 DXpedition.

After making two DXpeditions to Swaziland and Basutoland, respectively, I decided to tackle the last one to Bechuanaland and found not a ham friend willing to give it a try and endure a week of camping and DXing for the fun of it.

So we took off for Lobatsi and got the tents and antennas pitched just before dark. Operating was curtailed a bit on occasions by electric storms, which managed once to blow down the 40 meter antenna.

As in Basutoland last year the Transmit-Receive switch gave in after two days. Its replacement also started to get funny soon, so I put a couple of drops of engine oil in it, which caused a minor explosion after switching a couple of times, but after this purge it remained O.K.

I had high hopes of lots of contacts in the second weekend of the *CQ* Contest, but found that our sig was too weak amongst all the beams and strong stations and had to call CQ test so often, I got sick of it.

Notwithstanding all this, we produced 1740 QSO's with 80 countries in nine days on 7, 14 and 21 mc c.w., including such goodies as HP1, YS1, FR7, VS9MB, FY7, VK9, 6O1AA and others.

Gus, W4BPD, who was operating 6O1AA and myself had a good laugh when we had a ragchew QSO while waiting for 14 mc to open up to the U.S.A. in the early morning. I wonder if this is the first QSO between one DXpedition and another?

As on previous DXpeditions, the W's proved again to be the snappiest operators with the cleanest sigs, while the majority of the European stations still have room for lots of improvement in quality of sigs and/or operating.

The equipment used consisted of a Geloso-807 transmitter, modified double conversion HRO receiver and W9TO electronic keyer. Antenna for 20 meters was a ground-plane and for 40-15 meters a 66 ft doublet. Power was supplied by a 800 watt 110 v.a.c. generator.

QTH's and QSL Managers

CE6EZ Rolf, P. O. Box 145, Temuco.
CR7EM Box 852, Beira.
DL5CR ....via W5ADZ.
EA9CK Box 124, Tetuan, Morocco.
EL4A and EL4YL Mr. and Mrs. Ken Bale, Box 80, Monrovia, Liberia.
FA9UO ....via K4TWF.
FB8CO R. Rabaud, Aerodrome Arvanimamo, Madagascar.
FK8AW ....via W2CTN.
FM7WY G. Marie-Nelly, Direction Population, Fort-de-France, Martinique.
FY7YI ....via W3ICD.
GW2DUR ....via K2LTI.
HC8GI Box 5757, Guayaquie.
HK1QQ P. O. Box 342, Barranquilla.
HK3JK via P. O. Box 584, Bogota, Colombia.
HL9AT .... via K2EUJ.
HP2OW via P. O. Box 196, Colon, Rep. of Panama.
K8ETO/KL7 via W8FMJ.
KC6PE ....via W9SFR.
KH6EDY Navy #3080 USCG, Loran Stn., FPO, San Francisco, Calif.
KZ5LC .... via W2CTN.
LX3MA ....via DL4US.
LX3QX ....via ON4QX.
LU1ZL ....via W9LGR.
OA9C Harry, Box 193, Chiclayo, Peru.
OD5CL P. O. Box 1348, Beirut.
TG5FJ ....via K2DDK.
TG9AL ....via W2CTN.
TT8AG QSL via W3KVQ.
TU2AF Box 571, Abidjan, Ivory Coast.
VK9GP Norfold Island, Sidney, Australia.
VKØFZ W5WW, P. O. Box 214, Center, Texas.
ex-VP2LU ..via W2DGW.
ex-VP5FP ..via W2DGW.
VP7BP via Patrick AFB, Florida.
VQ8BC Arthur P. Howell, R.N., Wireless Telegraph Stn., Vacoas, Mauritius.
VK1M W/K via W1HGT. DX via GW3LQP.
VR4CB ....via W7PHO.
VR4CV Box 49, Honiara, Guadalcanal, Solomon Islands.
VS9AAC ......via W3KVQ.
YJ1MA W/K via W1HGT. DX via GW3LQP.
YJ1ZA/VK2QJ J. W. Birdsall, 23 Ebley St., Bondi Junction, Sidney, NSW, Australia.
YN3KM Jack, Box 14, Leon, Nicaragua.
YNØKVC ......via K4KCV.
YNØNWO .via W8NWO.
YV2BEN via P. O. Box 2285, Caracas.
ZD7SA QSL via W9FJY.
5A3TQ P. O. Box 263, Benghazi, Libya or RSGB.
5R8AA via P. O. Box 19, Fianrantsoa, Madagascar.
6O1LB P. O. Box 136, Modadiscio, Somali Republic.

Jim, WØIJN, has just taken this picture of his shack and Jr. Op and sent it in after processing when he received a QSL and picture of JA6ZD and his Jr. Op. Jim says that little Jimmy is usually not as quiet as he appears in this photo.

PROPAGATION

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

LAST MINUTE FORECAST

The forecast indices for the month of October, shown in the Propagation Charts following the predicted times of openings, are expected to be related to day-to-day propagation conditions in the following manner:

Forecast Indices	Above Normal Oct. 9-10, 15-16	Normal Oct. 1-2, 5-8, 11-14, 17-18, 25-29	Below Normal Oct. 3-4, 19-20, 24, 30-31	Disturbed Oct. 21-23
(1)	C	D-E	E	E
(2)	B	C-D	E	E
(3)	A	B-C	D-E	E
(4)	A	A	B-C	C-D

Where:

A—Excellent opening with strong steady signals.

B—Good opening, moderately strong signals, with some fading noise.

C—Fair opening, signals fluctuating between moderately strong and weak, with moderate fading and noise.

D—Poor opening, signals generally weak, with considerable fading, and high noise level.

E—Opening very poor, or not possible.

Generally normal shortwave propagation conditions are most likely to occur during the Phone section of the *CQ* World Wide DX Contest, 0200 GMT October 28 to 0200 GMT October 30.

CQ DX Contest Special

The 1961 *CQ* World Wide DX Contest will be held on the following dates:

Phone Section: 0200 GMT Oct. 28 to 0200 GMT Oct. 30

C.W. Section: 0200 GMT Nov. 26 to 0200 GMT Nov. 28

Following the practice of the past eleven years, this month's PROPAGATION COLUMN contains DX Propogation Charts devised specifically for the phone and c.w. contest sections. The Charts are valid from October 25 to November 30, 1961.

For more complete information and rules concerning the 1961 *CQ* World Wide DX Contest see page 76 of August's *CQ*.

Sunspot Cycle

The general level of sunspot activity during the 1961 Contest is expected to be *lower* than any similar contest period since 1954. The sunspot cycle continues to decline at a steady pace, with a smoothed sunspot number of 59 forecast for October, 1961. A sunspot prediction for November will be given in next month's column.

A monthly Zurich sunspot number of 69 was reported by the Swiss Federal Solar Observatory for July, 1961. This results in a smoothed sunspot number of 79 centered on January, 1961.

General Forecast

Barring any sudden radio storms developing during the contest periods (check the "Last Minute Forecast" appearing elsewhere in this column), the following is a band-by-band summary of general propagation conditions likely to occur:

10 Meters: Despite declining solar activity, some fairly good DX openings to many areas of the world are expected to occur during the 1961 Contest. This may, however, be the last contest for several years during which fairly frequent 10 meter openings will occur. The band should open a few hours after sunrise and remain open to one area of the world or another until the late afternoon hours. Circuits to Europe and those in a generally easterly direction are expected to peak an hour or two before noon, while those to South America and in a generally southerly direction are corecast to peak an hour or two after noon. Optimum conditions for openings to the Far East and in a generally southerly direction are forecast for the late afternoon hours.

15 Meters: Fifteen meters is expected to be the optimum band for DX during most of the daylight hours. It is forecast to open to almost all areas of the world sometime during the period from shortly after sunrise through the early evening hours.

20 Meters: Fairly good DX openings are expected to many areas of the world on this band from sunrise through the late evening hours. Conditions on 20 meters are expected to peak shortly after sunrise and again during the early evening hours.

40 Meters: This band is expected to open for DX during the late afternoon hours and remain

W6BHR

open until shortly after sunrise. During this period, openings to many areas of the world should be possible. Forty meters is expected to be the optimum band for DX openings during the late evening and early morning hours. During these periods, signals may often be exceptionally strong.

80 Meters: While generally not as good a nighttime band as 40 meters, some fairly good 80 meter openings are forecast to some areas of the world during the *CQ* W.W. DX Contest. Conditions are expected to peak on this band during the hours of darkness and the pre-dawn period.

160 Meters: DX propagation conditions improve on this band as solar activity decreases. At the present level of solar activity, DX openings to some areas of the world should be possible during the nighttime hours and the pre-dawn period. Because of low power limitations imposed on this band in many areas of the world, signals may often be weak and noisy, especially on phone.

For a more detailed circuit-by-circuit forecast please refer to the special Contest Propagation Charts which appear on the following pages.

Propagation Charts

This month's special Charts are based upon the following effective radiated powers at antenna radiation angles less than 15 degrees:

600 watts double-sideband a.m.
300 watts single-sideband a.m.
150 watts c.w.

Effective radiated power, or ERP, in this case is equivalent to the transmitter's *power output* multiplied by the *power gain* of the antenna at radiation angles less than 15 degrees, as compared to a free space dipole reference antenna. For example, a transmitter with a double-sideband a.m. power output of 150 watts, feeding an antenna with a 6 db gain (a power gain of 4 times) over a free space dipole at low radiation angles, has an ERP of 600 watts. In this example, the ERP happens to be the same value for which the special Charts have been computed. To use the Charts for other values of ERP, raise the quality figures shown in the "Last Minute Forecast" by one letter for each *increase* of 10 db in ERP and *lower* the figures by one letter for each 10 db *decrease* in ERP. For example, a c.w. effective radiated power of 1,500 watts would raise a circuit quality rating from C (fair opening) to B (good opening), etc.

Work-Plans

The propagation information contained in the Charts can be reorganized into work-plans which can serve as useful guides during contest period operations. For example, the following is a suggested work-plan for single-band 20 meter operation from the Eastern USA:

20 Meter Work-Plan from Eastern USA QTH

Time EST	*Areas To Which Openings Are Optimum*
6 AM-10 AM	Central Asia, Southeast Asia and the Far East, Pacific Islands, New Zealand and Australia, South America.
10 AM- 2 PM	Nothing Optimum.
2 PM- 6 PM	Eprope, North Africa, Eastern Mediterranean.
6 PM-10 PM	Africa, South America, Antarctica.
10 PM- 6 AM	Nothing Optimum.

The above type of work-plan shows the optimum times for piling up points on 20 meters. Perhaps more important, however, it points out the best time for catching some sleep, which in the case of the example is between 10 AM and 2 PM and 2 AM and 6 AM. Similar type work-plans can be devised for other QTH's and other operating conditions.

If a radio storm should develop during the contest periods, circuits passing through or near the auroral zones will probably become weak, fade considerably, or may even blackout entirely, depending on the severity of the storm. On the other hand, often during such storms, conditions on north-south circuits improve. If a radio storm should develop, concentrate on working east-west paths during the daylight hours, and north-south paths during the morning and evening hours. A "Last Minute Forecast" for the phone section, made at press time, appears elsewhere in this column. A similar forecast for the c.w. section will appear in next month's column.

Up to the minute propagation forecasts during the contest can be obtained from WWV broadcasts on 2.5, 5, 10, 15, 20 and 25 mc. at 19½ and 49½ minutes past each hour. WWV forecasts are intended primarily for north-Atlantic circuits, with a similar forecast for north-Pacific circuits available from WWVH, Hawaii on 5, 10 and 15 mc at 9 and 39 minutes past each hour.

The WWV and WWVH forecasts consist of a letter-number combination transmitted in slow Morse Code. The letter "N" indicates that conditions at the time of broadcast are normal; the letter "U" that conditions are presently unsettled or erratic, and the letter "W" that conditions are disturbed and a radio storm is in progress. The number indicates the average quality of propagation conditions forecast for the next few hours as follows:

1—useless	6—fair to good
2—very poor	7—good
3—poor	8—very good
4—poor to fair	9—excellent
5—fair	

Post Mortem

The *CQ* Worldwide DX Contest, because of the large amount of world wide activity it generates on the various amateur bands, offers an excellent opportunity to check the accuracy of the propagation prediction methods used in this column. As a result of information compiled during previous contests it has often been possible to improve the accuracy of these forecasts. Any comments or observations concerning the accuracy of this month's special contest forecast will be appreciated.

C.W. Section Forecast

The *Propagation Charts* appearing in this month's column are valid for both the phone and c.w. sections of the contest. Be sure to retain the Charts for use during the c.w. section. Next month's column will contain an updated sunspot number and "Last Minute Forecast," as well as Short-Skip Propagation Charts.

Sunspot Story Reprints

The Jacobs-Leinwoll report, one of the most comprehensive sunspot articles ever to appear, has been reprinted due to popular demand. This 28 page booklet contains all three parts which appeared in the April, May and June issues of *CQ*. Single copies are available for $1.00, and in quantities of 10 or more the price per copy is only 75¢. Only 1,000 copies have been printed, and the demand for them has been great. The booklet can be ordered through the *CQ* Circulation Dept., Box 55, 300 West 43rd Street, New York 36, N.Y. Orders will be filled on a first-come first-served basis while the supply lasts.

73, George, W3ASK

FORECAST INDICES

Circuits shown in the Propagation Charts are forecast to open:

(1) Less than 7 days during the forecast period.

(2) Between 8 and 13 days during the forecast period.

(3) Between 14 and 22 days during the forecast period.

(4) More than 22 days during the forecast period.

The reception quality expected during openings (signal strength, noise and fading levels), as well as the specific days on which each circuit is likely to open, are shown in the "Last Minute Forecast" appearing in the text.

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

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

The CQ World Wide DX Contest Special Propagation Charts are based upon a double-sideband AM effective radiated power of 600 watts, a single-sideband ERP of 300 watts, and a CW ERP of 150 watts, at antenna radiation angles less than fifteen degrees. The Eastern USA Chart can be used in the 1, 2, 3, 4 and 8 amateur call areas; the Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from October 25th through November 30, 1961. Propagation information contained in these Charts is derived from basic ionospheric data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

CQ WW DX CONTEST SPECIAL

NOVEMBER 1961

TIME ZONE: EST

EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western and Central Europe	8 A - 9 A (1) 9 A - 12N (2) 12N - 2 P (1)	7 A - 8 A (1) 8 A - 11A (3) 11A - 12N (4) 12N - 1 P (3) 1 P - 2 P (2) 2 P - 4 P (1)	5 A - 8 A (2) 8 A - 11A (1) 11A - 12N (2) 12N - 1 P (3) 1 P - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 7 P (1)	3 P - 5 P (1) 5 P - 6 P (2) 6 P - 11P (4) 11P - 1 A (3) 1 A - 3 A (2) 3 A - 5 A (1) 6 P - 8 P (1)* 8 P - 11P (3)* 11P - 1 A (2)* 1 A - 3 A (1)*
Eastern Europe and European USSR	8 A - 9 A (1) 9 A - 10A (2) 10A - 12N (1)	7 A - 8 A (1) 8 A - 11A (2) 11A - 1 P (1)	7 A - 3 P (1)	5 P - 3 A (1) 7 P - 1 A (1)*
North Africa and Southern Europe	7 A - 8 A (1) 8 A - 9 A (2) 9 A - 11A (3) 11A - 12N (2) 12N - 2 P (1)	6 A - 7 A (1) 7 A - 11A (2) 11A - 1 P (3) 1 P - 2 P (2) 2 P - 5 P (1)	6 A - 12N (1) 12N - 11A (2) 2 P - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 11P (1)	3 P - 5 P (1) 5 P - 6 P (2) 6 P - 7 P (3) 7 P - 11P (4) 11P - 1 A (2) 1 A - 3 A (1) 5 P - 7 P (1)* 7 P - 9 P (2)* 9 P - 11P (3)* 11P - 12M (2)* 12M - 1 A (1)*
South Africa	7 A - 9 A (1) 9 A - 11A (2) 11A - 2 P (3) 2 P - 3 P (2) 3 P - 5 P (1)	6 A - 10A (1) 10A - 12N (2) 12N - 2 P (3) 2 P - 4 P (4) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 7 P (1)	12N - 3 P (1) 3 P - 5 P (2) 5 P - 7 P (3) 7 P - 9 P (2) 9 P - 1 A (1)	5 P - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (1) 6 P - 9 P (1)*
Eastern Mediterranean	8 A - 12N (1)	7 A - 9 A (1) 9 A - 11A (2) 11A - 2 P (1)	7 A - 1 P (1) 1 P - 6 P (2) 6 P - 9 P (1)	6 P - 12M (1) 8 P - 11P (1)*
Central Asia	NIL	7 A - 10A (1) 6 P - 8 P (1)	7 A - 9 A (2) 9 A - 11A (1) 6 P - 10P (1)	5 P - 8 P (1) 5 A - 7 A (1)
Southeast Asia	11A - 3 P (1) 6 P - 8 P (1)	9 A - 11A (2) 11A - 1 P (1) 6 P - 8 P (1)	7 A - 9 A (2) 9 A - 11A (1) 6 P - 9 P (1)	NIL
Far East	5 P - 7 P (1)	5 P - 6 P (1) 6 P - 7 P (2) 7 P - 9 P (1)	7 A - 9 A (1) 5 P - 11P (1)	5 A - 9 A (1)
Pacific Islands and New Zealand	12N - 3 P (1) 3 P - 6 P (2) 6 P - 8 P (1)	7 A - 9 A (2) 9 A - 5 P (1) 5 P - 8 P (2) 8 P - 10P (1)	6 P - 9 P (1) 9 P - 3 A (2) 3 A - 7 A (1) 7 A - 8 A (2) 8 A - 9 A (3) 9 A - 11A (2) 11A - 2 P (1)	12M - 3 A (1) 3 A - 7 A (3) 7 A - 9 A (1) 3 A - 4 A (1)* 4 A - 7 A (2)* 7 A - 8 A (1)*
Australia	9 A - 4 P (1) 4 P - 7 P (2) 7 P - 8 P (1)	8 A - 9 A (1) 9 A - 12N (2) 12N - 5 P (1) 5 P - 8 P (2) 8 P - 9 P (1)	6 P - 1 A (1) 1 A - 5 A (2) 5 A - 8 A (1) 8 A - 9 A (2) 9 A - 3 P (1)	4 A - 6 A (1) 6 A - 8 A (2) 8 A - 9 A (1) 6 A - 8 A (1)*
South America	7 A - 8 A (1) 8 A - 10A (2) 10A - 1 P (3) 1 P - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 7 P (1)	6 A - 7 A (1) 7 A - 10A (3) 10A - 2 P (2) 2 P - 4 P (3) 4 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 1 A (1)	2 P - 4 P (2) 4 P - 6 P (3) 6 P - 10P (4) 10P - 1 A (3) 1 A - 3 A (2) 3 A - 6 A (1) 6 A - 8 A (2) 8 A - 2 P (1)	6 P - 7 P (1) 7 P - 8 P (2) 8 P - 3 A (3) 3 A - 5 A (1) 7 P - 8 P (1)* 8 P - 3 A (2)* 3 A - 4 A (1)*
McMurdo Sound, Antarctica	7 A - 10A (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 5 P (1) 5 P - 8 P (2) 8 P - 10P (1)	4 P - 7 P (1) 7 P - 11P (2) 11P - 2 A (3) 2 A - 3 A (2) 3 A - 9 A (1)	12M - 5 A (1)

CENTRAL USA TO:

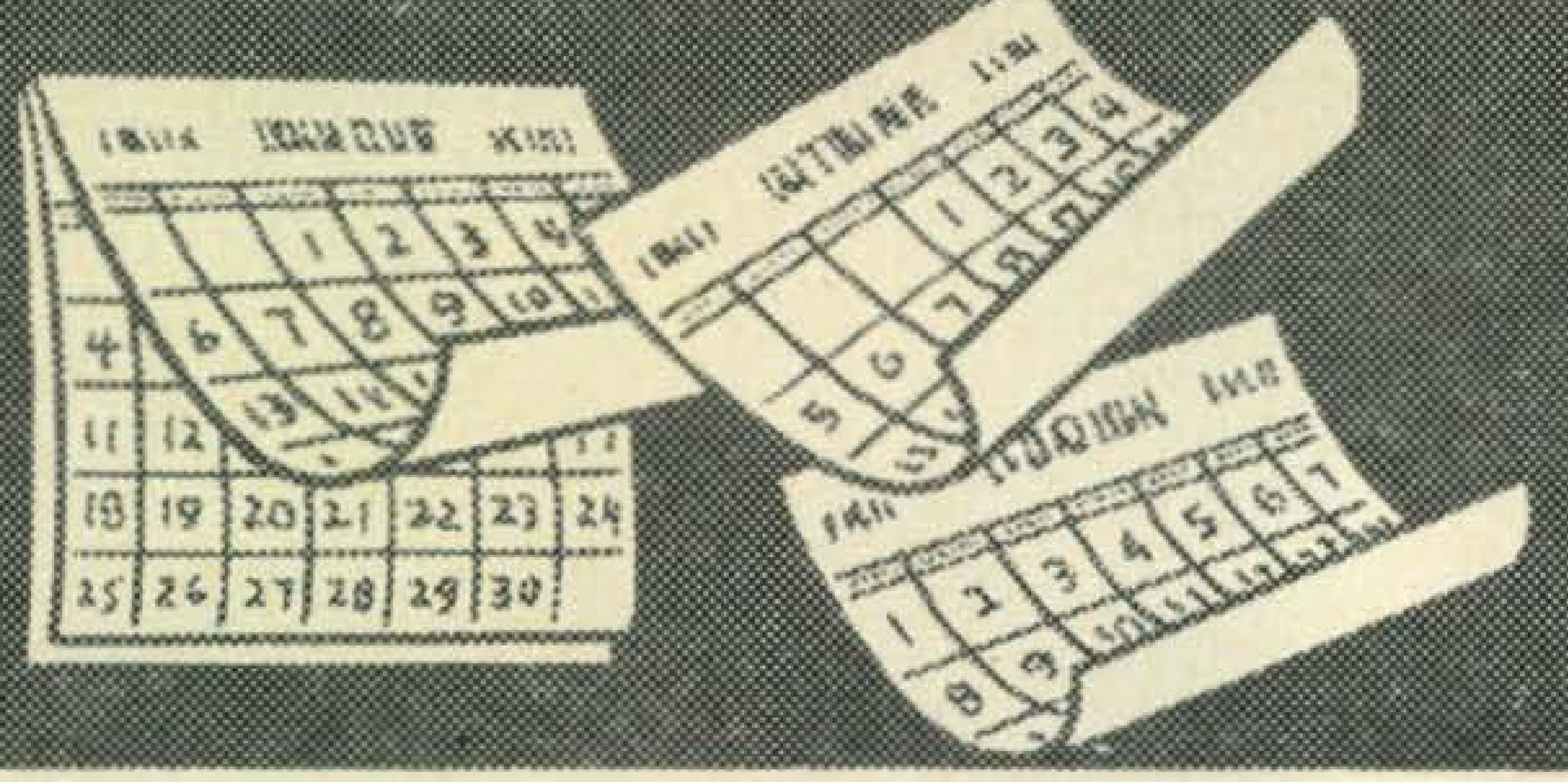
TIME ZONES: CST & MST

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western and Central Europe	8 A - 9 A (1) 9 A - 10A (2) 10A - 12N (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 12N (3) 12N - 1 P (2) 1 P - 3 P (1)	6 A - 12N (1) 12N - 3 P (2) 3 P - 5 P (1)	4 P - 6 P (1) 6 P - 1 A (2) 1 A - 3 A (1) 8 P - 1 A (1)*
Eastern Europe and European USSR	8 A - 10A (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 12N (1)	6 A - 1 P (1)	6 P - 1 A (1) 8 P - 11P (1)*
North Africa and Southern Europe	7 A - 8 A (1) 8 A - 11A (2) 11A - 1 P (1)	6 A - 8 A (1) 8 A - 11A (3) 11A - 12N (2) 12N - 3 P (1)	6 A - 8 A (2) 8 A - 11A (1) 11A - 12N (2) 12N - 1 P (3) 1 P - 5 P (2) 5 P - 9 P (1)	3 P - 5 P (1) 5 P - 6 P (2) 6 P - 10P (3) 10P - 11P (2) 11P - 2 A (1) 5 P - 7 P (1)* 7 P - 10P (2)* 10P - 12M(1)*
Central Africa	7 A - 9 A (1) 9 A - 11A (2) 11A - 2 P (3) 2 P - 3 P (2) 3 P - 6 P (1)	6 A - 10A (1) 10A - 12N (2) 12N - 2 P (3) 2 P - 4 P (4) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 8 P (1)	12N - 3 P (1) 3 P - 5 P (2) 5 P - 7 P (3) 7 P - 10P (2) 10P - 2 A (1)	5 P - 6 P (1) 6 P - 8 P (2) 8 P - 10P (1) 6 P - 10P (1)*
Eastern Mediterranean	8 A - 10A (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 12N (1)	7 A - 3 P (1)	6 P - 11P (1)
Central Asia	NIL	7 A - 10A (1) 6 P - 8 P (1)	7 A - 9 A (2) 9 A - 11A (1) 6 P - 7 P (1) 7 P - 8 P (2) 8 P - 10P (1)	6 A - 8 A (1) 5 P - 7 P (1)
Southeast Asia	10A - 1 P (1) 5 P - 9 P (1)	9 A - 10A (1) 10A - 1 P (2) 1 P - 5 P (1) 5 P - 7 P (2) 7 P - 11P (1)	7 A - 9 A (2) 9 A - 12N (1) 9 P - 12M (1)	6 A - 8 A (1)
Far East	4 P - 7 P (1)	3 P - 4 P (1) 4 P - 5 P (2) 5 P - 7 P (3) 7 P - 8 P (2) 8 P - 9 P (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 11A (1) 4 P - 8 P (1) 8 P - 10P (2) 10P - 11P (1)	3 A - 9 A (1)
Pacific Islands and New Zealand	10A - 1 P (1) 1 P - 5 P (2) 5 P - 8 P (1)	7 A - 10A (1) 10A - 1 P (2) 1 P - 5 P (1) 5 P - 6 P (2) 6 P - 7 P (3) 7 P - 8 P (2) 8 P - 11P (1)	5 P - 7 P (1) 7 P - 9 P (2) 9 P - 12M(3) 12M- 4 A (2) 4 A - 6 A (1) 6 A - 8 A (2) 8 A - 1 P (1)	11P - 1 A (1) 1 A - 6 A (3) 6 A - 7 A (2) 7 A - 8 A (1) 12M- 1 A (1)* 1 A - 6 A (2)* 6 A - 7 A (1)*
Australia	8 A - 3 P (1) 3 P - 8 P (2) 8 P - 9 P (1)	7 A - 8 A (1) 8 A - 11A (2) 11A - 2 P (1) 2 P - 7 P (2) 7 P - 10P (1)	2 A - 7 A (1) 7 A - 8 A (2) 8 A - 9 A (3) 9 A - 11A (2) 11A - 4 P (1) 8 P - 12M(1)	3 A - 4 A (1) 4 A - 7 A (3) 7 A - 8 A (2) 8 A - 9 A (1) 4 A - 5 A (1)* 5 A - 7 A (2)* 7 A - 8 A (1)*
South America	6 A - 8 A (1) 8 A - 10A (2) 10A - 1 P (3) 1 P - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 7 P (1)	5 A - 7 A (1) 7 A - 10A (3) 10A - 1 P (2) 1 P - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 12M(1)	2 P - 4 P (2) 4 P - 5 P (3) 5 P - 9 P (4) 9 P - 12M(3) 12M- 2 A (2) 2 A - 6 A (1) 6 A - 8 A (2) 8 A - 2 P (1)	6 P - 7 P (1) 7 P - 8 P (2) 8 P - 3 A (3) 3 A - 5 A (1) 7 P - 8 P (1)* 8 P - 3 A (2)* 3 A - 4 A (1)*
McMurdo Sound, Antarctica	6 A - 10A (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 3 P (1) 3 P - 6 P (2) 6 P - 10P (1)	4 P - 7 P (1) 7 P - 11P (2) 11P - 2 A (3) 2 A - 4 A (2) 4 A - 5 A (1) 5 A - 8 A (2) 8 A - 11A (1)	12M - 6 A (1)

WESTERN USA TO:

TIME ZONE: PST

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western & Central Europe	7 A - 9 A (1)	6 A - 7 A (1) 7 A - 10A (2) 10A - 1 P (1)	2 A - 7 A (1) 7 A - 11A (2) 11A - 3 P (1)	5 P - 1 A (1) 7 P - 11P (1)*
Eastern Europe and European USSR	NIL	7 A - 9 A (1)	5 P - 12M (1) 6 A - 7 A (1) 7 A - 9 A (2) 9 A - 11A (1)	6 P - 12M (1)
Southern Europe and North Africa	7 A - 10A (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 10A (3) 10A - 11A (2) 11A - 1 P (1)	6 A - 10A (1) 10A - 11A (2) 11A - 12N (3) 12N - 1 P (2) 1 P - 4 P (1) 10P - 1 A (1)	4 P - 6 P (1) 6 P - 9 P (2) 9 P - 12M(1) 6 P - 10P (1)*
South Africa	6 A - 8 A (1) 8 A - 10A (2) 10A - 12N (3) 12N - 1 P (2) 1 P - 3 P (1)	6 A - 10A (1) 10A - 12N (2) 12N - 3 P (3) 3 P - 5 P (2) 5 P - 7 P (1)	11A - 1 P (1) 1 P - 3 P (2) 3 P - 6 P (3) 6 P - 10P (2) 10P - 2 A (1)	5 P - 8 P (1) 6 P - 7 P (1)*
Eastern Mediterranean	NIL	7 A - 10A (1)	6 A - 7 A (1) 7 A - 10A (2) 10A - 1 P (1)	NIL
Central Asia	NIL	5 P - 7 P (1)	8 A - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (1)	6 A - 9 A (1)
Southeast Asia	9 A - 12N (1) 3 P - 4 P (1) 4 P - 5 P (2) 5 P - 7 P (1)	8 A - 9 A (1) 9 A - 11A (3) 11A - 12N (2) 12N - 3 P (1) 3 P - 6 P (2) 6 P - 9 P (1)	8 A - 11A (2) 11A - 1 P (1) 8 P - 11P (1)	3 A - 6 A (2) 6 A - 8 A (1) 4 A - 6 A (1)*
Far East	1 P - 2 P (1) 2 P - 5 P (2) 5 P - 7 P (1)	12N - 2 P (1) 2 P - 5 P (3) 5 P - 6 P (4) 6 P - 7 P (2) 7 P - 9 P (1)	8 A - 10A (2) 10A - 12N (1) 12N - 1 P (2) 1 P - 6 P (1) 6 P - 7 P (2) 7 P - 8 P (3) 8 P - 9 P (2) 9 P - 10P (1)	10P - 1 A (1) 1 A - 5 A (3) 5 A - 7 A (2) 7 A - 9 A (1) 12M- 2 A (1)* 2 A - 5 A (2)* 5 A - 7 A (1)*
Pacific Islands	9 A - 10A (1) 10A - 1 P (2) 1 P - 4 P (1) 4 P - 6 P (3) 6 P - 7 P (2) 7 P - 8 P (1)	8 A - 9 A (1) 9 A - 12N (3) 12N - 4 P (2) 4 P - 6 P (3) 6 P - 8 P (4) 8 P - 9 P (3) 9 P - 10P (2) 10P - 12M(1)	6 A - 7 A (1) 7 A - 9 A (3) 9 A - 11A (2) 11A - 5 P (1) 5 P - 7 P (2) 7 P - 8 P (3) 8 P - 10P (4) 10P - 12M(3) 12M - 2 A (2) 2 A - 4 A (1)	9 P - 10P (1) 10P - 6 A (3) 6 A - 8 A (1) 10P - 11P (1)* 11P - 5 A (2)* 5 A - 6 A (1)*
Australia	8 A - 12N (1) 12N - 5 P (2) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 8 P (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 11A (1) 11A - 1 P (2) 1 P - 6 P (1) 6 P - 8 P (2) 8 P - 10P (1)	7 P - 9 P (1) 9 P - 3 A (2) 3 A - 7 A (1) 7 A - 8 A (2) 8 A - 9 A (3) 9 A - 11A (2) 11A - 1 P (1)	2 A - 4 A (2) 4 A - 6 A (3) 6 A - 7 A (2) 7 A - 9 A (1) 3 A - 4 A (1)* 4 A - 6 A (2)* 6 A - 7 A (1)*
New Zealand	9 A - 11A (1) 11A - 4 P (2) 4 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	8 A - 9 A (1) 9 A - 10A (3) 10A - 12N (2) 12N - 4 P (1) 4 P - 6 P (2) 6 P - 7 P (4) 7 P - 8 P (3) 8 P - 9 P (2) 9 P - 11P (1)	5 P - 7 P (1) 7 P - 9 P (2) 9 P - 11P (4) 11P - 1 A (3) 1 A - 3 A (2) 3 A - 7 A (1) 7 A - 9 A (2) 9 A - 12N (1)	10P - 12M (1) 12M- 4 A (3) 4 A - 6 A (2) 6 A - 7 A (1) 11P - 12M (1)* 12M- 4 A (2)* 4 A - 6 A (1)*
South America	5 A - 7 A (1) 7 A - 9 A (3) 9 A - 12N (2) 12N - 3 P (3) 3 P - 4 P (2) 4 P - 6 P (1)	5 A - 6 A (1) 6 A - 8 A (3) 8 A - 12N (2) 12N - 2 P (3) 2 P - 4 P (4) 4 P - 6 P (2) 6 P - 8 P (1)	2 P - 4 P (2) 4 P - 8 P (4) 8 P - 12M(3) 12M- 2 A (2) 2 A - 5 A (1) 5 A - 7 A (2) 7 A - 2 P (1)	6 P - 8 P (1) 8 P - 1 A (3) 1 A - 3 A (1) 7 P - 8 P (1)* 8 P - 1 A (2)* 1 A - 2 A (1)*
McMurdo Sound, Antarctica	7 A - 10A (1)	6 A - 7 A (1) 7 A - 10A (2) 10A - 4 P (1) 4 P - 7 P (2) 7 P - 9 P (1)	5 P - 7 P (1) 7 P - 9 P (2) 9 P - 2 A (3) 2 A - 3 A (2) 3 A - 6 A (1) 6 A - 8 A (2) 8 A - 12N (1)	11P - 5 A (1)



CONTEST CALENDAR

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

Calendar of Events

Sept. 30 — Oct. 1	VK/ZL Phone
October 7— 8	VK/ZL C.W.
October 14—15	ARRL CD C.W.
October 21—22	ARRL CD Phone
October 25—26	YLRL CW Party
October 28—30	*CQ* WW DX Phone
November 4— 5	NYC Party
November 8— 9	YLRL Phone Party
November 11—13	ARRL SS
November 18—20	ARRL SS
November 25—27	*CQ* WW DX C.W.
December 2— 3	RSGB 21/28 Phone
December 2— 3	OK DX C.W.
December 9—10	Kansas QSO Party

1961 CQ World Wide DX Contest

PHONE

Starts: 0200 GMT Saturday, October 28th.
9:00 PM EST Friday, October 27th.
6:00 PM PST Friday, October 27th.

Ends: 0200 GMT Monday, October 30th.
9:00 PM EST Sunday, October 29th.
6:00 PM PST Sunday October 29th.

C.W.

Starts: 0200 GMT Saturday, November 25th.
9:00 PM EST Friday, November 24th.
6:00 PM PST Friday, November 24th.

Ends: 0200 GMT Monday, November 27th.
9:00 PM EST Sunday, November 26th.
6:00 PM PST Sunday November 26th.

VK/ZL

Phone

Starts: 1000 GMT Saturday, September 30th.
Ends: 1000 GMT Sunday, October 1st.

C.W.

Starts: 1000 GMT Saturday, October 7th.
Ends: 1000 GMT Sunday, October 8th

This popular contest from "Down Under" is sponsored by the Wireless Institute of Australia this year. A complete rundown on the rules appeared in last month's CALENDAR.

Primarily it's the world working the VK/ZLs, one point per contact and each VK/ZL district worked on each band also counts one point for your multiplier.

Your log must be postmarked no later than one month after the close of the contest and goes to: The W.I.A., Federal Contest Committee, G.P.O. Box 851J, Hobart, Tasmania, Australia.

YLRL

C.W.

Starts: 1200 EST Wednesday, October 25th.
Ends: 1800 EST Thursday, October 26th.

Phone

Starts: 1200 EST Wednesday, November 8th.
Ends: 1800 EST Thursday, November 9th.

Louisa Sando, W5RZJ tells you all about the 22nd annual YLRL Anniversary Party in her column this month. Say, I didn't know the YLs had been around that long. How about that!

CQ W.W. DX

Phone

Starts: 0200 GMT Saturday, October 28th.
Ends: 0200 GMT Monday, October 30th.

C.W.

Starts: 0200 GMT Saturday, November 25th.
Ends: 0200 GMT Monday, November 27th.

Can't imagine anyone not knowing the rules of our contest. But if you are a bit hazy on some of the minor details you can find them all in the August *CQ*.

On occasion we have received suggestions for some modifications in the rules. These generally are from areas that feel that they are at a disadvantage because of their geographical location.

There is no question that countries in Asia and Africa boarding the Mediterrean area have a distinct advantage with all those three pointers and multipliers to the north and northwest of them. Especially now with the increasing activity on the lower bands.

However, a modification of rules for one area would bring similar requests from other areas and in no time it would be a colossal mess. True, we do have awards for world wide supremacy but the basic awards are for competition in your immediate area only. The many categories and divisions, especially the single band feature, make this contest most attractive to all contested minded operators. We still think we have the best and most popular DX contest in the world and no rule changes are anticipated at this time.

Have you ever stopped to consider the many available awards? There is still time to get the necessary forms if you hurry. A large self-addressed stamped envelope to *CQ*, 300 West 43rd Street, New York 36, N.Y. will do the trick.

RSGB 21/28

Starts: 0700 GMT Saturday, December 2nd.
Ends: 1900 GMT Sunday, December 3rd.

This is a phone contest only and operation is confined to the 21 and 28 mc bands. Work stations in the British Isles only of course. (G, GB, GC, GD, GI, GM and GW).

1. Serial numbers of 5 figures, RS report plus the usual progressive 3 figures starting with 001.
2. Each contact is worth 5 points.
3. An additional bonus of 50 points may be claimed for the first contact with each British Isles country-numeral prefix on each band. G2, GC2, GB, GM6 and etc. A possible 37 on each band.
4. A further 50 bonus points is available for each additional ten stations worked, regardless of the band.
5. Log sheets should be columned and show in this order: Date/time in GMT, station worked, serial number sent and received, band, blank column, bonus points and points claimed. If you don't want to go to all that trouble, a large addressed envelope plus an IRC will get you a supply from the RSGB.
6. Each entry should also include a summary sheet with name and address (*block letters*) and other pertinent information. And don't forget the usual signed declaration that all rules have been observed.
7. Certificates will be awarded to the leading station in each country and each call area in the following: VE, VK, W/K, ZL & ZS.
8. There is also an SWL section and rules are same as above except that the bonus points listed under Rule 3 is only 20 points. CQ or Test calls will not count. The station logged must actually be working someone and the call and report must also be listed.
9. Logs go to the RSGB Contest Committee, New Ruskin House, Little Russell Street, London W.C.1, England. Postmark deadline is December 18th.

The presentation of the 1960 Trophies donated by K2IEG for the highest phone score on a single band (14 mc) and by W7KVU for the highest c.w. score on a single band (14 mc) was quite a gala affair aboard the *SS Rio Jachal*. The presentation to Ricardo Sierra Jr. CX2CO, was covered not only by the newspapers but by radio and TV as well. Reading L to R Newspaper reporter, CX1CA, CX1CE, LUØAC/mm (making the presentation), LU4BW, CX4AW, the guest of honor, CX2CO, Capt. of the Ship and the Director of Radiocommunications.

NYC Party

Starts: 2300 GMT Saturday, November 4th.
Ends: 2300 GMT Sunday, November 5th.

Here's a new one sponsored by the Bronx High School of Science who took advantage of the open date in our CONTEST CALENDAR. This is an invitation to contact stations in New York City and an opportunity to gain some new awards.

Scoring is simple. One member of the QSO must be a NYC station. Each contact counts one point and the total number of points are to be multiplied by 5 for each new borough worked, five in all. They are Bronx, Brooklyn, Manhattan, Queens and Staten Island.

Suggested frequencies: 3550, 7025, 14,100, 21,075 and 28,100 on c.w. On phone try the middle of each phone band. Also look for some activity on 2 and 6 meters. Logs go to: The Bronx High School of Science, Att: WA2BQK, 222 East 202nd Street, New York 58, N.Y.

The following awards are available: WNYC Award for working seven (7) stations in each of the boroughs of the Bronx, Brooklyn, Queens, Manhattan and two (2) in Staten Island; WAB Award for working twenty (20) stations in the Bronx; WAM Award for working ten (10) stations in Manhattan.

A log of stations worked, dates, modes and boroughs is required along with a signed statement from two licensed amateurs who have inspected the QSLs necessary for the above awards. Otherwise the cards will be required.

The WAB award is free but a self addressed samped envelope would be appreciated. However there is a $1.00 fee for the WNYC and WAM awards. Send your WNYC and WAB applications to Kenneth Schaffer, WA2BQK c/o The Bronx H.S. of Science. The WAM applications go to: Richard Factor WA2IKL, 115 Central Park West, New York, N.Y.

There you are you "certificate chasers," there's your opportunity to pick up three over a week-end.

[*Continued on page 110*]

VHF

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

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

OSCAR

It is expected that OSCAR I will be airborne sometime this month, operating on 145,000 mc. Should the launching be successful, PLEASE keep 145 mc clear and under no circumstances call the vehicle. See this month's SPACE section on page 77.

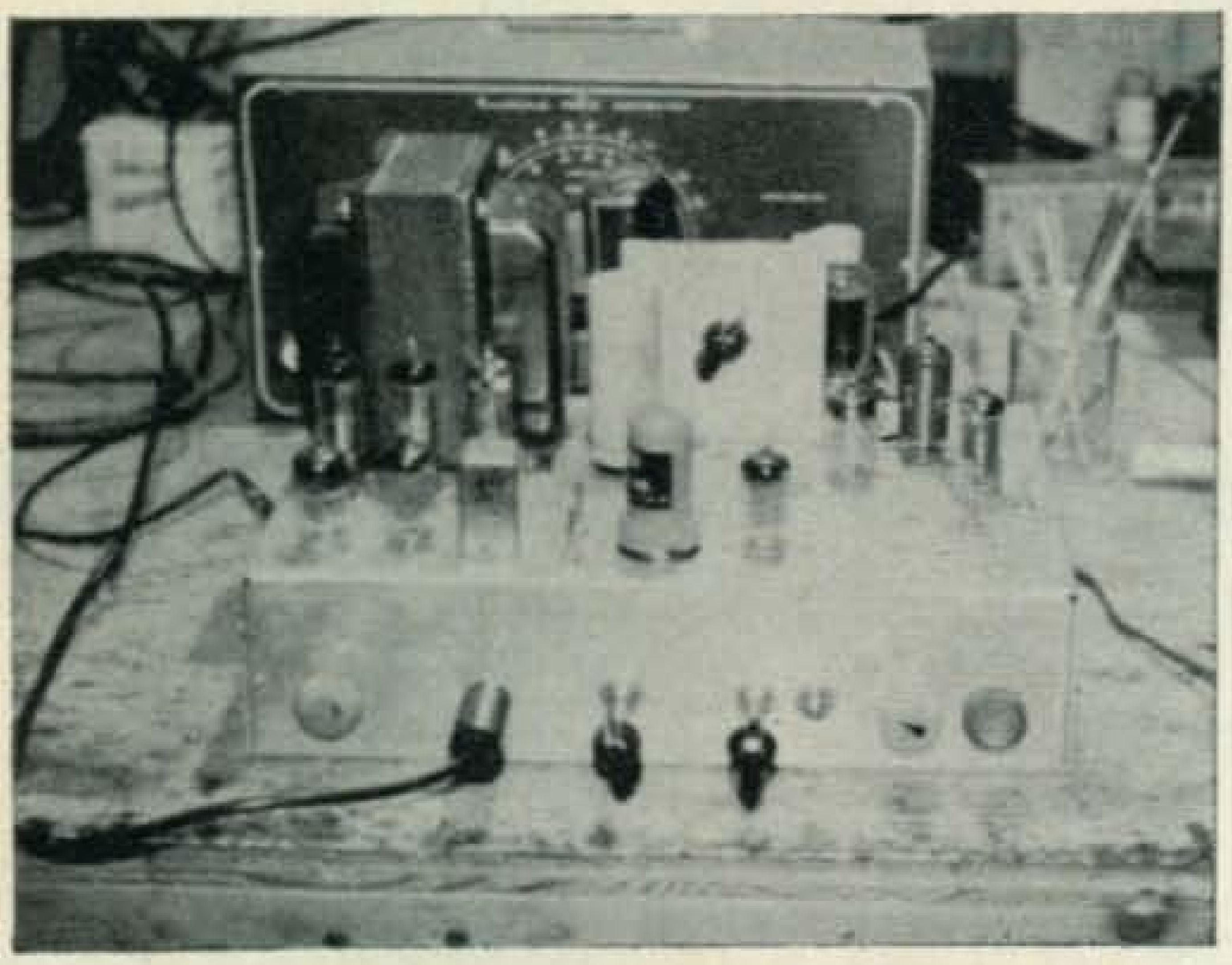
This month marks the ending of our first year at *CQ* and the beginning of a second. I hope you have enjoyed reading the 'ole V.H.F. COLUMN the last eleven months. From your many letters and enthusiastic contributions we assume that the column is at least satisfactory. It has been a great honor to serve you over this last year and hope to be in this capacity for many more to come.

More V.H.F. S.S.B.

Our discussion in the July issue re: s.s.b. seemed to have provoked a great amount of interest. One letter, that from Fred B. Cupp, K8AOE, of 3810 East 365th Street, Willoughby, Ohio, was unusually interesting and well worth reprinting . . .

"This letter is in response to your comments on sideband in the July V.H.F. COLUMN. To my knowledge, there are only about ten stations on sideband in the Cleveland area.

"I have been on for several months with a homebrew double sideband rig (2E26's). Signal reports are all good although only one contact has been made so far on a band opening; W4VXZ. The rig also has provision to shift to a.m. screen modulation at 12 watts which is handy for the multitude of stations unable to copy sideband.



Cheap and easy simple 50 mc s.s.b. rig by Bill, K9SFX, at Columbia, Ill. (Circuit on this soon)

"With the help of K8MSB, a printed circuit version of this rig, with vox and tone oscillator has been constructed on a 5″ × 7″ board, and by the time you receive this, at least half a dozen members of the East Shore V.H.F. club will be bashing out their carbon copies.

"Now before you dyed-in-the-wool single sidebanders get wound up, let me point out the advantages of d.s.b. for v.h.f. use. Although it has 3 db less punch for a given input power, it is about 20 db simpler to construct and tune up. At any rate, how else can you put out 25 watt p.e.p. with only 6 tubes (including speech and vox?). The clincher to this point is that on about half the contacts, the listening station doesn't even realize that the other sideband is still present.

"Future plans call for trying the rigs mobile on the club frequency 52.008 mc, and, of course, plans are on paper for a companion receiver." *How about all the details on these units, Fred?*

"Finally, let me pose a question. Why must the serious sidebanders hug the bottom 15 kc of the phone portion of 6 meters? I have tried and proven that a sideband rig is effective all the way up to 54 mc. I agree that the sidebanders should stick to a common frequency, but why pick one so close to the pink ticket line? The sidebanders started at the upper end of 80. 40, and 20, so why not pick a spot way up in the 6 meter band? Anyone for a sked at 53.28 mc d.s.b.?"

Another letter, from Bob Heil, K9EID, of 402 Border Street, Marissa, Illinois, who takes the other side of the story . . .

"I wonder if you could mention keeping a.m. out of the 50.1 to 50.12 s.s.b. segment. Many of the s.s.b. contacts are made with difficulty because the a.m. stations will not stay above 50.12. If we can get the ball rolling, maybe we could keep s.s.b. on the low end and make it a lot nicer for everyone."

Syracuse V.H.F. Roundup

It's that time again! That's right—Time for the 7th Annual Syracuse V.H.F. Roundup. The date is October 7, 1961 at the Three Rivers

Inn, just north of Syracuse. We highly recommend this gathering for all v.h.f. men in the country. Don't miss it. It is not only the biggest but the best. See December 1960 V.H.F. COLUMN for details on last years affair. Speakers, awards, floorshow, steak dinner, and many big prizes. Write now (it's getting late) to K2TXX, 233 Ester Street, Minoa, New York. Make it a point to be there; I will.

FP8 DXpedition

Charlie O'Brien, W2EQS, will once again be at St. Pierre starting the last week in September. FP8AS will be on 6 with a New Ranger II; eleven element rotary; 75A-4 and Filter-King converter. Look for the FP8AS on c. w. on the low end.

S.S.B. Directory

If you haven't already done so, by all means drop a line to K2PCG if you work s.s.b. He'd like to know the time you usually get on the air, and, if on a net, its starting time. Also give your v.h.f. band, frequency, power, etc. The address is Phil Gural, K2PCG, 204 East Northfield Road, Livingston, New Jersey. You will receive a copy of the directory when it is published.

F.M. Net Directory

Listed below is the most recent compilation of wide-band f.m. net locations throughout the nation. Asterisk indicates "special purpose" nets, *i.e.* CD, local emergency, etc. Fifteen kc deviation is almost universally used. The authors/editors of the *F.M. Net Directory* (K4ZAD, W4DYE and W4PDX) naturally cannot accept responsibility for the accuracy of the listed information. However, in the interest of completeness, they welcome any corrections or additions. The printing of the *Directory* is courtesy of K9DOF and copies are available from K4ZAD upon receipt of a s.a.s.e. (large envelope).

Alabama		
Birmingham	145.35	
California		
Bakersfield	146.06	W6NCG
Bakersfield	146.90	W6NCG
Fresno	146.06	W6NAS
*Los Angeles	146.60	K6TFQ
*Los Angeles	146.70	K6RTD
Los Angeles	146.76	W6IWY
*Los Angeles	146.86	K6GHJ
*Los Angeles	147.30	W9FBP/6
Ontario	146.76	W6NJE
*Palo Alto	145.45	K6GID
San Diego	146.76	
*Terrence	147.12	K6CUK
Colorado		
Longmont	145.20	
Connecticut		
Old Greenwich	52.525	K1CMT
Florida		
St. Petersburg	146.85	K4YOQ
Tampa	146.90	K4YOQ
Tampa	147.25	K4YOQ
Idaho		
Boise	145.44	W7OL
Boise	146.76	W7CJM
Illinois		
Chicago	52.525	W9QBH
Chicago	146.94	K9OJV
*Chicago	147.06	K9OJV
Chicago	147.18	K9OJV
Chicago	147.30	K9OJV
Chicago	147.40	K9OJV
Chicago	147.50	W9LIZ
*Chicago	147.60	K9OJV
*Chicago	147.70	K9OJV
Chicago Suburbs	147.24	K9OJV
Champaign	147.30	
*Dupage	53.600	
Homer	52.525	W9EIX
Lake County	147.18	K9OJV
*Quincey	146.90	K9KCY
Indiana		
Angola	52.525	K1CMT/9
*Angola	52.640	W4CTU/9
Central Indiana	147.30	W9EHZ
Charlestown	52.525	K9ARL
Elkhart	52.525	K9DOF
Elkhart	52.600	K9DOF
Elkhart	146.90	K9RKO
Elkhart	147.24	K9DOF
Elkhart	147.30	K9DOF
*Fort Wayne	52.700	
Fort Wayne	52.525	K9UMQ
Indianapolis	52.525	K9OXL
Indianapolis	52.600	K9UMN
Jasper	52.525	K9LXJ
Lafayette	52.600	K9KRE
Lafayette	52.525	K9KRE
Lebanon	52.525	K9MGV
Ligonier	52.525	K9CFP
Ligonier	52.600	W9FSA
Ligonier	147.24	W9FSA
Marion	52.525	
N.W. Ind.	147.30	W9EHZ
Putnamville	52.525	W9BJJ
Seymour	52.525	
South Bend	52.525	W9UB
Terre Haute	52.525	
Wabash	52.525	W9QUC
Iowa		
Cedar Rapids	52.525	KØDHF
Cedar Rapids	147.50	
Des Moines	147.50	WØQNQ
*Des Moines	147.30	WØQNQ
Kentucky		
Louisville	147.30	W4BAZ
Kansas		
*Kansas City	147.26	
Topeka	147.32	WØKOL
Louisiana		
Baton Rouge	147.30	K5DAC
Maryland		
Baltimore	145.32	
*Anne Arundel County	147.30	W3NAE
Anne Arundel County	146.94	W3NAE
Michigan		
Battle Creek	52.525	K8QFO
Benton Harbor	52.525	K8PNH
Birmingham	52.525	W8QFX
Detroit	145.20	W8WFA
Detroit	147.30	W8CLL
Detroit	147.50	W8HP
Detroit	146.97	W8BJZ
Holland	146.94	W8IQF
Jackson	52.525	K8JKK
Kalamazoo	52.525	K8AHX
*Kalamazoo	52.640	K8AHX
*Kalamazoo	146.70	K8AHX
Niles	52.525	K8GMY
Minnesota		
Minneapolis	52.600	KØWMR
Minneapolis	53.640	KØGGT
Missouri		
St. Louis	52.525	KØYRW
*St. Louis	147.24	
St. Louis	147.30	
Warrensburg	147.24	WØJUR
New Hampshire		
Manchester	52.525	K1API
Nashua	52.525	K1QLV
New York		
Auburn	53.480	K2AVJ
Manhassett	53.750	W2GHR
Manhassett	52.640	W2GHR
Sidney	52.525	W9BBX/2
Syracuse	52.525	K2BZC
Spracuse	52.640	K2KZL
*Syracuse	53.440	K2JIM
Syracuse	53.750	K2KZL
Syracuse	145.26	W2AMP
Troy	53.750	W2KLZ
Troy	52.640	W2KLZ
Utica	145.59	
Westchester Co.	147.06	K2AVP
North Carolina		
Burlington	145.26	W4SWB
Lenoir	53.61	W4WID
Riedsville	145.26	K4BYW

Ohio

Cleveland	52.525	W8AZO
*Cleveland	53.490	W8ITR
Cleveland	53.580	W8ITR
Cleveland	145.26	W8BUQ
Cleveland	145.68	W8PVQ
Cleveland	147.24	W8ITR
Cleveland	147.30	W8GMS
Columbus	145.26	W8OQT
Columbus	147.30	W8RSY
Freemont	52.525	K8OSH
Hicksville	52.525	K8BUH
Kenton	52.525	W8LQW
Newark	145.26	W8QOQ
*Ottawa	145.35	K8MIN
Ottawa	145.26	K8MIN
Northeast Ohio	53.620	W8EIL
*Toledo	145.35	K8DPE
Toledo	146.90	K8DPE
Westerville	145.20	

Oregon

Coquille	146.76	
*Portland	146.76	W7KCK
Portland	53.720	W7VS
Portland	147.17	W7VS

Pennsylvania

Catawissa	52.525	W3MYV
*Pittsburgh	147.18	W3UGV

Tennessee

*Memphis	145.35	W4WBK
Memphis	145.50	W4WBK

Texas

Dallas	52.95	K5VCG
Dallas	146.97	K5MYG
San Antonio	53.000	W5LVE
San Antonio	145.20	W5LVE

Utah

Salt Lake City	52.525	W7YRU

Vermont

Vermont State	52.525	

Virginia

Burkeville	52.525	W4UWL
Charlottesville	145.26	W4NUH
Danville	145.26	K4GWG
Brookneal	145.26	K4PCO
Brookneal	145.30	K4PCO
*Lynchburg	52.525	K4ZAD
*Lynchburg	145.50	W4NJE
*Lynchburg	145.59	W4NJE
Lynchburg	145.68	W4DYE
Lynchburg	52.525	W4DYE
Norfolk	145.26	KN4WKI
Portsmouth	147.30	K4ISP
Pulaski	146.98	W4CBM
*Richmond	52.525	K4PEN
Richmond	52.525	W4DXC
Roanoke	146.98	K4UMK
Roanoke	145.26	K4UMK

Washington

Olympia	53.290	W7UVH
Olympia	53.620	W7UVH
*Portland/ Seattle	53.098	W7VS
Seattle	144.70	W7FNO
Seattle	146.76	W7YKA
*Seattle	146.82	W7GZS
Seattle	146.88	W7GZS
Yakima Valley	147.84	
Yakima Valley	145.69	

Wisconsin

Appleton	147.30	
Chilton	147.30	W9IIU
*Milwaukee	53.560	
*Milwaukee	53.740	
Milwaukee	145.35	
*Milwaukee	145.50	
*Milwaukee	145.53	
Milwaukee	146.94	
Milwaukee	147.00	
Milwaukee	147.18	

Canada

Toronto	144.36	VE3CYC

Project Moonbounce—K1HMU

Many comments were received re: Ned Conklin's letter (K1HMU) in the July issue. Bob Cooper, K6EDX, sent us a copy of his letter to Ned . . .

"Regarding your letter in this month's [July] *CQ* V.H.F. COLUMN, I believe you will find that circular polarization is *not* the answer to diversity fading for moonbounce work on 144 mc.

"For example, while it is true that circular signals cannot be twisted (as you can't twist a circle), I believe you have overlooked the affect of faraday rotation on the "direction of the corkscrew" winding. Experience with circular rotation has shown that if you wind, for example, in a right hand direction (clockwise) the returned signal will (through faraday rotation) be left hand wound. True, it is still polarized in a circular fashion, but the twisting has still taken place and geometrically the signal has reversed itself (*i.e.* the leading edge of the wave has wound itself back through the trailing edge) much like the affect you achieve when you turn a sock inside out. You still have a sock, but it's an inverted sock!

"Other than that, good luck with your 144 mc moonbounce."

Wilbur Golson W5CD, and his famous 6 meter mobile/marine, 50.25 mc station. Wil is heard all over the Louisiana-Mississippi Gulf Coast.

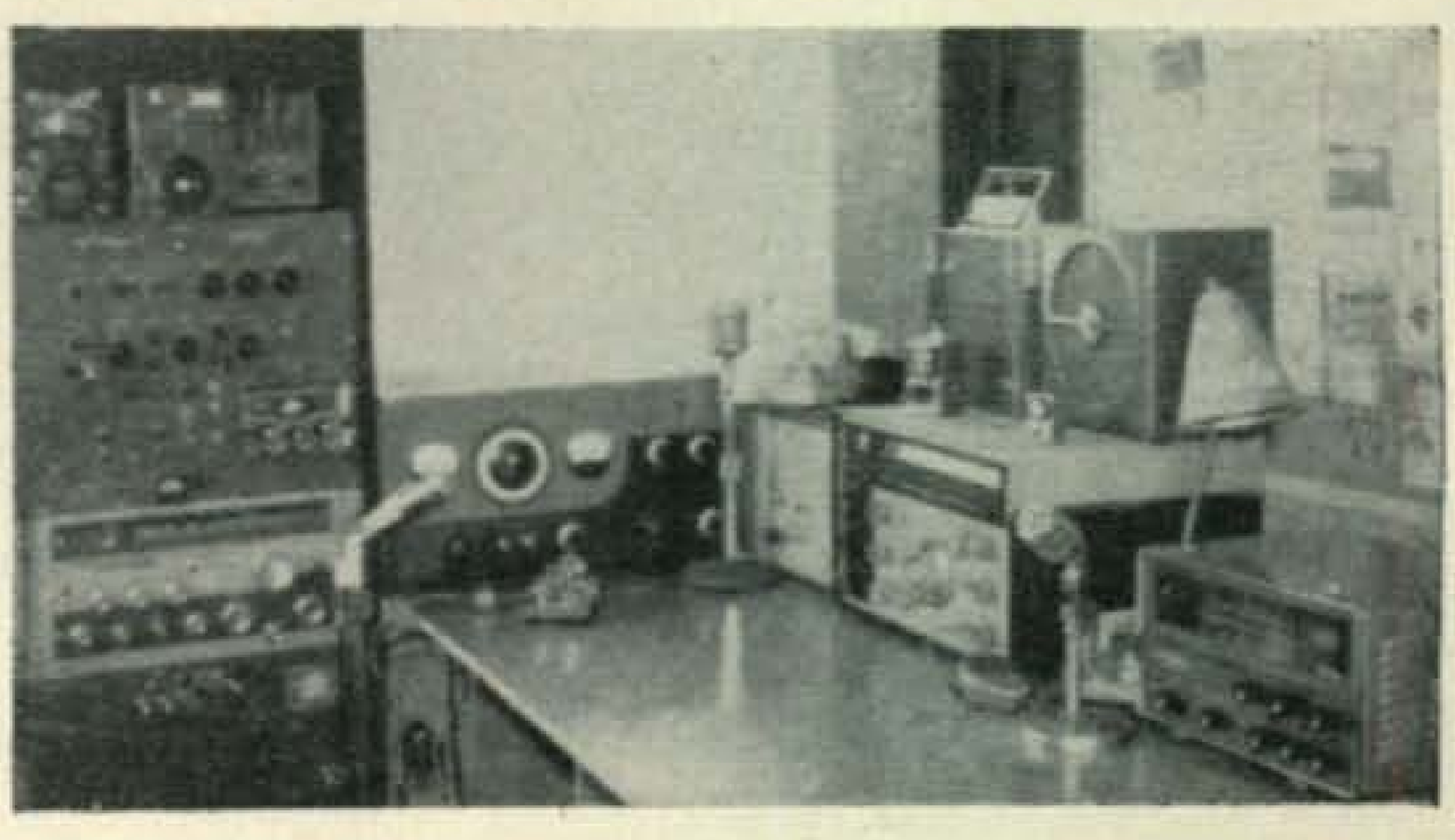
A short note from Alan, VE3BZS, "One comment on Ned, K1HMU's, letter in the July issue of *CQ* is that he doesn't make it clear that the echo returns with reversed sense of polarization."

Naturally, Ned has sent us a new letter commenting that . . . "this second letter solves, I think, all the problems in the first. Much correspondence resulted and many thanks for printing the first letter. I really believe we're on the right track now—full steam ahead!" Now on with . . .

Project Moonbounce 144 Mc 1961

This is the second letter sent by K1HMU in the interests of 144 mc moonbounce. The first letter was concerned with descriptions of equipment and of a helical antenna that was to be used in order to get around Faraday rotation. Since that time, things have progressed both

(*Continued on page* 110)



Operating position at K9EID Marissa, Illinois.

Space Communications

GEORGE JACOBS, W3ASK
11307 CLARA STREET,
SILVER SPRING, MARYLAND

Project OSCAR

At column deadline time (the last day of August), the approval by various U.S. Government agencies for a mid-September launching of a Project OSCAR satellite seems almost assured. If all went according to plan, the dream of an orbiting satellite built by and for radio amateurs should be a reality by the time this column appears in print. If no unforseen delays were encountered, and the launching was successful, OSCAR I's 100 milliwatt space-borne transmitter should now be sending out series of HI's for all the world to hear on 145.00 megacycles in the internationally allocated 2 meter amateur band.

As dramatic as a successful launching of an OSCAR satellite might appear, this will mark but the beginning of the *most important* phase of the OSCAR I program—the collection of useful scientific information from OSCAR's payload by radio amateurs and other observers throughout the world.

This month's column will be devoted entirely to a discussion of the types of technical information OSCAR is expected to yield, and how radio amateurs throughout the world, as well as all others who can tune in OSCAR's signal, can participate in its collection.

The primary objectives of the OSCAR I program are:

1. Qualitative analysis of signal propagation characteristics at 145 megacycles.
2. Measurement of Doppler shift.
3. Attempt to obtain useful predictions of the satellite's orbital path by a statistical analysis of a large amount of relatively low-accuracy tracking data.
4. Measurement of internal temperatures in the satellite to verify theoretical calculated temperatures.
5. Determination of the lifetime of the OSCAR package.
6. One of the most important purposes of all: to arouse amateur interest in the new age of space communications and to demonstrate once again that radio amateurs are a cohesive world-wide group which can produce useful technical results of no small magnitude! The OSCAR program is expected to encourage amateurs everywhere to sharpen their technical knowledge and make increased progress in the areas of high-gain steerable antennas, low-noise stable v.h.f. receivers and precision measurement techniques.

Reporting OSCAR Reception

Any amateur copying the OSCAR beacon should submit an OSCAR Tracking Report to the Project OSCAR Association, P.O. Box 183, Sunnyvale, California. The Association is bearing the responsibility for data reduction and for making the results available in published form for the use of scientific organizations throughout the world. Since it is expected that thousands of reception reports will be received during the approximately three week life of the OSCAR package, standardization of the reports is an absolute necessity. A uniform method for reporting tracking information has been worked out to present the information in a brief and standard form. All reception reports submitted to the Project OSCAR Association by mail *must* be in an 8½ × 11 inch sheet of paper in the format shown in fig. 1. A self-addressed, stamped business-size envelope forwarded to the Association with a request will bring a free supply of the standard OSCAR reporting forms. Forms can be reproduced locally, if desired, but they must be of the standard size and format.

It is anticipated that the majority of reports will originate with radio amateurs, using their own 2 meter equipment, but reports from any and all listeners and observers will be welcome. OSCAR will pass over or near almost every spot on the Earth four times in 24 hours. It will take up to 12 minutes for the satellite to traverse the sky from horizon to horizon. Each pass will provide data of interest, and regardless of your working schedule or operating hours, OSCAR will be in your neighborhood up to twenty-eight times a week. Record as much data as possible.

Completing the Report Form

It is realized that equipment available to participants in the OSCAR program will vary considerably. Many reports will be based on the use of simple, barefoot 2 meter receivers. Other reports will result from the use of low-noise, crystal controlled multi-stage receivers of the latest design and other exotic gear. Antennas will range from simple fixed dipoles to giant arrays and parabolas, rotatable in both elevation and azimuth. Not everyone will have the necessary equipment to measure azimuth, elevation, signal strength and Doppler shift with a high degree of accuracy. Nevertheless, even the simplest report containing the time that OSCAR's signal is first heard on a pass and the time that it fades out, will be of considerable value.

Fill out as many columns in the report as you can along the following lines:

Station Location: This is one of the most important entries on the tracking report. To accurately plot the data, the OSCAR data reduction crew must know exactly where your receiving antenna is. To do this, location must be reported in terms of latitude and longitude, to the nearest minute. This information can usually be obtained from a large scale aeronautical sectional chart which is available from your local airport, or it may be scaled from land titles available at county clerk offices.

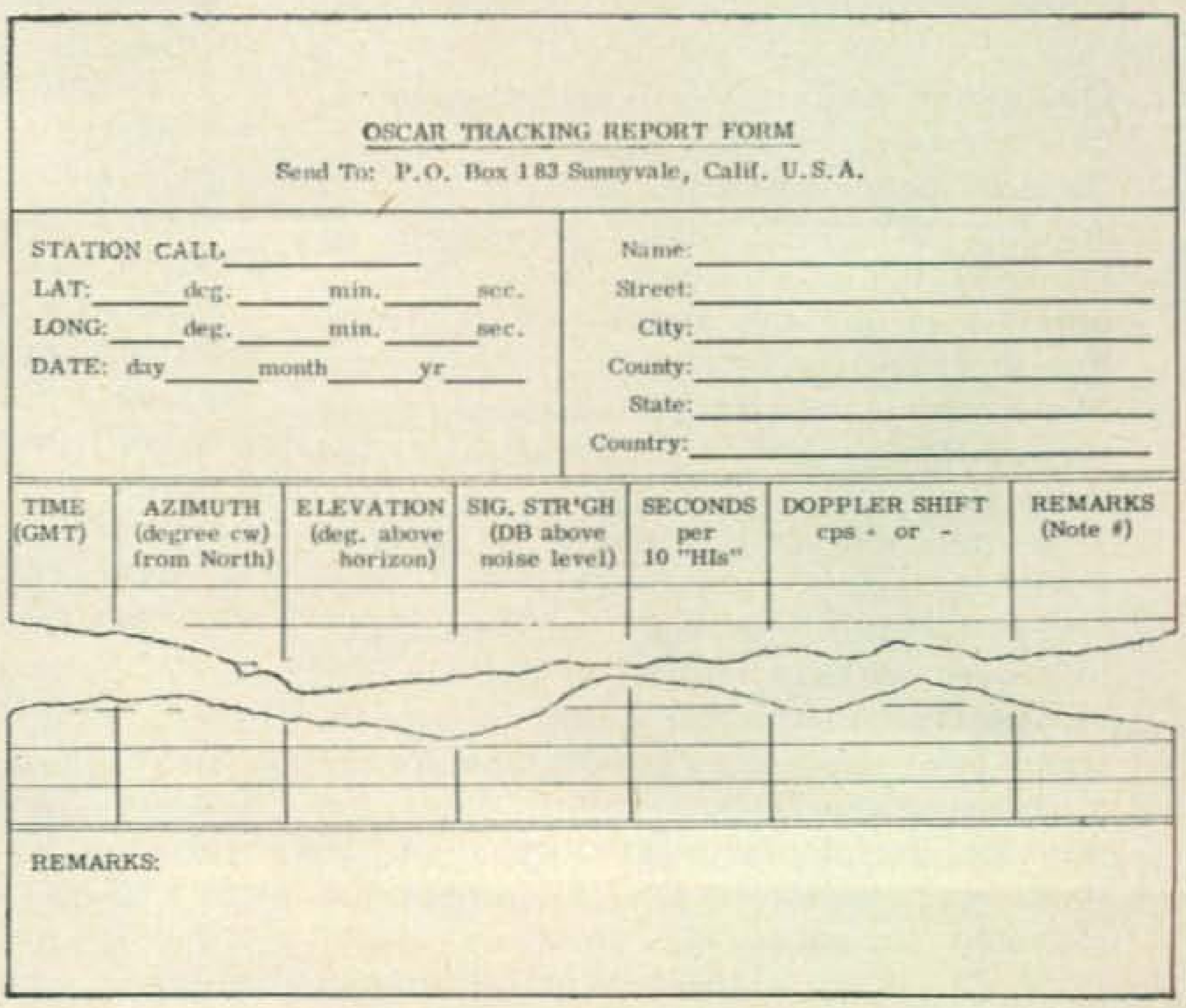
Time: Time is the next important measurement. GMT (also called Zulu, Z, or Greenwich time) must be employed for all observations. Use of any other time will automatically cause the report to be discarded. Be sure to convert from local time in your area to GMT. If you have any trouble doing this, check "World Time Keeping," by Curry, which appeared in April 1961's *QST*.

Time entries must be accurate to within ten seconds. Check your time-piece against a standard time station such as WWV, JJY or CHU. Accurate time can also be obtained in most areas as a telephone service. Time to the nearest second should be recorded for when the satellite is first heard, the time of maximum Doppler shift, and the time that the signal is last heard.

Azimuth: If a rotator and a directional antenna are being used, the azimuth information should be reported. This data, together with time, latitude and longitude, will be helpful for predicting OSCAR's orbit. The azimuth bearing on which OSCAR's signal sounds loudest, or upon which the observation is being made, should be reported in degrees clockwise from true north. (East would be 90 degrees, South 180 degrees and West 270 degrees.) The most accurate tracking possible is desired, and the antenna should be aligned with true north and checked periodically for accuracy. Two relatively simple methods for alignment of an antenna with true north (aiming it at the north star, and using a compass corrected for magnetic variation) are described in "Project OSCAR Measurement and Tracking" by Walters, Wells and Hillesland, in July 1961's *QST*. Orient the antenna so that the indicator reads 0° when the beam points to true north.

Elevation: A report of elevation, or how high in the sky OSCAR is, adds a third dimension to pin-pointing it in space. Most existing amateur facilities do not at present have the ability to control antenna elevation. This can be accomplished by placing a second rotor at right angles to the azimuth rotor, setting the indicator to 0 degrees when the antenna is horizontal, and 90 degrees when the boom is vertical. Record OSCAR's elevation angles in column 3 of the report form.

Signal Strength: Signal strength can be obtained if your receiver has an S-meter. Run the receiver "wide open" and note the S-meter reading before OSCAR can be heard, and when there is no other signal on the frequency. This is an indication of the noise level. Note the S-meter readings as OSCAR comes into view. *Subtract* the reading due to noise from the reading due to OSCAR's signal. *Multiply* this difference by 6 db (on the assumption that 1 S-unit equals 6 db) and enter the result in column 4. Thus if the residual noise level with the receiver gain at maximum is S-3 and the needle kicks up to S-6 on OSCAR's keyed pulses, the difference would be 3 S-units, or 18 db of signal.



OSCAR TRACKING REPORT FORM

Send To: P.O. Box 183 Sunnyvale, Calif. U.S.A.

STATION CALL ____
LAT: ____ deg. ____ min. ____ sec.
LONG: ____ deg. ____ min. ____ sec.
DATE: day ____ month ____ yr ____

Name: ____
Street: ____
City: ____
County: ____
State: ____
Country: ____

TIME (GMT)	AZIMUTH (degree cw) (from North)	ELEVATION (deg. above horizon)	SIG. STR'GH (DB above noise level)	SECONDS per 10 "HIs"	DOPPLER SHIFT cps + or -	REMARKS (Note #)

REMARKS:

Fig. 1—To facilitate data reduction, reports of OSCAR's reception must be filed on a uniform reporting form similar in format to the official OSCAR Tracking Report Form shown above. The size of the report form must be 8½x11 inches. Official forms are available free upon request from the Project OSCAR Association.

Seconds per 10 HI's: OSCAR's keying circuit transmits a series of HI's in International Morse Code (.... ..). The keying circuit is temperature sensitive and the HI rate is an indication of the temperature inside the package. The HI rate is determined by the time in seconds that is required to receive the ten HI's, from the beginning of an H to the end of the tenth I. This value should be reported in column 5. A calibration of the keying rate per minute versus temperature has been made for the OSCAR package, and HI rate information will permit verification of the theoretically calculated temperatures.

Doppler Shift: Doppler shift is the apparent difference between the transmitted and received frequency resulting from the rapid velocity of a space-borne transmitter in relation to a fixed receiver ground. It is analogous to the apparent change in pitch of a train's whistle as it approaches an observer and then goes away. The whistle is higher in pitch as the train approaches and lower as the train goes away. At the exact instant that the train is opposite the observer, the true pitch of the whistle is heard.

To measure the Doppler shift on OSCAR's frequency will require a stable signal source (drift of less than 500 c.p.s. in 30 minutes) on 145 megacycles which will provide the beatnote with OSCAR's incoming signal, and an audio oscillator and an oscilloscope for measuring this beatnote. Figure 2 shows how this equipment can be setup to give reasonably accurate Doppler shift measurements. OSCAR's beacon is tuned in on 145 megacycles and the stable external beat source (or b.f.o.) is set for a low audio note which will *rise* in frequency as OSCAR approaches. Thereafter, neither the receiver tuning nor the beat frequency should be adjusted. Any change in beat-note must be the result of the Doppler shift or results will be inaccurate. By plotting the audio beat-note against precise time (try to get an accuracy of plus or minus a few seconds), the exact time of PCA (point of closest approach) can be determined. The resulting curve will resemble the letter "S." The time at the center of the "S" curve corresponds to the PCA. When the PCA is nearly overhead, the total change in frequency will be approximately eight kilocycles.

The total shift will be less, the more distant is the point of closest approach.

If a tape recorder is available, the beat note may be recorded and played back after the pass, when it may be more convenient to determine the Doppler shift curve. Record the audio output of the receiver by placing the recorder microphone near the receiver speaker. Record a reference time mark on the tape (a "woof" at an exact minute) just before recording OSCAR's signal. The Doppler data can be deduced after the pass is over and, if necessary, the tape can be run several times to improve accuracy of the curve.

More complete data on the Doppler shift, and how it can be measured appears in, "Ground Support for Project Oscar," by Garner and Wells, in May 1961's *QST*.

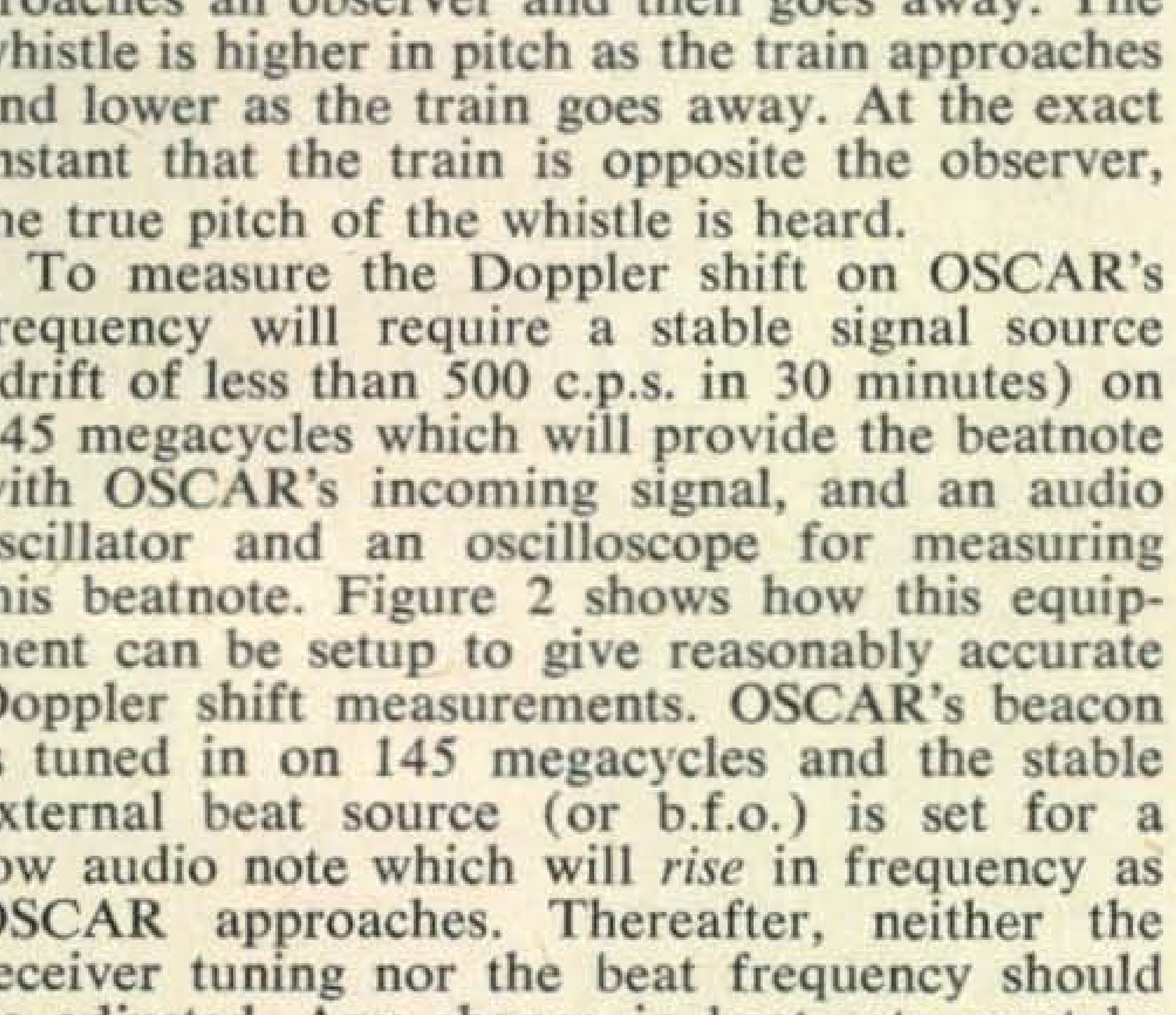


Fig. 2—Sample setup for measuring Doppler shift of OSCAR satellite. The coupling between the crystal-controlled external beat oscillator and the converter input circuit must be as light as possible to prevent decreased receiver sensitivity as a result of overloading. Be sure to turn off external signal or b.f.o. when making signal strength measurements of OSCAR's reception.

This completes the information required on the OSCAR Tracking Report Form. There is additional space for remarks, such as time signal is first heard, fadeout time, unusual observations, etc. Whether your setup is simple or sophisticated, your observations will be of considerable value. The most important things to remember are *accuracy* in measurement and *precision* in timing.

Method of Reporting

Written reports should be sent directly to the Project OSCAR Association, P.O. Box 183, Sunnyvale, California. *A separate reporting form should be used for each pass.* When about a half-dozen reports have been accumulated, send them along to the Association for data reduction, preferably by airmail if the distance warrants it. Amateur communication systems are being setup to feed reports back to the Association by radio in order to determine orbital data in as short a time as possible. Reports sent by radio should be followed up with the written report sent by mail. More information on the OSCAR communication networks, and the methods that will be used for dissemination of predicted orbit information appears in September 1961's *QST*. Be sure to check W1AW's transmissions as often as possible for the latest information concerning Project OSCAR.

A Word of Caution

OSCAR's beacon will operate on 145 megacycles. It's power is low, it's weak signal will have to travel long distances. PLEASE KEEP THE CHANNEL CLEAR. Don't be guilty of rag-chewing on a frequency that will make amateur communication history if left in the clear.

OSCAR I will not have the ability to receive and re-transmit signals. This is being planned for *future* shots in the OSCAR program. PLEASE DON'T CALL THE VEHICLE.

(*Continued on page 118*)

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

ham clinic

Practical Taylor Modulation

IN THE December 1960 issue of *CQ*, we covered some of the theoretical aspects of the Taylor ("Super") Modulation System. In answer to our request to readers for more information, we were nearly swamped with letters, copies of old RN articles, diagrams of *existing* rigs and reams of related information.

Looking over all the material available to us, we came to a number of conclusions—the most important being: the system would work and work well *if* some care was taken in design to "fit" ham band requirements; little audio is needed; band-switching and re-tuning are no problems if dial settings are logged; c.w. operation is simple; the signal does have more punch than the average plate modulated rig; it can be used effectively with low as well as high power and a number of hams are using it today with remarkable success.

In spite of the fact that the Taylor System (TS) made a signal *readable* when a.m. plate modulation (with an equal powered rig using the same antenna) could not be read, there were still those who tried to prove theoretically that the system was not *practical*. However there were a number of determined hams around who stuck to it and did make it work.

Beginning this month then, we will publish a few *practical* tested TM circuits and will start off with Herb Romine's (W5SLO) rig.

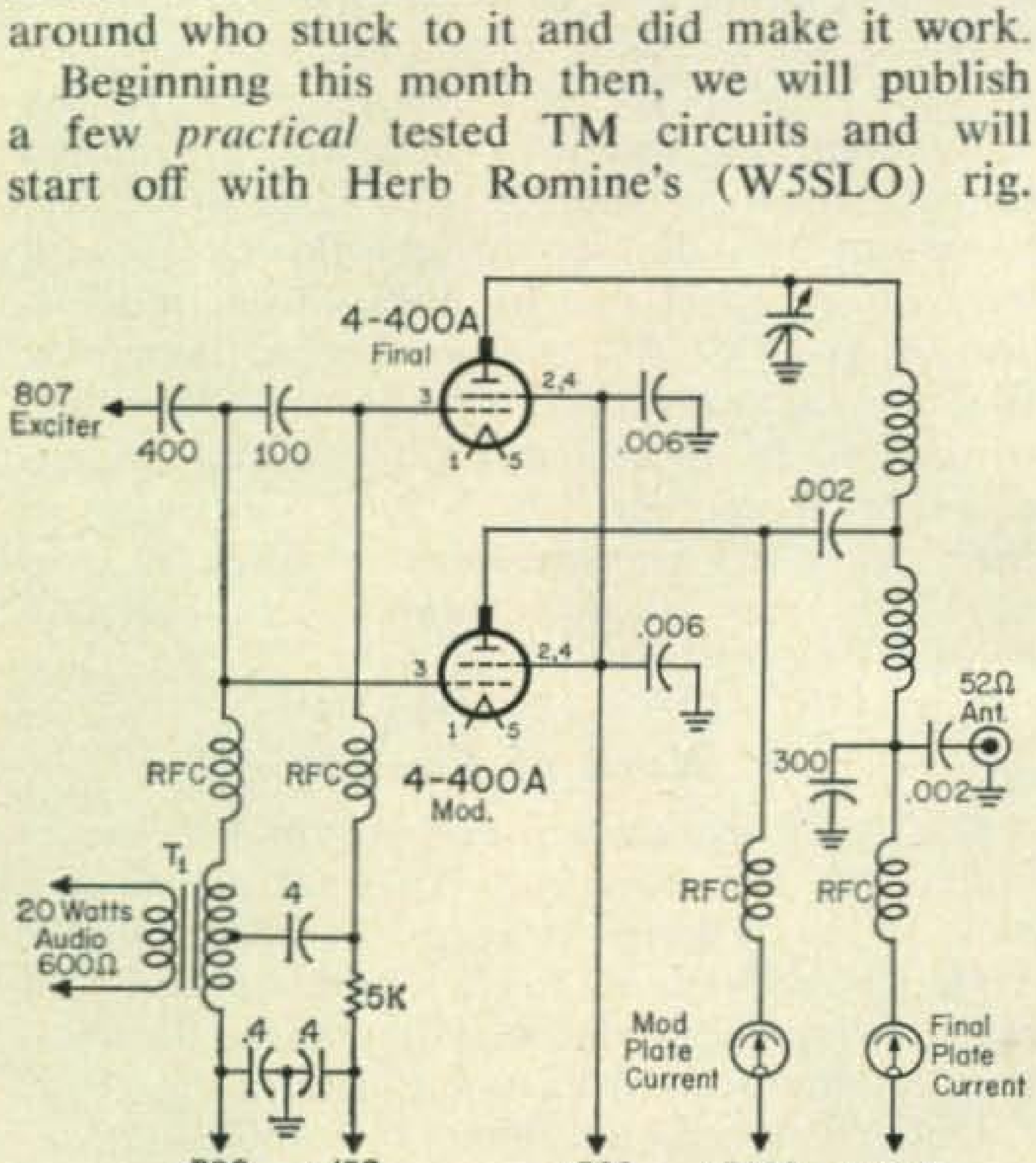


Fig. 1—Taylor Modulation system used by W5SLO employing two 4-400 A's as modulator and amplifier.

Next month we'll give you a modification of the 274N surplus transmitter which uses 1625s in the final. The information for this worthwhile change was supplied to us by Fred Moore, (W4JYB/F7BI).

In W5SLO's rig (Fig. 1), the operating conditions are as follows. Static: carrier tube plate current, 300 ma; grid current, 7 ma; modulation tube plate current 30 ma. With modulation: carrier tube and modulator tube plate current, 250 ma. Excitation from the driver stage should be controlled by the screen voltage of that stage. A wire-wound pot can be used for this purpose. If possible, the screen supply for final screens should be regulated. Bias voltage regulation is not necessary.

Herb uses a relay for switching from phone to c.w. by switching bias voltage. Transformer T_1 is an ordinary 600 ohm line to class B grids unit.

Tubes such as the 4-65, 4-125, 4-250 or the 4-400 are ideal for use with the Taylor system because on positive peaks they are capable of drawing high plate current.

With the TM system, 4 times the sideband power with a reduction of about one half the normal a.m. bandwidth are possible. With careful shielding and normal by-passing techniques, those who use the system report a reduction in BCI and TVI.

If you try the TM system (as modified), let us know how you make out; we would like to publish the results.

Questions

Our back-log of questions is so large that we have decided to devote most of this month's column to answering questions. If you have a question, be sure to include a self-addressed *stamped* envelope for your reply. If you desire modification of a particular commercial or home-built rig, send the whole diagram for it along with your letter and include enough postage for its return. We repeat: we do not do complete rig design. Sorry, time does not permit it.

Choosing questions of general interest is very difficult. We try when possible, to publish questions that are most frequently posed and attempt to cover as much of the ham technical field as we are able to.

When inquiring about certain aspects of a printed article in any publication, we urge you to write to the author; you can save time by doing so, for in many cases we must query him for you.

Mobile Receiver Calibrator—"I need a good crystal controlled 100 kc receiver calibrator. It should be trasistorized and self-contained. How about it?"

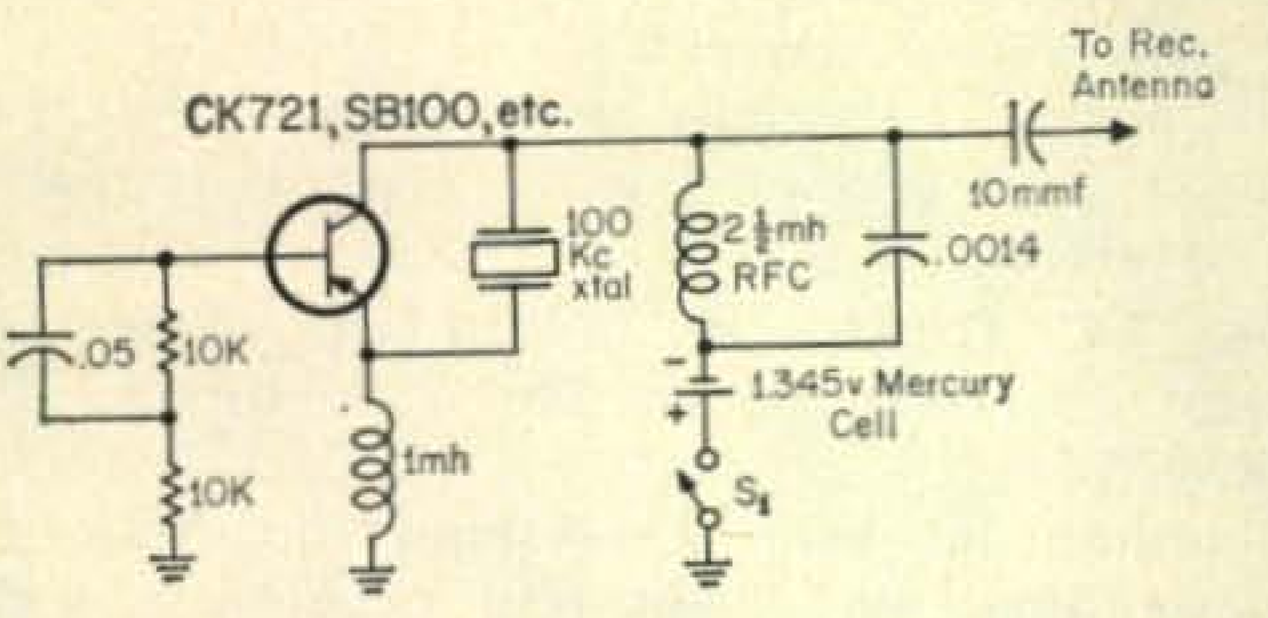


Fig. 2—Transistorized crystal calibrator ideal for mobile use. Switch S_1 is not really necessary since the current drain from the mercury cell is quite low.

Sure, see fig. 2. This circuit, adapted from a NBS circuits works fine. The switch shown is really not necessary, because the battery will last for a very long time. However, you may want to turn the unit off and on as you need it.

HT-37 With A T-R Switch—"I experience a large amount of hash with my HT-37 using a T-R switch. The information I have received from various sources really does not help me solve my problem. Any ideas?"

Yes, thanks to George Eastman (W8UGD) here is a tested solution (Hallicrafters please copy).

He writes: "to remove hash from the HT-37 in standby position while using a TR switch, proceed as follows. First, remove the HT-37 from its cabinet and turn it up-side down with front toward you. In the rear right hand corner you will find the power transformer, to the left of it is the terminal strip containing the bias network which has the following parts mounted on it; SR_1, R_{64}, R_{63}, R_{62}, and R_{46} along with C_{98} and C_{99}.

"Reverse the ground connections on R_{62} and R_{46} (which is grounded thru terminal *J* on the relay).

"To do this, unsolder the ground end of R_{62} (which is the end nearest the rear apron); unsolder the end of R_{46} (which is nearest the front of the transmitter, connected to the tie point with two white wires). Now *very* carefully reverse these two resistors and solder the end of R_{46} to the ground terminal nearest the rear of the transmitter (where you unsoldered R_{62}). Solder R_{62} to the terminal containing the two white wires. This does the change and increases the cut-off bias from –56 volts to –84 volts. The latter voltage completely cuts off the 6146 tubes and does not change the operating bias (–49 volts). Figure 3 shows how the change is made."

George also made a stiff wire gimmick so that he could adjust the bias without removing the HT-37 from its case. He installed a feed through terminal in a hole near the relay and connected it to the bias control terminal on the 10K pot so that the bias could be adjusted and checked. The gimmick is about 8" long

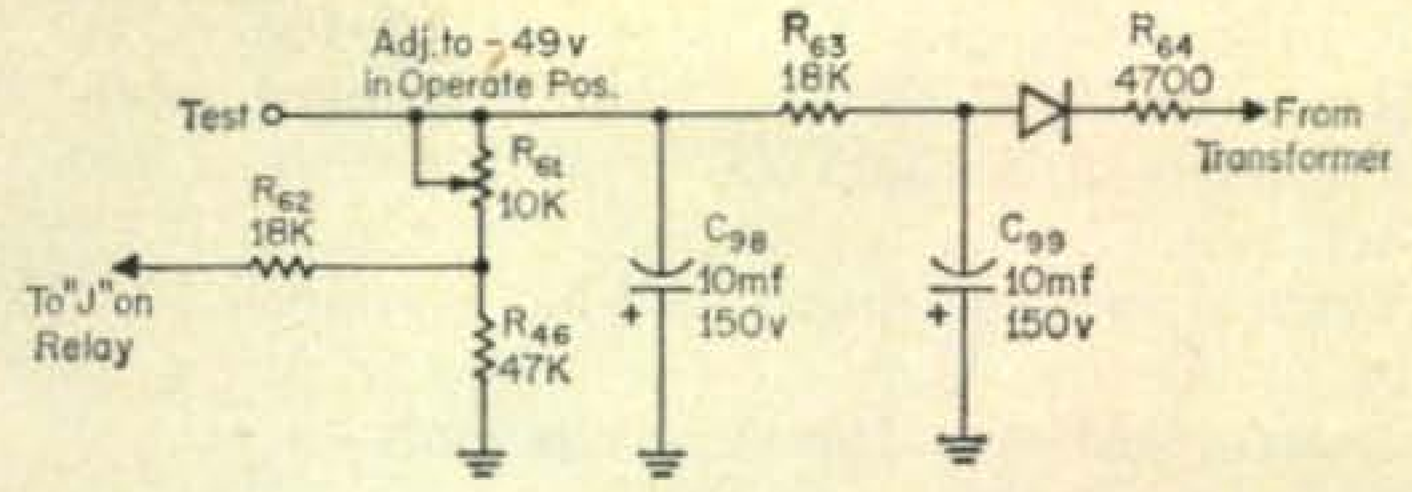


Fig. 3—Circuit showing modification to the HT-37 for hash-free operation when a T-R switch is used.

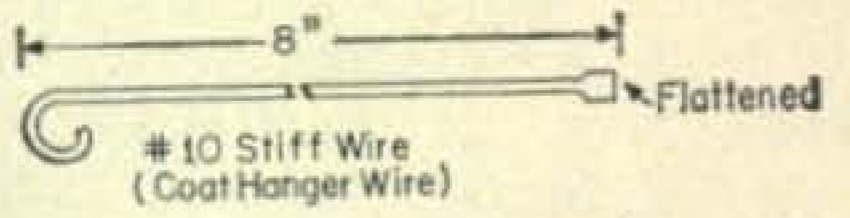


Fig. 4—Homemade tool for adjusting final bias on the HT-37 without removing the unit from its cabinet.

made out of stiff number 10 wire whose end is flattened like a screw-driver point. See fig. 4 for details.

Surplus Info—Those of you looking for technical manuals and other info on surplus items, keep these two companies in mind: Technical Manuals Co. 515 LaFayette St., Utica 4, N. Y. and Lee Industrial Surplus, Inkster, Mich. Both seem to have large stocks of surplus manuals of all kinds.

Scope Phase Shift—"I have a scope that I built from a kit about 18 months ago. I note that there is a considerable amount of phase shift in the vertical and horizontal amplifiers at low frequencies. What do I look for?"

First check the tubes and try to match amplifier tubes if one must be replaced. Then check all bypass, decoupling and coupling capacitors.

90 Ohm Coaxial Cable—"I have a large amount of surplus 90 ohm coaxial cable. I am interested only in working on 10 meters when open or even locally. Any suggestions for an antenna using this cable for transmission line?"

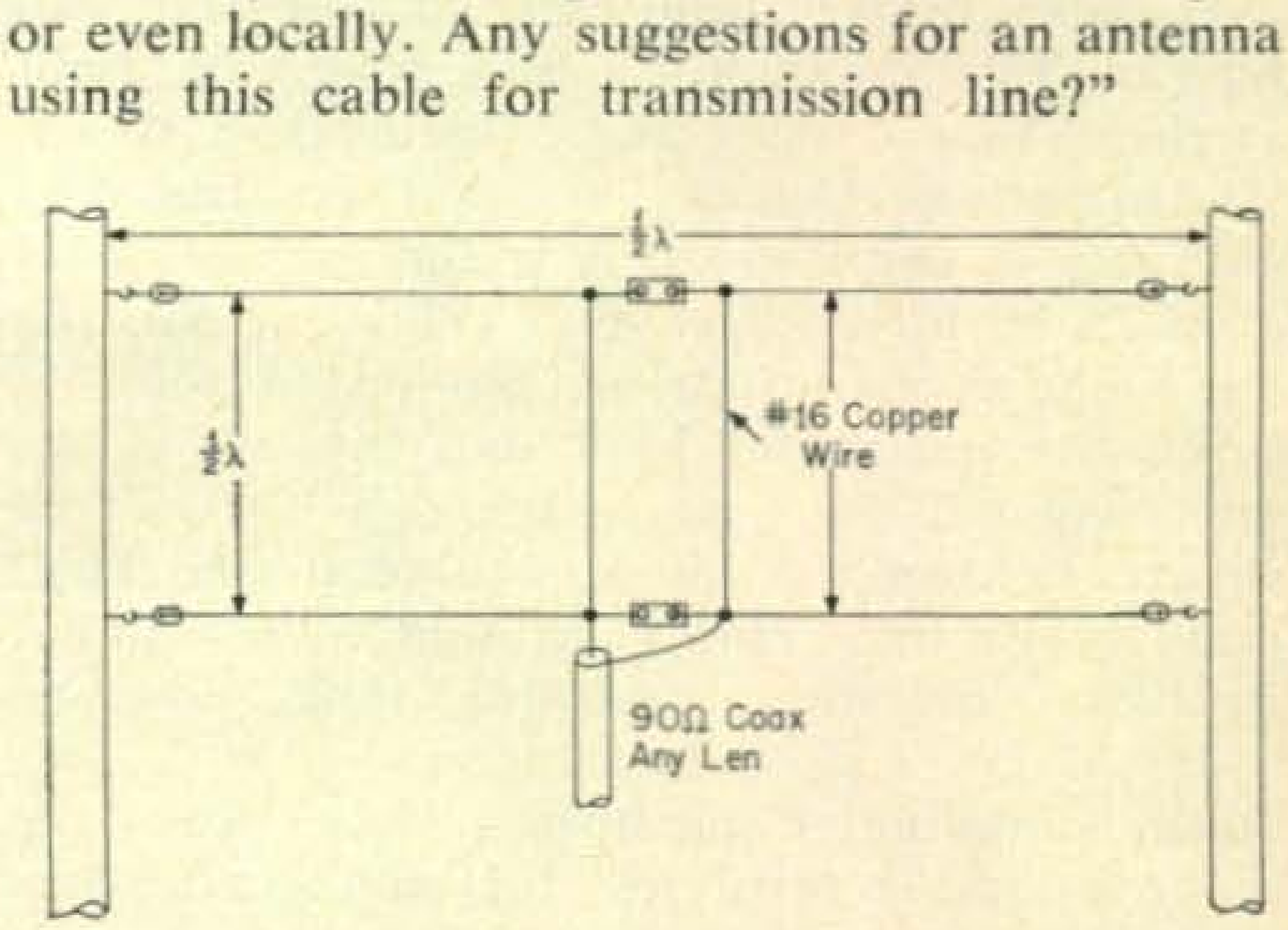


Fig. 5—Lazy H antenna with feed point impedance of 90 ohms. Number 16 wire is adequate for a 10 or 15 meter model but heavier wire should be used for lower frequency bands.

Yes, a good practical 10 meter antenna that has an input impedance of 90 ohms is the old reliable Lazy H. See fig. 5. Note that the antenna is 2 half wave dipoles spaced ½ wave-length apart, and connected together. The current in each leg is in phase. Maximum radiation is at right angles to the plane of the array. It has about 6 db gain over a straight dipole and is bi-directional in both the vertical and horizontal planes.

Vertical vs. Horizontal—"What is more critical of placement near a large group of trees for desired best operational results (sic)—a vertical or horizontal antenna?"

A vertical, because vertical wave polarization is involved which is influenced by the trees "production" of interference patterns which in themselves produce standing waves in space.

Tube Shorts—"To me, a short is a short. However, I hear the terms, 'hot' and 'cold' shorts relative to vacuum tubes. What's the difference?"

Tube metal elements are necessarily close together. When they are hot, they expand and can often expand far enough to produce a "hot" short. When the elements cool off there may be no short. A "cold" short is one where tube elements short and stay shorted, hot or cold. Sometimes a cold short is due to rough handling which can cause mechanical failure of internal tube elements and consequent cold shorting. A hot short can occur in condensers too and is tough to find because when not under voltage (cold) checks A-okay. See?

One Way Skip—"What causes one way skip? On 10 meters for example, I can hear a station but he can't hear me."

The cause? Well, the experts say (usually) F layer tilt or even sporadic E layer cloud motion. In other words, his signal bounces right into your antenna, but yours somehow misses the correct ionospheric "reflection point" to his.

TVI-TV—"Any cure for horizontal TV oscillator radiation?"

Depends on the radio receiver you have and type of TV. Sometimes a high pass filter right at the TV will help and sometimes it won't. Using bottom chassis shielding (in the TV) will help in some cases. A friend of mine used a 15.75 kc filter effectively. With one set, the mere addition of a good ground to the TV killed the horizontal hash and birdies. If the set involved, is your neighbor's across the street or down the block, a note to the FCC may get things going. Minimum horizontal oscillator radiation standards must now be followed by TV manufacturers.

Open Coupling Capacitors—"How does one make a simple open test for small capacitors without a bridge or some other complicated piece of test equipment?"

Connect a good pair of high impedance headphones (magnetic) in series with a 22½ volt battery. Between the remaining terminals of the battery and headphones "snap connect" your ceramic or other small coupling capacitor. If the condenser is good, you'll hear one make and break click. If it is open you'll hear no click. If it is shorted you'll hear a click every time you touch the condenser terminals (keeping original contact polarity the same). Leaky *small* capacitors require a more elaborate setup to detect the fault.

Output Transformer—"What's this business of blowing receiver output transformers if a speaker load is not connected?"

It is true, especially where a push-pull a.f. output stage of high power (5 watts or more) is envolved.

7mc BC QRM—"What can we (American hams) do about the terrible 7 mc foreign BC QRM?"

Nothing but keep a stiff upper lip. Majority International agreement (not necessarily with US concurrence) established foreign BC usage of the 7 mc band.

Letter—"I wrote the ———— Company for some information relative to a bad piece of equipment I bought about 3 months ago. I bothered the dealer about my case until he invited me to leave his store. I got angry. The reply I received from the manufacturer is enclosed. Don't you think they should be boycotted by all amateur radio magazines? I do, and urge you do it in HAM CLINIC."

My answer: It seems to me that the company has bent over backwards trying to please you, even with a new replacement receiver which was specially checked out for you. Their final answer does not sound unreasonable to me. I know many hams who are very satisfied with the type of set you now have.

I urge you to send the second set back to your dealer and get your money back (as they have offered to let you do). In this case, I side with the company. I don't think you can be pleased.

HAM CLINIC does not "black list" anyone. If we do not have something *good* to say about a person or firm, nothing at all is said in this column. We do however, reserve the right to express our private opinion, and this we do in our correspondence, advertisers or not.

BC-453 to Transceiver (s.s.b.)—"I heard over the air that someone in California has come up with a BC-453 for s.s.b. *transceiver* operation. Where can I get the info?"

A complete instruction book with fine detail (photos etc.) on how to do this is obtainable from *Western Radio Amateur Mag.* 10517 Haverly St., El Monte, California for $3.00.

Book Review—*VHF for the Radio Amateur.* Frank Jones, W6AJF has been writing for ham technical journals for many years. Known best for his adventures into the v.h.f. realm, Frank has done what many hams would like to do, come up with a good book on v.h.f. radio. With 9 chapters of easy reading, the author covers the subject of v.h.f. from antennas to parametric amplifiers as only he could do it. Many, many photographs, schematics and construction information galore fill the book. And you can bet that the equipment described in this 208 page book will work!

I enjoyed every page of it, but what intrigued me most was Section 7.1 which described a 14 to 18 mc i.f. receiver for use on the 432 and 1296 mc bands. This is something!

For those of you interested in VHF you're missing something if you do not have a copy of Frank's new book. For $3.50 you can't go wrong. You can get a copy from *CQ*.

SB-10 Distortion—"Some of my friends have the Heath SB-10 s.s.b. adaptors which sound fine, but mine does not. The signal is distorted. I'm feeding a final pair of 6146s in AB-1. Any hints on the 'gremlin'?"

Sure. First check all tubes. Next check alignment of the SB-10 as called for by the instruction manual. Then, without your final on, listen to your signal using a good selective s.s.b. receiver. To do this, use headphones, antenna disconnected from receiver, r.f. gain low, and just enough a.f. gain so you won't have feedback from the mike as you talk into it. As you talk into the mike, adjust the two phasing controls on the top chassis of the SB-10 for *intelligibility*. Now switch sidebands and check to see how your suppression is. If it is bad, check your r.f. network. Of course, you will make certain that your carrier is nulled properly as you go along. If you cannot seem to null the carrier, check your nulling pots (these should be wirewound units). The SB-10 can be adjusted without a scope or a signal generator using just a good s.s.b. receiver and a pair of headphones.

Now then, if you cannot "talk-adjust" the unit, check the stability of your v.f.o. (if you use one). An f.m.'ing v.f.o. will cause distortion. Next, check for final parasitics. Neutralization may help (in the case of a homebuilt final). Check for *final* linearity. Your SB-10 can be perfect but your final may have the "gremlin." As a last resort, use a scope and compare the output of your SB-10 with the output of your final. Over-excitation is the greatest cause of SB-10 distortion. Keep drive (both a.f. and r.f.) low.

If you still cannot find your trouble, suspect interstage coupling capacitors and poor screen voltage regulation for the 6146 screens.

Blue Modulator Tubes—"I note that when I drive a pair of 6AQ5s used as modulators in my mobile rig that there is a blue glow in each tube. How come?"

Could be gassy tubes, but I am inclined to think that you may be feeding too much high voltage to them. The old 807s sometimes behaved this way, but there was nothing to worry about.

Neutralization Indicator—"It seems to me that a neon bulb used as an indicator of final stage neutralization is better than a grid-dip meter because it is more sensitive to r.f. How about this?"

The little neon bulb (¼ watt) requires about 90 volts dc to fire it. It is a sensitive indicator around r.f. circuits. However, the GDO is also sensitive if handled correctly. It will "catch" parasitics that the neon will not. Furthermore, it is easier to read a meter than try to judge the brilliance of a neon bulb; a hard thing to do. No, I'll take the GDO.

Parallel Resistors—"Is it always necessary when paralleling resistors of different values (resistance) to match them wattage-wise?"

Generally yes. However, in some circuits carrying *high* current, make sure that the lowest valued resistor can take the maximum. Where small currents are involved (grid circuits etc.) no need to worry about wattage similarity.

Coax and Lightning—"I use a steel tower, and it is well grounded. For lightning protection should I ground the coaxial cable outside the house or just depend on the ground connection in the shack?"

I say ground outside. The Cushcraft connector which incorporates a gap (without line loss), is the answer to outside grounding for better protection.

Viking Valiant—"What can cause the condition in my Viking Valiant where I cannot seem to get the proper dip in my final? In other words I sometimes find it very hard to load up. It did work fine before this thing started up."

First check for proper r.f. drive to the final. Next check your final clamp tube action. Check for poor switch contacts and final tuning component connections. Bet the first suggestion is the cause of your woes, but if not, check your biasing connections.

MR-1—"Because I live near a high power commercial c.w. station which operates on a number of frequencies, I have trouble receiving ham band signals with my MR-1. How about a filter or something?"

The Heath MR-1 is a good little receiver, but a set costing three times as much would more than likely have trouble in your location. High power *shock excitation* (especially c.w.) is hard to keep out of a set. You can try a trap which will tune to any one or all of the frequencies of the offending station. The trap can be a simple coil and condenser combination placed in the receiver's antenna circuit. It is tuned for minimum feed-through. I'm inclined to think, however, you are "stuck" with your location. Anyone have a good concrete technical suggestion to help this young fellow out?

TR-4 Rotor Operation—"I have a TR-4 rotor which I remounted on a pole some distance from my ham-shack; about 75 feet. I now have a little difficulty calibrating the unit. What gives?"

The "Ham M Man" (Bill Ashby) says you need 18 volts a.c. for proper operation. You must use wire heavy enough for terminals numbers 1, 2 and 4 for proper voltage to be applied to the motor. A voltage drop using the regular 4 conductor cable (about #19

[*Continued on page 118*]

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

semiconductors

For some time, International Crystal Mfg. Co., has been manufacturing a line of wired and tested etched circuit board sub-assemblies. A set of these assemblies was wired together to show how a very sensitive ten meter transceiver could be constructed. The transceiver operates directly from the car battery and no power converter is required.

TRC-1—This unit is a three-transistor converter consisting of an r.f. amplifier, mixer and crystal oscillator. The standard TRC-1 is designed to operate in the range 26.9 to 27.3 mc and produce an i.f. output of 5.89 to 6.21 mc. However, it may be used on the 10 meter band by inserting the proper crystal frequency and repeaking the front end. The conversion gain is 20 db and the noise is less than ½ microvolt.

TRB-1—The TRB-1 strip is a six-transistor, two-diode unit designed for second mixer and i.f. amplifier use. It consists of one high frequency i.f. amplifier with untuned input, mixer stage, crystal oscillator, two low or 2nd i.f. amplifier stages, and a special detector/noise-limiter/squelch circuit developed by International. With the a.v.c. on the low i.f. amplifier, the TRB-1 provides a.v.c. for use on the TRC-1 r.f. amplifier stage. The TRB-1 also provides squelch voltage for use in the audio amplifier. The TRB-1 provides positions for two crystals to produce an i.f. in the 5800 to 6200 kc range. The 2nd i.f. is 455 kc.

TRA-2—This unit is an etched circuit board audio-amplifier using three transistors and a push-pull class B output stage. The amplifier is used as a receiver audio section and for modulating the transistor transmitter. It is capable of producing 300 mw of average power and has an input impedance of either 100K or 50 ohms. The output impedance is either 500 ohms or 3.2 ohms. The idle current is 15 ma, kicking to 85 ma on audio peaks.

TRT-TA—This unit is a three transistor transmitter designed for operation in the 27- 30 mc range. The TRT-2A uses a fundamental crystal in the 14000 kc range and provides two positions for crystals. The crystal oscillates due to base emitter feedback in the first stage. The collector circuit is tuned to the second harmonic of the crystal. The second transistor is a grounded base buffer which drives the grounded base final amplifier. The power output is in excess of 100 milliwatts.

Construction

The units were assembled in an LMB box, number 783 and measures 8″ long, 6″ wide and 3½″ high. The circuit boards are designed to mount above the chassis using the spacers and bolts provided. The switches at the front of the TRT-2A and TRB-1 are mounted on the front panel. A series of 1/8″ holes are drilled in the bottom of the box for mounting the boards. These holes are positioned by lay-

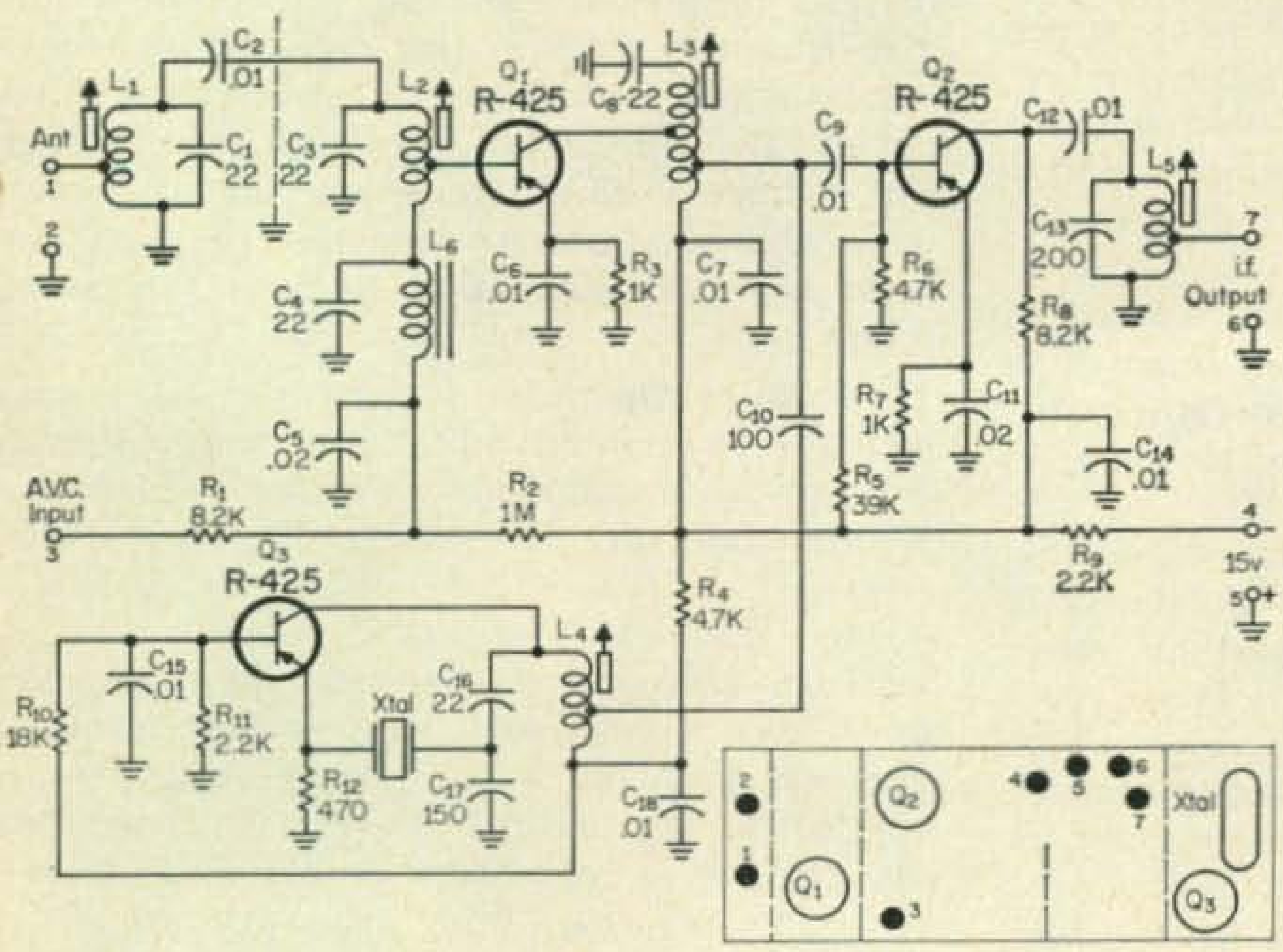


Fig. 1—Ten or eleven meter converter sections, TRC-1. I.F. output is in the 6 mc region.

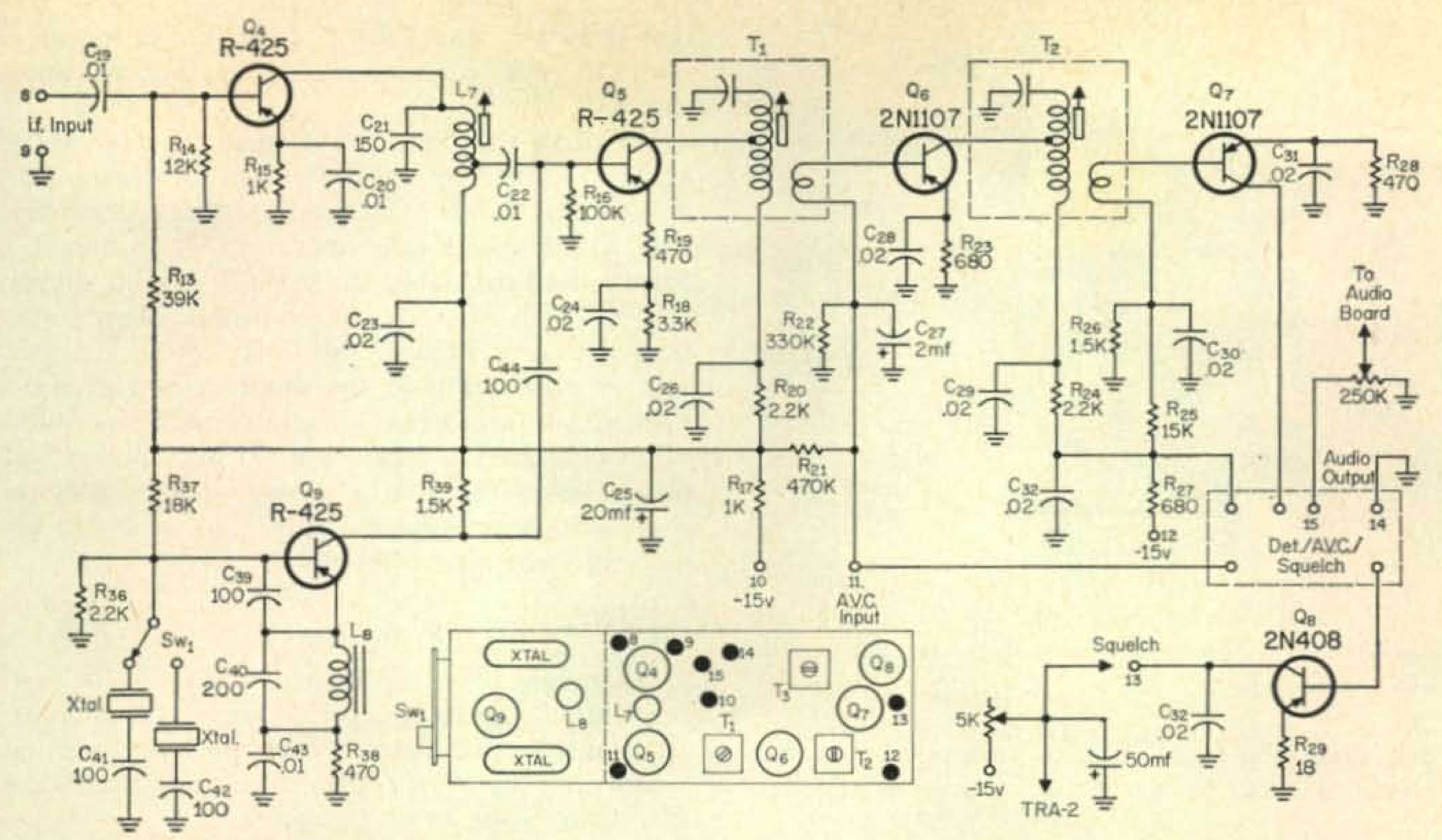


Fig. 2—Second mixer and i.f. amplifier section TRB-1 containing also the detector, a.v.c. and squelch circuits. These circuits are represented by the dotted section for the sake of simplicity. Components shown connected to terminals 13, 14 and 15 are externally mounted and are not a part of the circuit board.

ing the subassembly on the bottom of the chassis and marking the four corner hole locations. Do not tighten the corner bolts excessively as this will break the circuit board corners.

The front panel controls include the frequency switches, TR switch, the volume and squelch controls. The speaker, which also serves as a microphone in this unit, is mounted on the front panel. The antenna jack and optional microphone jack are mounted on the rear panel. An external speaker jack was also added after the photos were taken.

After the subassemblies are installed, wire the interconnections as shown in the accompanying diagram. Clips are furnished with the units so that no soldering to the boards is necessary. Use shielded cable to connect the r.f. signal into the TRB-1 and the audio signal out. The a.v.c. terminal on the TRB-1 is a tight fit. Be careful that this terminal does not short to the case of the mixer transistor. The antenna leads should be coax.

Testing and Alignment

After the unit is completed each section should be tested individually. Connect a milliammeter in series with the power lead to the TRC-1. It should draw less than 5 ma. If it does not, check your connections. Apply a signal of less than 100 microvolts to the antenna. Peak the antenna coil, r.f., mixer and i.f. coils for maximum signal at the receiving frequency. The antenna coil should be repeaked with the unit connected to the permanent antenna. Use a weak signal for this adjustment. Note that adjusting the crystal oscillator coil

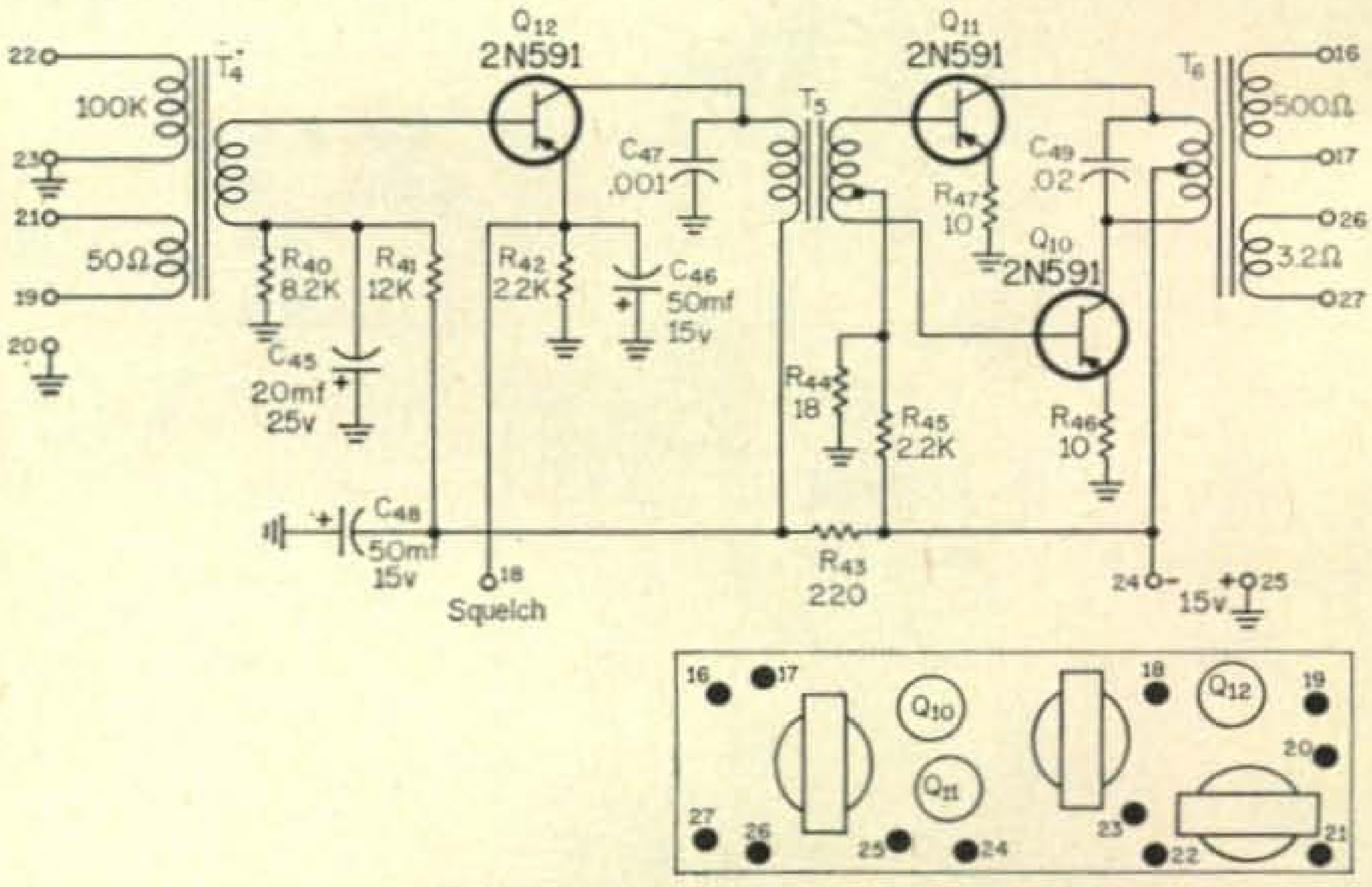
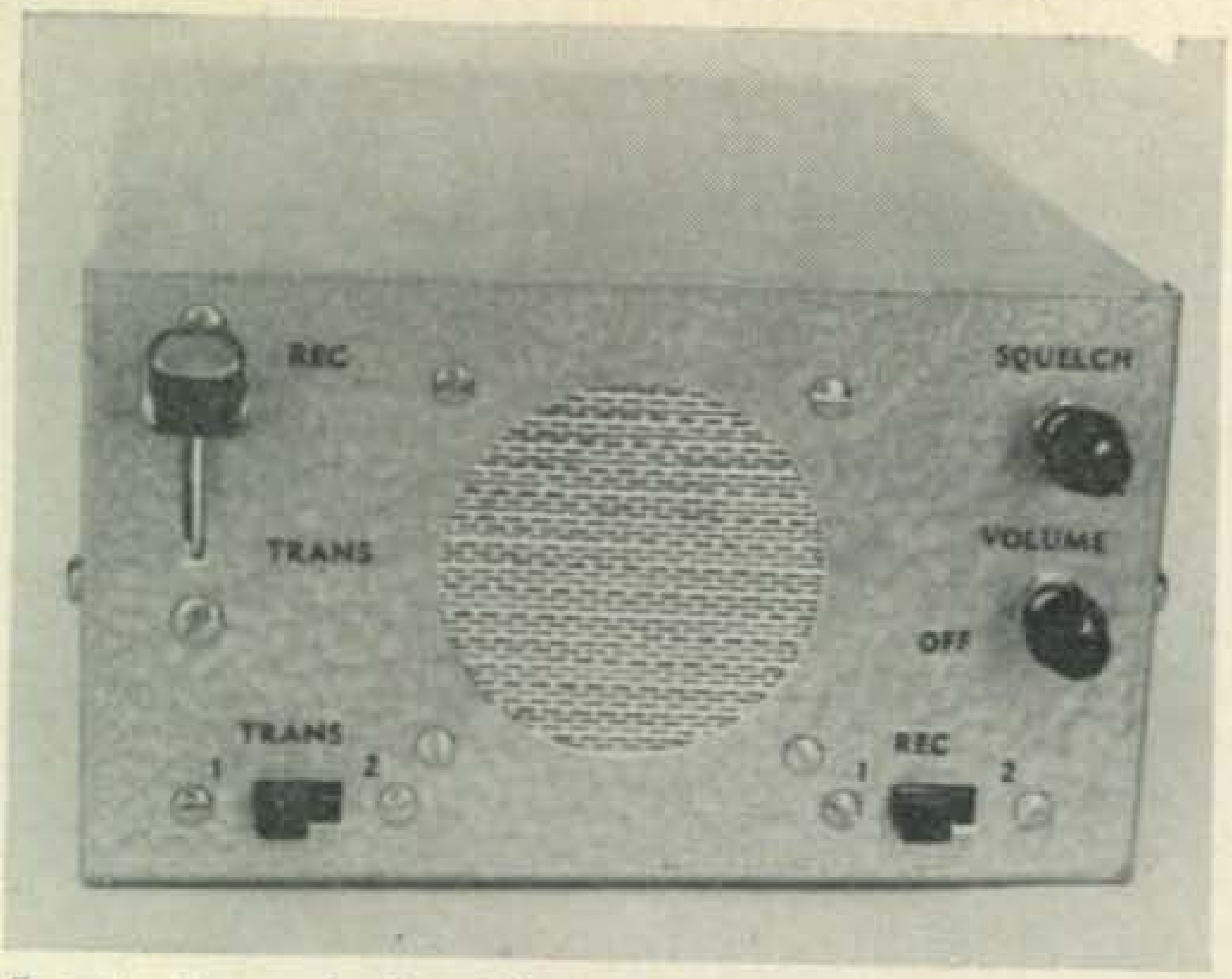


Fig. 3—Schematic of the TRA-2 etched circuit audio section.



Front view of the 10 meter transceiver using the International Crystal Mfg. Co. etched circuit subassemblies. In this unit the speaker is used as the microphone.

will drop the oscillator in and out of oscillation. It should be set in the middle of its oscillating range.

Apply power to the TRB-1. It should draw no more than 10 ma. The 455 kc i.f. amplifier stages have been aligned, but the peaking can be rechecked. Check the operation of the squelch. It should activate the receiver with any signal exceeding one microvolt. Check the current drawn by the TRA-2. It should be no more than 15 ma when not amplifying an audio signal.

To peak the TRT-2A, connect a volt meter across R_{52} and apply +12 volts to terminal 28. Adjust coil L_{10} for maximum voltage consistent with stable oscillator operation. Trimmer C_{46} can be used to rubber the crystal around slightly for net operation. Next, complete the connection between 29 and the T-R switch, connect a #49 pilot lamp to the antenna and energize the transmitter. Peak all adjustments for maximum brilliancy indicating maximum power output. The bulb should glow very bright and should indicate upward modulation when you talk into the microphone.

Frequencies

Although these units are designed for Citizen's Band operation, they can be supplied for 10 meter applications. Naturally you are not hamstrung by CB regulations and can adjust the rig to your heart's content.

You will have to order the proper crystals for the units, however. Your two ten meter transmitting frequencies should be within 100 kc of each other. Once you decide on these frequencies, divide the number of kilocycles by two. This is the frequency of the crystals. The

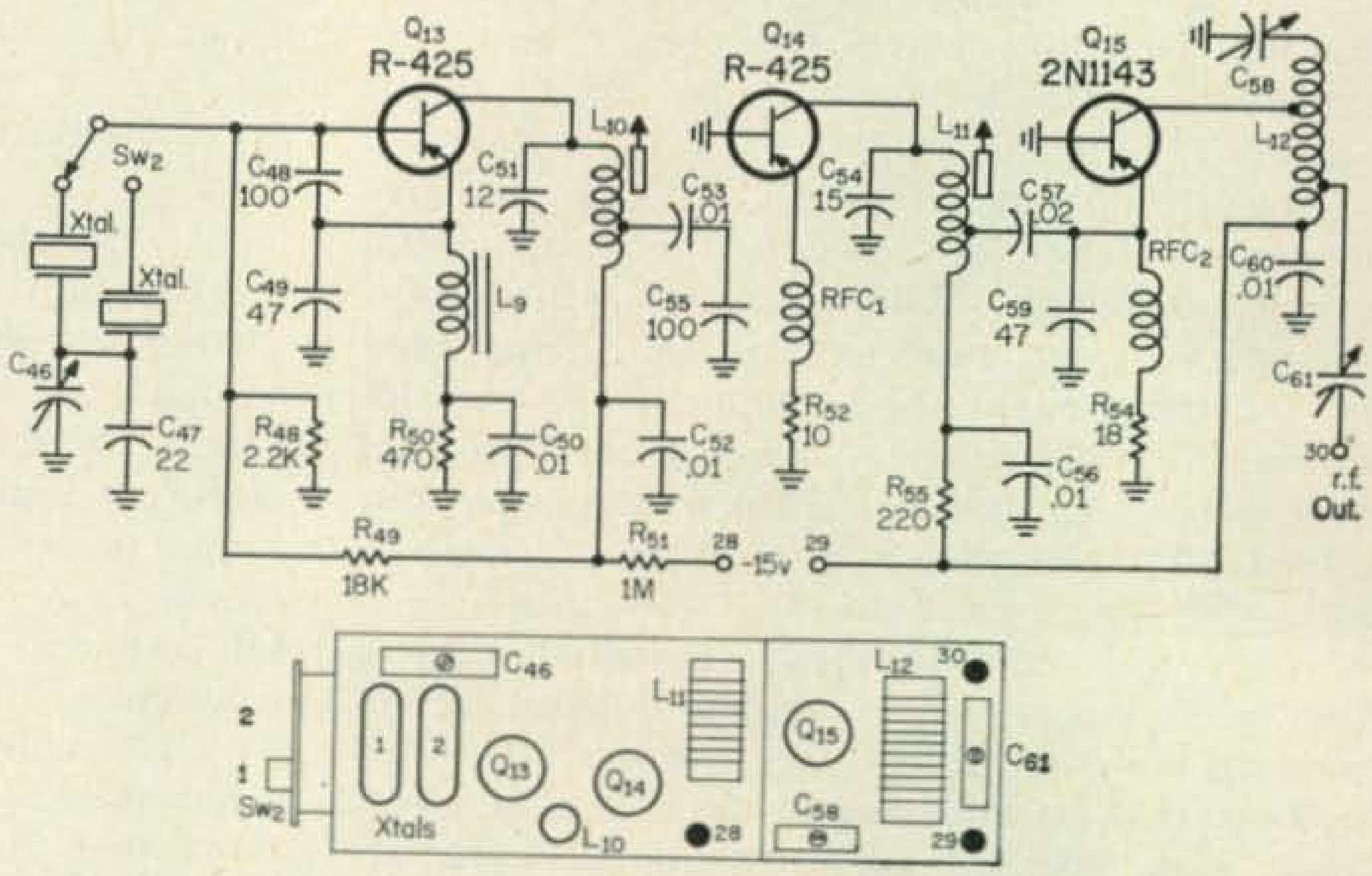


Fig. 4—Schematic of the TRT-2A transmitter circuit board. Two crystals are selectable by a slide switch mounted to the end of the board.

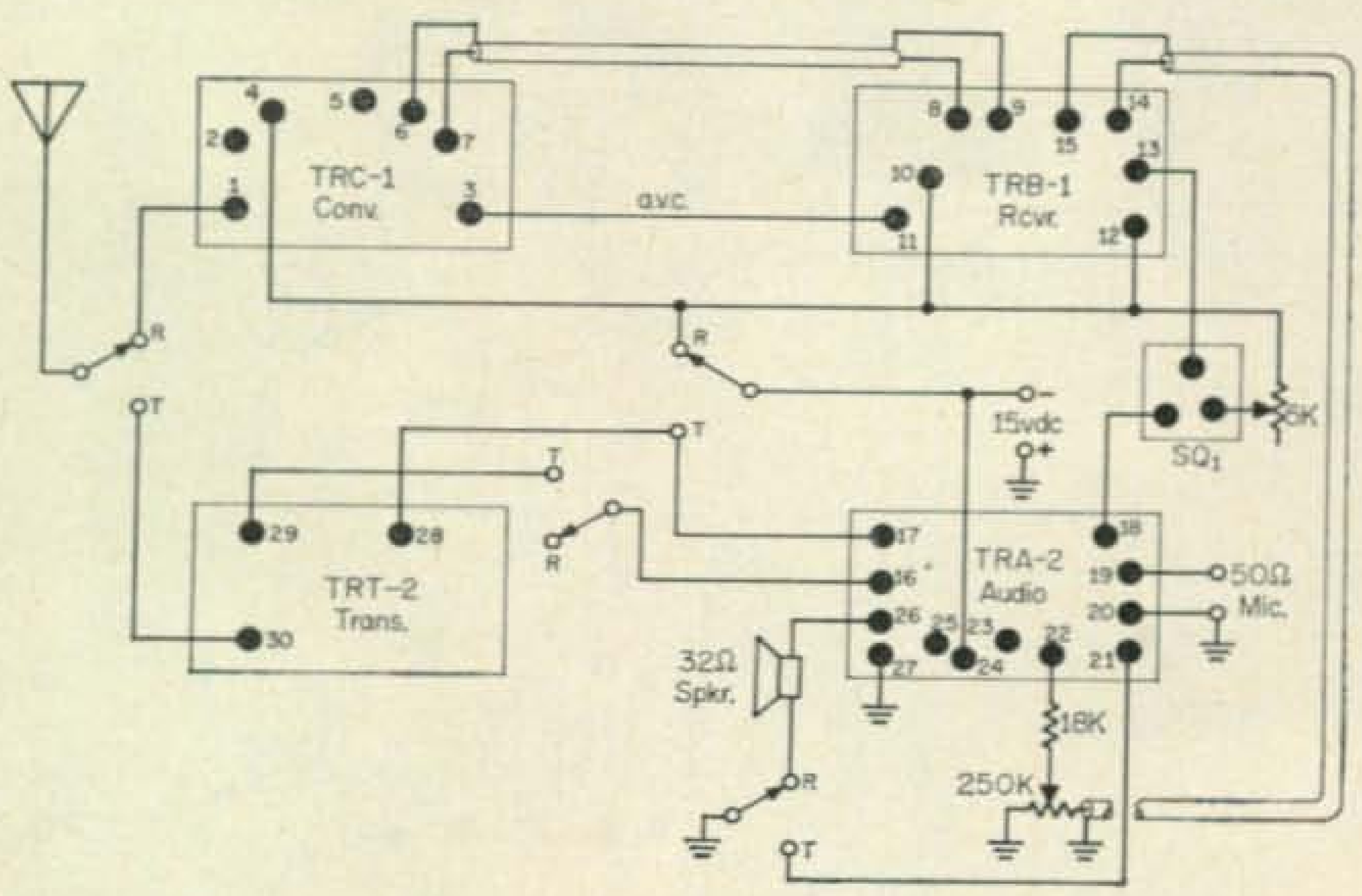
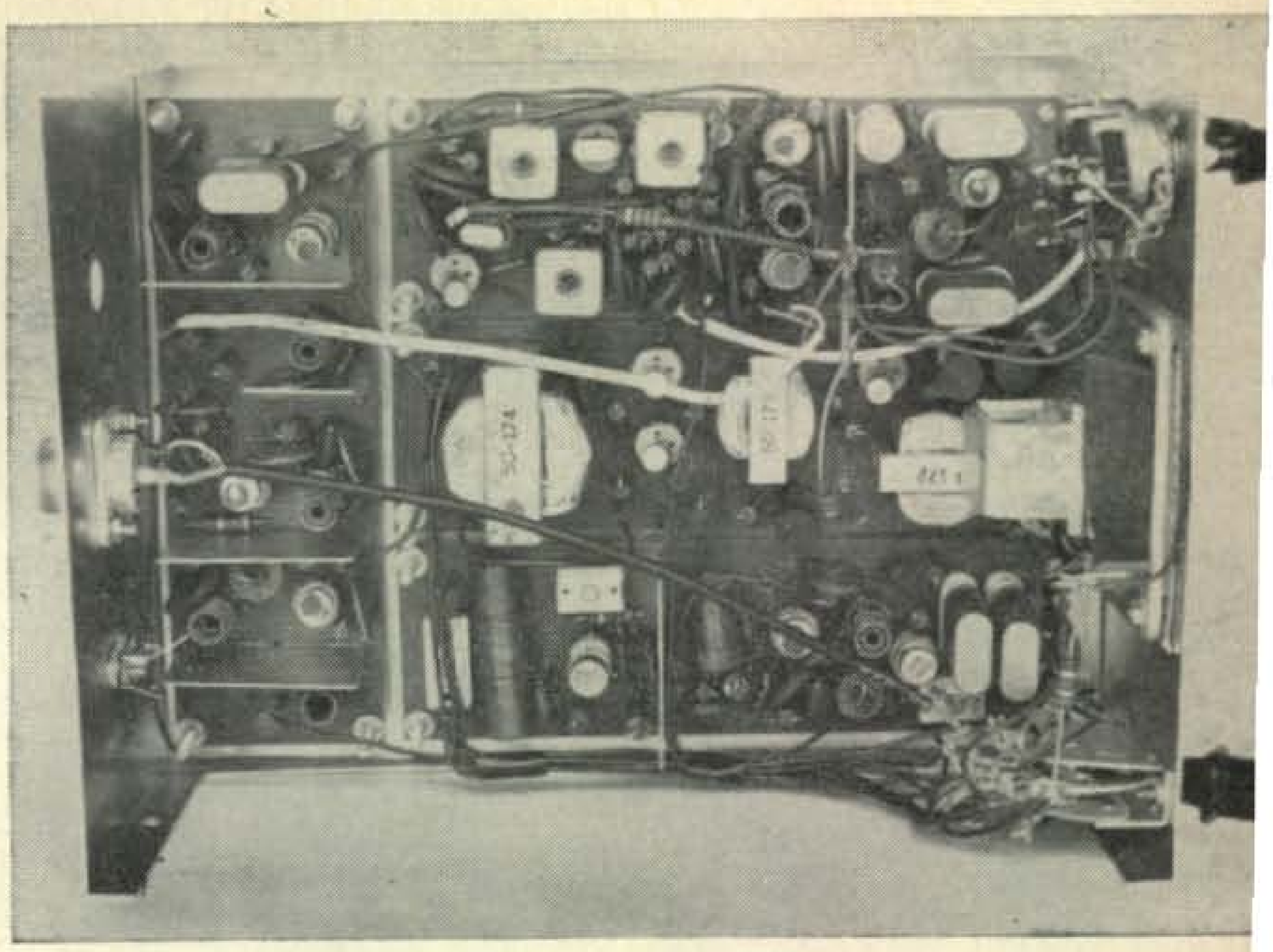


Fig. 5—Transceiver interwiring diagram using International Crystal's transistor subassemblies.

converter crystal should be 22.7 mc if you want to operate in the low end of the 10 meter band. This will heterodyne 28.5 mc to 5800 kc and 28.9 to 6200 kc. Thus you will be able to receive between these frequencies. The receiver crystals should be selected to receive on the same frequency as the transmitter operates and are determined as follows: Say you wish to operate on 28.7. Subtract from this the local oscillator crystal of 22.7 mc. This is 6 mc even and is the 1st i.f. This frequency must be heterodyned to 455 kc so the 2nd oscillator crystal would be 6455 kc. In other words, you subtract 22.7 from the operating frequency and then add 455 kc.

Although no coil data is given, most amateurs can reproduce the circuitry with the aid of a grid-dip meter. The transistors used in the converter, oscillator and buffer of the TRT-2A and the mixer oscillator portion of the i.f. strip are R-424's or SO-65's. These transistors are identical, however the SO-65's have slightly less noise and are used in receiver circuits. The final transistor is a TI 2N1143 and the audio transistors are RCA type 2N591's.

The transistor transceiver has been used over a path 5 miles long with Q5 signals both ways. One end of the circuit used a three-element beam up 40 feet while a doublet on a roof was used at the other end. This range can be interpolated to other installations.



Interior view of the unit showing the location of the subassemblies. Note that felt is glued on the speaker openings to improve its frequency response.

Semiconductor News

General Electric Co., Rectifier Division, Auburn, N. Y. has announced a new line of miniature Vav-V-Sel selenium rectifiers in a paper-base, phenolic cartridge which is approximately 50% the size of standard units. They are available with PRV's up to 31,500 volts. Brochure 180.50 provides additional information. New from GE Semiconductor Products, Liverpool, New York, is a series of high-speed germanium mesa transistors, types 2N705, 2N710, 2N711 and 2N725, designed for high speed switching applications, and feature a total switching time of 96 nanoseconds. Publication PR-10 gives more data on these devices. Also of interest are three new high voltage germanium transistors, types 2N1924, 2N1925 and 2N1926, which feature 60 volt breakdown ratings and are usable in audio and high voltage switching applications. For more information request specification sheet number 20.80.

Minneapolis-Honeywell, Semiconductor Division, Minneapolis 8, Minn., have a very interesting line of tetrode power transistors, types 3N45 through 3N52. Of interest to experimenters and amateurs is the 3N51, a 40 volt, 15 ampere, 94 watt unit, priced at $7.20 in single quantities.

International Rectifier Corp., El Segundo, Calif., is featuring an experimenters package, that is, a booklet on solar batteries and your choice of selenium, silicon or cadmium sulfide cells. The most interesting unit, the silicon solar cell, is priced at $2.25 amateur net. The booklet is given free with each cell. Having written the booklet for IR, I must show restraint in my praise of it—hi. It's terrific! The latest issue of *Rectifier News* contains an article on several novel ways to employ silicon rectifier cells and also Semiconductor High Voltage Technology.

If you work with parametric devices and are interested in Varicap frequency multipliers, be sure to request a copy of "Analysis and Design of the Varicap Frequency Doubler" by George Luettgenau from Pacific Semiconductors, Inc., Hawthorne, Calif. It is undoubtedly the most comprehensive work on this subject this writer has seen. Also of interest from PSI is a series of 15 high voltage micro rectifiers and 17 full wave micro bridge rectifiers. These devices have PIV's as high as 20,000 volts. Detailed specifications are available by writing PSI.

Philco Semiconductors, Lansdale, Pa., have announced a series of silicon photosensors for use in photodiode readout circuit in data processing equipment.

Radio Corporation of America, Sommerville, New Jersey, are marketing a multiple diode assembly to simplify computer manufacturing. The double and triple units are designated 2DG001 and 3DG001, respectively, and are housed in a TO-33 package.

Sylvania Electric, Woburn, Mass., have expanded their germanium alloy switching transistor line approved for military applications. They include the 2N1306 through 2N1309 and feature a wide range of beta, frequency and voltage control.

That covers the semiconductor field for another month. The big WESCON show, in San Francisco, is on the agenda for later this month and should provide a source of new developments which can be expected in the next 12 months.

73, de Don, W6TNS

sideband sideband sideband

SIDEBAND

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

SSB DX HONOR ROLL

TI2HP	245	K6ZXW	191
W6UOU	236	W2LV	190
W8PQQ	236	PZ1AX	182
PY4TK	227	W3KT	179
HB9TL	227	K2FW	177
W3NKM	226	KØCTL	175
VK3AHO	220	W2VCZ	175
WØQVZ	219	W2YBO	171
VQ4ERR	218	XE1AE	167
W6RKP	218	YV5AFF	163
W2ZX	218	W3VSU	161
W6PXH	215	W7DLR	158
K2MGE	213	DL1IN	155
W5AFX	211	W6EKZ	154
W6WNE	209	UR2AR	154
W6BAF	208	W2HXG	152
ON4DM	205	W1ORV	152
W4OPM	202	W6YMV	150
W2FXN	201	K1IXG	150
W5IYU	201	K6MLS	150
W8YBZ	200	WØPGI	150
K4TJL	200	XE1SN	150
W1OOS	200	K2TDI	150
WØCVU	195	W6VUW	144
MP4BBW	192	PJ2AA	142

CQ SSB CERTIFICATES AND STICKERS

Worked 50

K5UXP	K8COI
W6WWQ	K6RPZ
W8TTN	WØMCX
SM5BPJ	CR6CA
OE1FF	K4SDC/CN8

Worked 75

ZS7P	W7BPS
W6WWQ	K8LSG

Worked 100

LA6VC	K2YIY
WA6EYP	DL7AP
UA3FG	W5KC
KØRDP	K5OGP
W4OM	K5MDX
SM5AQV	W1UOP

Worked 125

YV5AFF	HB9J
DJ3CP	WA6AMZ
W7DLR	

Worked 150

YV5AFF	W7DLR
DL1IN	XE1SN
WØPGI	W1ORV
UR2AR	K2TDI

Worked 175

PZ1AX	W3KT
KØCTL	W2VCZ
W1OOS	

Worked 200

VK3AHO	W1OOS
K4TJL	ON4DM
W5IYU	

Worked 225

W3NKM	HB9TL

SSB DX Honor Roll

We'd like to remind sideband DXers that you must keep your listing up to date at least every three months in order to remain on the Honor Roll. This rule has been formulated in fairness to those who continue in the DX race and who constantly strive to raise their score of countries worked on 2 way sideband.

We must also request that, when sending future listings, you certify over your own signature that the confirmations are for *two-way single sideband operation.*

Just a word about the sending of QSL cards. We urge that you send your cards to us via certified mail with return receipt requested. In this way, you can be sure that the cards have been safely received by us and need not have to resort to long distance calls nor special delivery letters to calm your fears. Every effort is made to return your cards as promptly as possible but, with the ever increasing number of sideband DXers submitting cards, it does take more time to check the lists and we ask for your patience.

Reciprocity in the Making

The mail usually is full of interesting and informative letters and bits of information but none recently so welcome as a piece of paper sent to us by Ray, W6MLZ, ARRL Southwest Division Director. This bit of paper with the magical numbers S. 2361 entitled "A Bill to Amend Sections 303 and 310 of the Communications Act of 1934 . . ." was introduced by Senators Goldwater, ex-6BPI, and Schoeppel; has been read twice in the Senate and has been referred to the Commerce Committee for further action.

Briefly, this bill would amend the Communications Act of 1934 to permit the licensing of foreign hams in this country if their home country licenses or would license American hams on a reciprocal basis.

At the recent Phoenix convention, Ray had the opportunity to discuss reciprocal licensing with Senator Goldwater and to urge the introduction of such a bill. S.2361 was the result of this meeting and now that the ball has been started on its course by Ray and Mr. Goldwater, it is up to those of us who believe that reciprocal licensing is needed and necessary to make sure that the initial momentum is given an extra push to put it into orbit.

The Commerce Committee of the Senate has a great many bills to consider during their sessions; we grant that there may be more important bills for the Senators to consider and we have a sinking feeling that this bill could be buried under tons of paper if it is allowed to make progress under its own weight. But this need not be the case if those Senators are on the receiving end of thousands of letters and telegrams urging prompt affirmative action in committee and their approval in reporting out this Bill to the Senate itself.

If you feel that reciprocal licensing is important, and in the considered opinion of many people this act of friendship and trust would go a long way with many people around the world, let the Committee of Commerce of the U.S. Senate know that you want this bill, Senate Bill S.2361, reported favorably to the Senate for prompt passage. Don't wait for the other guy to do it—do it yourself! Send that letter or that telegram now!

The start of Senate Bill S-2361—Senator Barry Goldwater of Arizona with Ray Meyers, W6MLZ, at the Phoenix Convention as they set the wheels in motion for the Senate bill on reciprocity which the Senator introduced on August 1.

Lend A Helping Hand

Were you ever lost in a Pacific island jungle for 31 days, alone and despairing, finally to have a friendly group of natives save your life? Did you realize your dream and return sixteen and a half years later to show your appreciation? This is the story of Fred Hargesheimer, WØEBG, of White Bear Lake, Minnesota, a story that has been re-told in a fascinating manner in a booklet *I Had To Go Back*.

Nestling on the eastern side of Cape Deschamps on the North coast of New Britain lies the village of Nantambu. It is a tiny village, the home of thirty to forty primitive natives of the East Nakanai tribe. In World War II, Nantambu was an important barge staging point for the invading Japanese forces. In recent years, it has become a sort of tropical backwater, visited only by the occasional administrative patrol, itinerant missionary, and trader of copra and trochus shell.

In July of 1943, the people of this village found a lone American airman wandering in the jungle into which his plane had crashed. Because these natives were imbued with rudimentary Christian ideals and beliefs brought to them by the first missionaries, they nursed this airman back to health and protected him from the enemy. Many an airman who crashed in the jungle owes his life today to the heroic efforts of these people.

In the spring of 1960, Fred Hargesheimer re-visited New Britain and the natives who saved his life during the war. On his return to the States, Fred and a few friends established the "Airman's Nantambu Memorial Foundation." The dual purposes of this Foundation are to encourage the growth of Christian leadership and build a living memorial to the natives of the South Pacific who risked their lives to give aid to members of the Allied Forces. An immediate objective will be the construction of a school in New Britain to further the education of a thoroughgoing Christian character among those people.

Small nameplates will be placed on each desk, each chair, each book. The nameplates will bear the legend "This is a gift, with love, from . . ." Your nickels, dimes, and dollars are needed to carry on the work started by WØEBG. Send your contributions today to "The Airman's Nantambu Memorial Foundation," c/o First State Bank, White Bear Lake, Minnesota. You won't add a "rare country" to your list but you'll find that this is the best contact you have ever made!

"G" Whizzes

Surrounded by s.s.b. transmitters, exciters and linear amplifiers in ever increasing numbers, we could very easily lose sight of the fact that we have no corner on the market when it comes to putting a nice neat package around some fine s.s.b. circuitry. Some of you may have seen or heard the K.W. "Viceroy" on the air but most of you I'll wager are strangers to a beautiful package made by K.W. Electronics over in G-land.

Here is the latest photo of two of the world's most popular and successful DXers. Paula, EA2CQ, and Juan, EA2CA of San Sebastian Spain, are the world's outstanding amateur radio couple with a joint total of over 500 countries confirmed on phone.

Running 175 watts p.e.p. from 80 through 10 meters, it features all of the niceties we find in our own commercial rigs: a.l.c., vox, anti-trip and a real fine stable v.f.o. along with a claimed carrier suppression of 45 db and unwanted sideband suppression of 40 db. The carrier is generated at 435 kc and a pair of crystal diodes are used as a balanced modulator. A half-lattice filter is used for unwanted sideband rejection and to provide a band-pass flat within 3 db from 250 to 2800 cycles. Complete with power supply, it sells for £ 125. At the prevailing rate of conversion, this is about $350. The exciter version, similar in appearance to the transmitter but with an output of about 8 watts p.e.p., sells complete with power supply for £ 87/10; about $245. It will drive linear 6146's or a single 4-125A to full output.

In the high power department, there is the KW 500, a 500 watt p.e.p. input grounded grid linear which can be driven by any 100 watt output transmitter like our HT-37, 32S-1, or the "Viceroy" itself. This unit, complete with 1750 volt power supply goes for £ 87/10; about $245.

Before you rush to the store to try to buy one of these gems, remember there are a few things like import duties. A comparison tho' shows that the average ham in England still has a tougher time in acquiring commercial gear than the average American ham. Refusing to let this stop him, the G-operator is still assembling many a beautiful sounding "home brew" rig. We doff our hats to these gentlemen.

On the other side of the ledger, our own gear is being sold "over there" and as an illustration of the difference in price, a Hammarlund receiver, the HQ-170 sells for £ 184; about $515. This unit sells in the States for $359. It isn't hard to see why there is so much construction going on in other countries where the dollar is harder to come by.

Hats Off To VK2QJ/YJ1ZA

There is a gentleman sidebander named John W. Birdsall. His call is VK2QJ and he lives in Sydney, Australia. During the second week in July, this gentleman sidebander went on a DXpedition to New Caledonia (FK8) and New Hebrides (YJI). John contacted thousands of sidebanders, probably most of them Americans. Without waiting for the receipt of dollar bills, IRCs, or stamped, self-addressed envelopes, John sent a QSL card to each one of his contacts. Sometimes, he sent two—one to the bureau and one direct—all of them by Air Mail. John must have spent countless hours looking up addresses in the *Call Book*. John must have spent a great deal of his money on postage. Did you write to John to thank him for his great and unique courtesy? We hope so!

Getting the Right Start on Sideband

Last month's column brought you a brief and simple explanation of how to receive sideband and how to ready your new sideband transmitter for on-the-air operation.

Before making your first sideband contact, you should understand certain facets of good sideband operation. You can make more contacts (local or DX) with less power than you could previously on phone. You can make contacts more quickly through the use of vox if you use it properly. This means that you should no longer indulge in interminable CQs nor in long-winded monological transmissions. As Joe, W4OPM, points out, a beginner in sideband can almost always be singled out by the way he calls CQ. He keeps calling and calling until, often, those who would answer him, weary of the waiting and slide off the frequency. This is a hangover from the days when long calls were necessary since one did not expect an immediate on-frequency answer. This is unnecessary on sideband!

The Ryden family of Birmingham, Michigan, sure believe in "togetherness." Seated, l. to r., Alcia, K8RBB; Mary K8ONV; Sally K8ONW; and standing Ken, K8OHG. You can't tell from the photograph that Mary and Ken are the proud parents in this sideband family; they don't look much older than their girls!

Call CQ no more than three times followed by your call three times with the information that you are "standing by" or "listening on the frequency." (Naturally, if you are looking for answers on other than your transmitting frequency, you indicate exactly where you are listening. This will be discussed further in "Working DX on Sideband.") If your first call goes unanswered, try it again. No luck? Band conditions may be poor for your area; or, more likely, there is another QSO or CQ on frequency with the signals being stronger than your own. Try another part of the band or answer another station, or, if that fails to bring a response, break into a roundtable of strong signals and find out if your rig is operating properly.

Now, one point that we ask you to particularly keep in mind. Before opening up on a frequency, *always but always* listen for a few minutes to see if the frequency is in use. Even if it sounds vacant to you, always ask first "Is this frequency occupied?" Ask the same question again. Maybe the fellow on the frequency who could hear you was listening so intently to his contact (which you couldn't hear) that he didn't come back to you right away. Maybe the other end of the contact was so strong that you couldn't be heard the first time. If your inquiry whether the frequency is clear is answered with "Yes, the frequency is occupied," just say: "Thank you," move on, and repeat the procedure until you find a clear frequency.

To get back to the length of your transmissions after your CQ has been answered, we take a passage from the notes of VK3AHR: "Sidebanders should keep their transmissions brief and pause frequently to listen. The other fellow will probably want to comment without delay on your remarks or he may not even be copying you due to a change of band conditions or the arrival of interference on the frequency.

"When making a transmission, don't 'send double'; in other words, don't repeat your words

From the frozen depths of Camp Century in Greenland where he is pictured at the operating desk of KG1CC, Tom Cruse was transferred to the sunny grounds of Ft. Belvoir, Virginia, now using the call K4WCC.

Kermit, W9YMZ, proudly displays his call license plate in his Northbrook, Illinois shack where he is now also displaying his "Worked 100" certificate.

incessantly unless your report is less than Q4 or you know that it will be appreciated by the other party. You need not say 'over' when you wish the other fellow to speak (unless during phone patching). Your contact will know from your voice inflection or the contents of your transmission when you want him to pick up the ball.

"Never cover more than one subject in one transmission. The old phone method of covering 20 subjects during a 5 to 10 minute single transmission, replied to by 20 corresponding comments from the other party; should be dropped as it is completely antiquated in sideband operation.

"The excessive use of phonetics should also be eliminated. 'CQ DOG XRAY,' 'JAPAN ONTARIO HONOLULU NORWAY,' 'LOUIS OCEAN SUGAR AMERICA NORWAY GERMANY ENGLAND LOUIS ENGLAND SUGAR' — all are superflous! The excessive use of phonetics in circumstances where you are putting through a Q5 signal, immediately stamps you as a poor operator, the common name for which is lid."

Now, let's bring up the matter of "moving down five." Again, we quote W4OPM who points out that the fault is in not checking the frequency "down five" first. If you are in contact with another station and find that he is becoming difficult copy, suggest to him that he stand-by while you scout around for a clear frequency. When you have found one, come back and ask him to listen to see if the new frequency is clear from his end. If it is not, let him find a frequency that is acceptable to you both. But don't move down until you are sure that you will not be interfering with another QSO already in progress on a frequency "down five."

Now to get to that all important moment when you're ready to make your first two-way sideband contact. Since you're probably not yet sure of the potency of your signal, we suggest that you locate the loudest station calling CQ on the band. You zero-beat his frequency. "Zero beating" is accomplished by placing your transmitter on CALIBRATE and moving your v.f.o. until the null of your signal is exactly on top of the signal to which you are listening. You answer his CQ by replying: "W3XXX, this is K9XXX, K9XXX; do you copy?" If you receive no response, try it again. This time he hears you and you've started on the most fascinating aspect of amateur radio-single sideband operation!

This discussion will be continued next month. Again we urge you to send us any questions or comments on this series.

Sideband Around The World

Calgary, Canada, now boast the Calgary Association of Sideband Amateurs with VE6TF as President; VE6IN, Vice President; VE6VK, Secretary-Treasurer; and VE6VP, Director. The purposes of the Association are to promote sideband in Calgary and to promote a national Canadian amateur radio organization. All VE6's are invited to join the group . . . Correction Please. There has been no change in the HV1CN QSL managership, as erroneously reported in August. Mack, W2BIB, will continue as the sole distributor of these much wanted pasteboards . . . We hope that Manuel, HP1ME, is recovering satisfactorily from the fall that broke his leg in three places . . . And speaking of Panamanian sidebanders, one of the most delightful to chat with is John, HP1JF. He has a long and interesting record of diplomatic service and was, in fact, responsible for the third party traffic agreement between the U.S. and Panama. Although John is the father of four married children and is a grandfather five times, he's promised to demonstrate the exciting "Tamburito" dance on his next visit to New York . . . Renan, PY7VBR, who is an electronic technician in Ceara, Brazil, is encouraging his XYL to continue her amateur radio studies so that she may use her call, PY7VGO on the General bands . . . A newly active couple on sideband are Tom, EL2G, and Jeannie, EL2N. Each provides a most interesting contact . . . Warmest congratulations to Rene, OE1RZ, and XYL, who welcomed their second child, first son, Hans Christian, on June 30 . . . As a navigator for BOAC, Eric, G3HUA, has the opportunity to indulge his love of travel. He, XYL Christina, and son Terry are used to packing at a moment's notice for departure to almost anywhere in the world . . . EA8BA in the Grand Canary Islands now has a new operator, our good friend, Forrest, W5YOR, of Houston, Texas. As a field project engineer, Forrest operated from many areas of the States before going to Nigeria last year, the first place where he could not use his KWM-1. With his XYL, Bertha, at his side, he is looking forward to renewing many friendships from EA8BA . . . We were saddened to learn that Bill Kohler, OA4GM, had become a Silent Key . . . Arnold, PZ1AP, who has only recently joined us on sideband, will soon be leaving for The Netherlands where he plans to study electronics for the next 3 or 4 years . . . We're looking forward to the return of Bill, PZ1AX and his lovely XYL from Europe where they spent a month's vacation to be followed by a month's tour of the USA. . . . When Ron, G6LX, paid a short visit to the States in early Summer, he amazed Sam, W3HN, with his unerring sense of direction and the speed with which he made his way from Washington, D.C. to Sam's home in Chevy Chase, Maryland, a route that confuses many visitors who are more familiar with our highways than is Ron . . . ZB1A, a permanent resident of Malta, is keeping the sideband fraternity happy with his frequent appearances . . . 4X4IX and 4X4DK now share a mutual QSL manager who is Jack Bromberg, WA2-KNC, Apt. 5, 463 Berriman Street, Brooklyn 8, New York Incidentally, our best wishes to Jack who married a lovely Italian girl, Bianca, in London in September and brought her back to the States.

We join his many friends in wishing a long and happy life to the newly married David Packards. Dave, who made a host of friends as YN1TAT, was married in early August and now has taken up residence in Haiti . . . Another change in location was made by Tom, ex-KG1CC, who now operates from Fort Belvoir, Virginia, as K4WCC . . . Because of poor conditions, Bruno, I1RIF, made only 100 contacts from Sardinia as IS1RIF in early August . . .

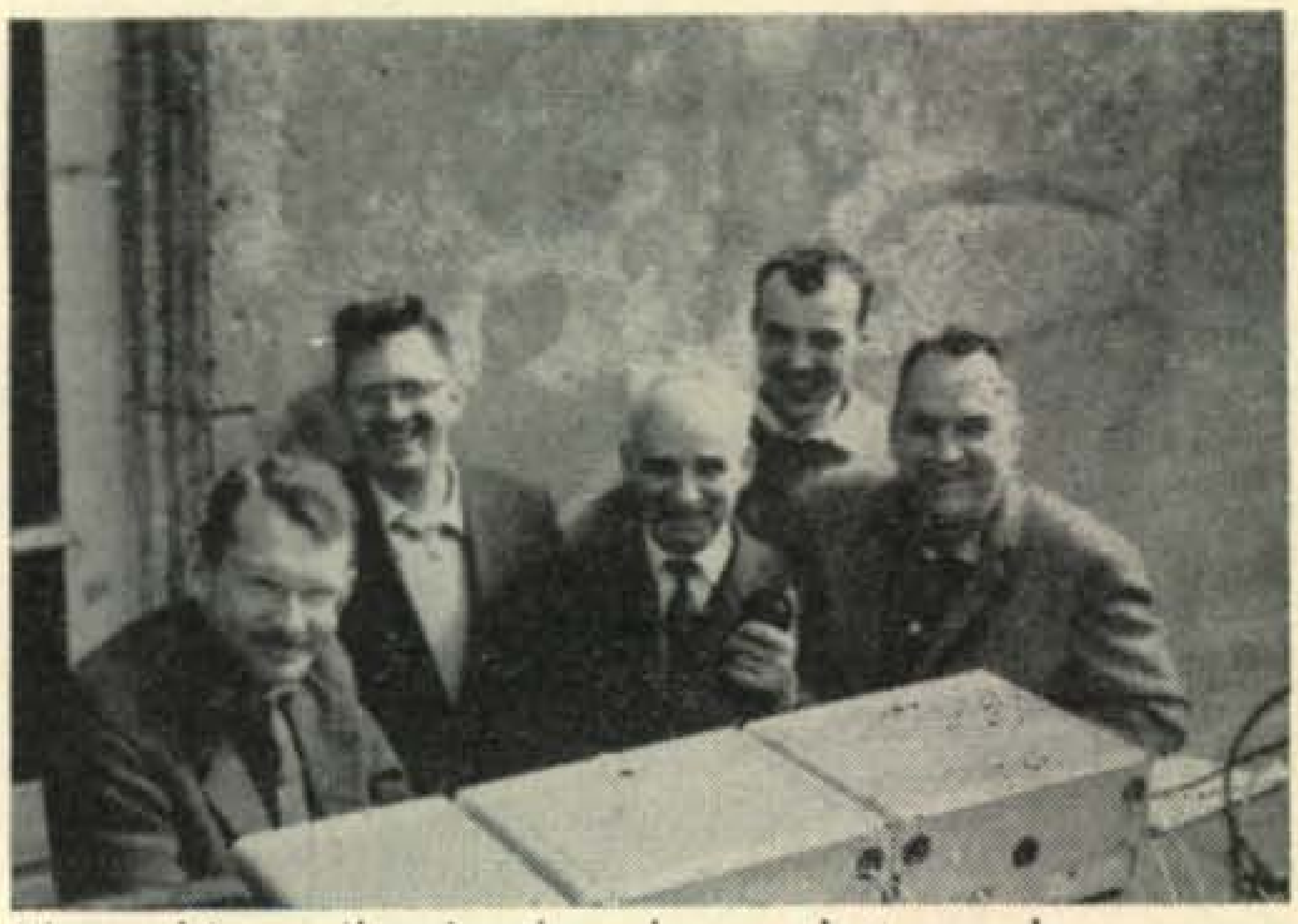
A DXpedition that really came off successfully was that of Art, K2VQQ, to the Balearic Islands. Although Art's visit was of short duration, he left his KMW-1 with Lorenzo, EA6AZ, who did a yeoman's job of operating and satisfied most of the demand for this new country on sideband . . . If any of the newer monkeys in your local Zoo arrive wearing a VQ9TED QSL, don't be too surprised! Ted is now in the wilds of Tanganyika catching monkeys for shipment to U.S. Zoos . . . If you were as confused as we were to hear UW9CC on sideband, we can clear up the mystery of this unknown country by pointing out that the Russians have encountered the same problem that we have. They've used up the UA calls and new stations are now given UW prefixes . . . John, operating from VR5RZ, capably demonstrated how a rare DX station can control the pile-ups; when his instructions were ignored, he just stopped operating!

We share the joy of Robby, VQ4ERR, whose family was enlarged by the addition of another grandchild, born to his daughter who lives in Trinidad . . . Les, G8KS, really had a fine arrangement for himself on his visit to the Channel Islands. Using the call, GC8KS/A, Les operated stretched-out in a comfortable lounge chair on the lawn of the White House Hotel on the island of Herm; used the battery power from his car and employed the services of his son to log the contacts! . . . It was good to hear that Frank, VQ4RF, overcame an attack of the flu and then pneumonia, plus several relapses, during the summer. Last news we had was that Frank was well along the road of complete recuperation . . . DVers will be delighted to learn that the departure of Paul, K6CQV/KS6, from Pago Pago, slated for mid-August, was delayed. Paul received a new batch of cards and was trying to catch up with the backlog of 1200 waiting for his confirmation . . . Newcomers to sideband include HM2QA in Korea; UF6BC in Georgia; and JA3UI, as well as a brief appearance by UA0BP in elusive Zone 18 . . . Bet there's no doubt now in the mind of Neil, VK3HG regarding the effectiveness of his new V-beam. The morning we heard Neil, he was the loudest station from Australia. Make it permanent, Neil? . . . Thanks should be given to Bob, MP4BCC, who is unfailing in his courtesy and cooperation when it comes to helping W/Ks make new DX contacts. If you stop to realize how much of his operating time is devoted to this endeavor, you will surely try to reciprocate Bob's courtesy.

Band Hopping

Mac, W2BO, buddy of our Contest Columnist, Frank, W1WY, had been on c.w. since 1912 but finally in 1961 joined the sideband fraternity. We don't know if Mac can break the c.w. habit completely but he sure makes a fine sidebander . . . Another old-timer, Erv, W2LT, switched to sideband this year partly to contact his son at BV1US but also because he found himself enjoying more and more s.s.b. roundtables while he was still on a.m. Erv is a fascinating conversationalist and has a wealth of experinece in the communications field . . . 75 and 20 meters were even duller than usual this summer with Alice, K4TGA, and Ham, K4TGB, out in the Mid-West visiting his family . . . Syd, W8UTQ, was none other than 3V8CA home in Grand Haven, Michigan, for a summer of relaxation. He planned to return to Tunisia in early September with a beam that should help his signal considerably . . . When Lou, W0CGE, is missing from the band, you can be sure that he's out with his family overseeing the building of their new home in Des Moines . . . It was nice to meet another Atlanta, Ga. operator, this time on 40 meters. Cal, W4TTT, was pounding his way through the QRM when we first met and we managed to learn that he works at the Atlanta Airport . . . Tony, K4QNV/5, is an Air Force pilot but is now attending the University of Oklahoma where he is studing Industrial Engineering under the AF Training Program . . . Heartiest congratulations to the

Young "Gus" Dotti, I1KL, of Rome, Italy shown with his fine homebrew equipment which puts out such a potent sideband signal *(Photo courtesy of W2BNC)*



Those big smiles in the above photograph were occasioned by a first demonstration of sideband at a French hamfest in Sion during the summer. Chuck, F7BD (second from left) and Russ, F7CR (extreme right) delighted the French hams including Terry, (left), Louis Miranda, F2LM (center) and Vic, (fourth from left).

Roger W1UOP, must be phoning one of his buddies in Needham, Massachusetts, to tell him about all the rare DX he's been working lately. There won't be any bare spots left on the walls when all of Roger's new certificates are displayed.

members of the Chicago Area Radio Club Council who did an outstanding job of presenting amateur radio from the International Trade Fair in Chicago during late July and early August. Using sideband, the group was

[*Continued on page 114*]

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

Novice

AN amplifier is a device, usually containing a tube or transistor, whose output is an enlarged reproduction of the input wave characteristics. It may be a single-stage amplifier, that is, one containing a single tube and its associated circuitry, or it may be a number of stages joined together by coupling circuits.

In the single-stage amplifier circuit shown in fig. 1, the signal voltage is applied in series with the grid-cathode circuit and the grid bias voltage supply. The changes in the grid-to-cathode voltage due to changes in the signal voltage cause the plate current to change. The changes in the plate current flow through R_L which is in series with the plate-cathode circuit and the plate voltage supply. The resistor R_L is called the plate *load* resistor and the voltage developed across it varies with the plate current. Since the load resistor is fairly large—approximately five-times the internal (plate) resistance of the tube—the voltage developed across R_L is greater in magnitude than the signal voltage applied to the grid. Hence, by the action of the amplifier, a small grid voltage becomes a larger voltage in the plate circuit, and thus is said to be amplified.

The grid of the amplifier is biased so that it is always negative with respect to the cathode regardless of the alternating cycle of the input voltage wave. As long as the grid is negative with respect to the cathode, it does not draw electrons. When no electrons are attracted by the grid, no current flows in the grid circuit and therefore it consumes no power. Thus we say the grid represents an infinitely high impedance. However, if the grid becomes positive (excessive input signal or loss of bias), current flows and the grid circuit does consume power.

In dealing with amplifier circuits, knowledge that the amplifier produces a large voltage in its output when a small voltage is applied to its grid is not sufficient. It is important also to know just how much the voltage is increased by amplification. To determine this increase quantitatively, we use characteristic curves like those discussed in the last few NOVICE COLUMNS.

The characteristic curves which you can use for determining voltage-increases in amplifiers are the grid-plate current curve and the plate-voltage/plate current curve. Although the following discussion is based on the grid-plate curve, in actual problems, it is more practical to use the plate voltage/plate current curve, since it does not involve the mathematical calculations which follow.

Notice the grid voltage/plate current-curve in fig. 1B. This curve gives the plate current for any value of grid voltage in the useful range for the tube's operation. To see how this curve is used, assume that the input voltage to the grid of the amplifier is a sine wave with a peak-to-peak amplitude of 18 volts (about 6.3 volts r.m.s.) and that the bias applied to the grid is negative 10 volts. This means that the average grid voltage will be minus 10 volts over a cycle of operation, or in other words, that the operating point of the stage is minus 10 volts. To determine the plate cur-

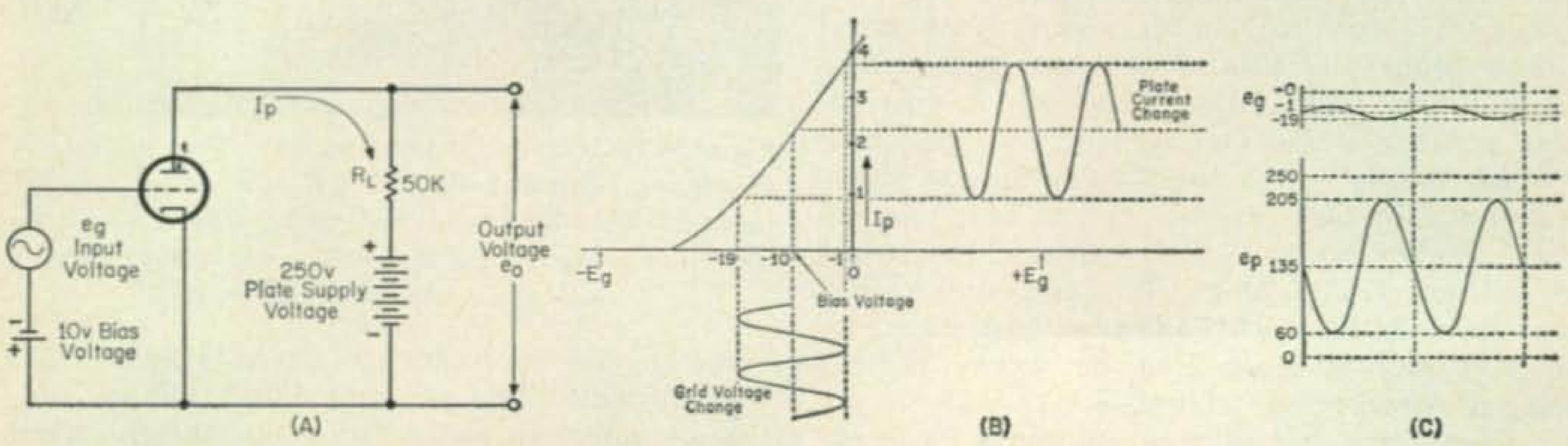


Fig. 1—A basic amplifier circuit and the waveshapes that might be found with proper operating conditions. At B is the E_g-I_p Characteristic curve; at C is the plate and grid voltage waveshapes. See text for full discussion.

rent for any value of grid voltage, follow a vertical projection from a value of grid voltage up to the E_g-I_p curve and then move across horizontally to the plate current change. The point of intersection with the vertical scale is the value of plate current for the specific value of grid voltage. Notice that in the curve the grid voltage varies from –1 to –19 volts and the resulting plate current varies from 3.8 ma to 0.9 ma. The average plate current is 2.3 ma. At the no-signal current condition, that is when no signal is applied to the grid, the value of plate current is likewise 2.3 ma.

The voltage change across the load resistor (R_L) represents the useful output of the amplifier. From the values of current indicated in the curve, you can calculate the voltage output by multiplying the resistance by the plate current at specific values of grid voltage. For example;

1. Grid at –1 volt
   $E_o = I_p \times R_L$
   $= 3.8 \text{ ma} \times 50\text{K}$
   $= .0038 \times 50{,}000$
   $= 190$ volts
2. Grid at –10 volts
   $E_o = 2.3 \text{ ma} \times 50\text{K}$
   $= .0023 \times 50{,}000$
   $= 115$ volts
3. Grid at –19 volts
   $E_o = 0.9 \text{ ma} \times 50\text{K}$
   $= .0009 \times 50{,}000$
   $= 45$ volts

The preceding calculations have disregarded one factor, the plate supply voltage. The above figures are for the voltage dropped across R_L but to determine E_o we must subtract them from the supply voltage (250 volts) to determine the plate-to-cathode potential. Thus; 250– 190= 60 volts, 250– 115 = 135 volts and 250 –45 = 205 volts.

At C in fig. 1, notice the curves showing the grid and plate voltage curves for the values indicated. These curves show the correct amplitude and time relationships. The input voltage (e_g) varies from –1 to –19 volts or a total voltage variation of 18 volts. The plate current voltage curve represents the voltage variation at the top of resistor R_L. Its range is from 20 to 205 volts or a total variation of 205 minus 60, or 145 volts. These figures show that the output voltage is considerably greater in amplitude than the input voltage. The ratio between the two voltages is 8.1 to 1. This ratio is called the *gain* of the amplifier stage. The power output of the stage described is less than 0.20 watts. Thus, you can conclude that the circuit produces a fairly large voltage change, but produces very little power. Such a stage can be called a *voltage amplifier* as it is concerned chiefly with voltage amplification and not power.

Distortion in Ampliers

Whenever the plate current waveshape in an amplifier is not identical to the voltage impressed on the grid, the output is said to be *distorted*. There are three types of distortion in amplifiers, frequency, phase-shift and amplitude or nonlinear distortion. Any one of these may be present in amplifiers, either separately or in combination. You can see the effects of each type in the illustration fig. 2.

At A, notice the drawing showing a typical pair of original signals that might appear on the grid of an amplifier. The pair includes a sine wave of one frequency and a second sine wave at a frequency three times that of the

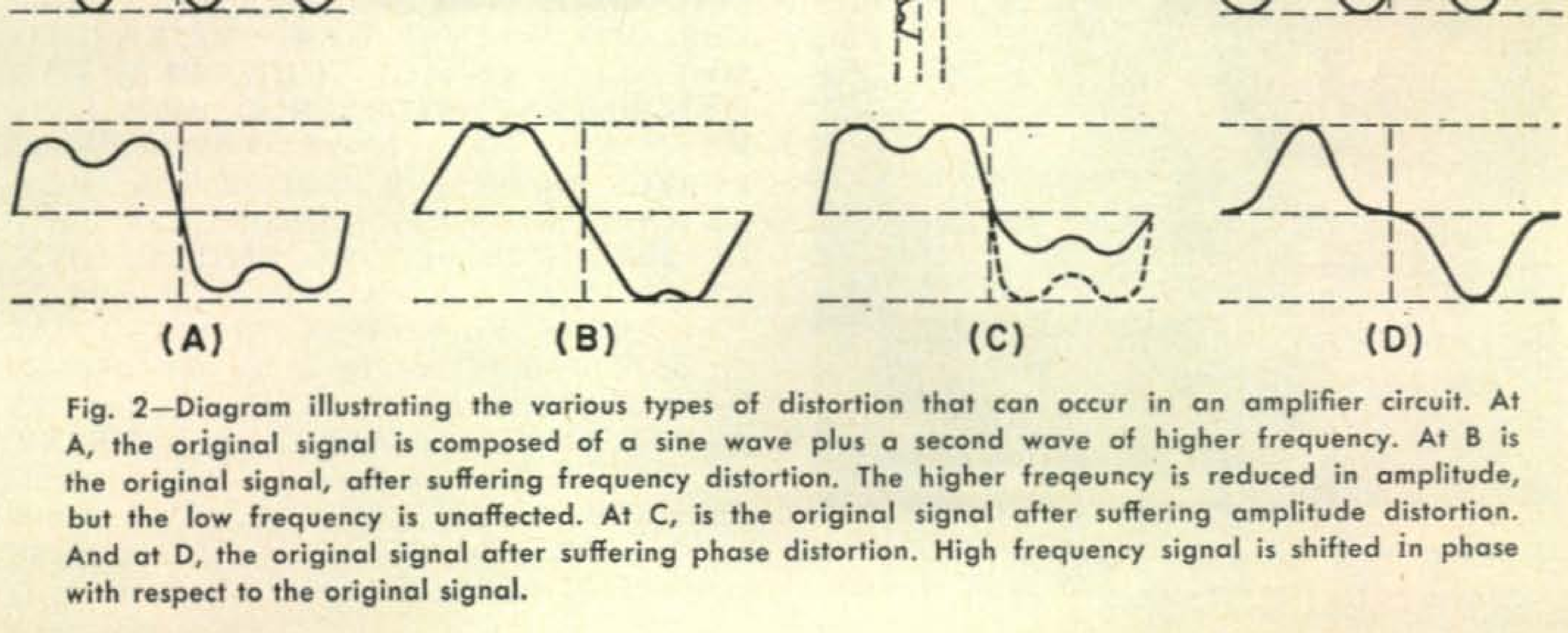


Fig. 2—Diagram illustrating the various types of distortion that can occur in an amplifier circuit. At A, the original signal is composed of a sine wave plus a second wave of higher frequency. At B is the original signal, after suffering frequency distortion. The higher freqeuncy is reduced in amplitude, but the low frequency is unaffected. At C, is the original signal after suffering amplitude distortion. And at D, the original signal after suffering phase distortion. High frequency signal is shifted in phase with respect to the original signal.

first. These two waves are combined in the grid circuit and then amplified in the tube. If both frequencies are not amplified the same amount, the waveform appearing in the plate circuit will not resemble the waveform of the signal on the grid. In other words, the output will be distorted. This type of distortion is called *frequency distortion*. Notice at B that the higher frequency signal in the distorted output is only about ⅛th the amplitude of the low frequency signal although it started out with an amplitude about ¼th as large. The low frequency signal was virtually unaffected by the tube. Obviously the circuit has discriminated against one frequency. Thus frequency distortion has occurred.

Amplitude distortion affects the magnitude or amplitude of the output wave. This type of distortion is caused by the plate current changing a large amount for a grid voltage change near zero grid voltages, but only a small amount for the same grid voltage change near cutoff. The effect of amplitude distortion is that a part of the output wave does not have as great an amplitude as the other part. In the diagram at C the negative portion of the wave is not as large as it should be. The dotted line shows how the negative part would appear if the amplitude distortion were not present.

Phase-shift distortion occurs when reactive components are present in the circuit. Under these conditions, there is a phase shift of one or more of the signals comprising the input signals. The diagram at D shows the high-frequency component of the signal shifted 180°, producing a distorted output.

Next month we will discuss the classification of amplifiers by what they achieve and the conditions under which they operate.

Of course you've heard of "Dog Xray." Dick, K7NIE wants you to meet him, the chief op of W7IFN!

Who's DX?

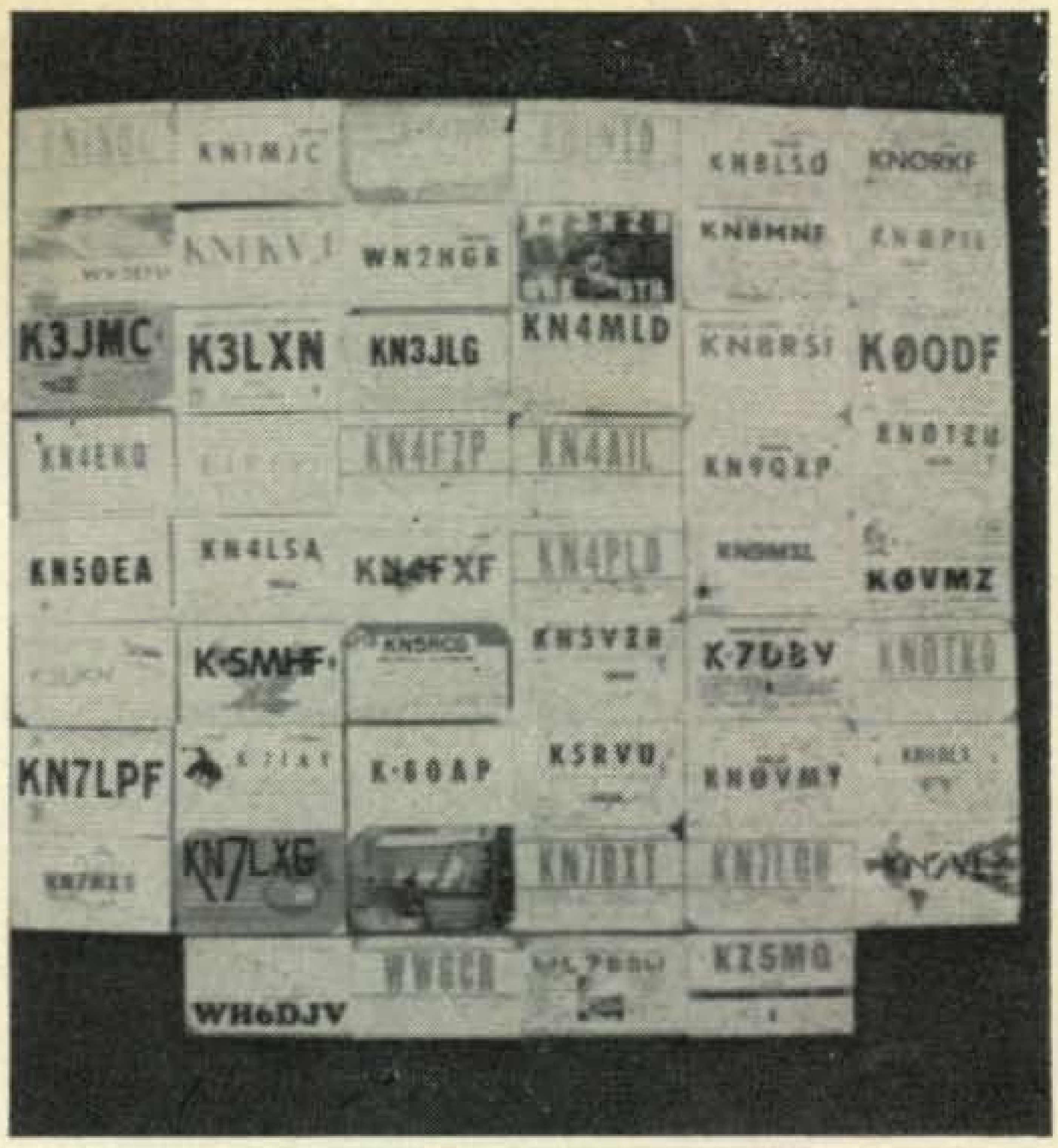
The DX conditions have really been rough the last few months but should snap out of the doldrums shortly. The first signs of life appear as evidenced by not one—but three DX reports this month.

Bill Feidt, K2YMD/F, USRO/NATO, APO 230, N.Y., N.Y., reports reception several 40 meter Novices at his QTH in Neuilly, France, near Paris, with an SX-32 and 15' length of wire for an antenna. Heard on 40 on July 24, 1961 from 0145-0400 GMT (7/23/61 2045-2300 EST) with fairly good signals: *KN1*PTG, QWE, RIK, RQB, SDQ, SMQ, SQC; *WV2*PFK, RFQ/1, RNS, ROA, ROI, RSJ, RTO, SOL, SQY, TAG, TKD, TYI; *KN3*NKZ, QJA, ONG, OWZ, *WN4*APB, ARH, BPX; *KN4*ZUH and KN5LGJ. Many thanks for the fine report, Bill.

Keith Lamonica, WA6CYT/7, Route 1, Box 207, Pasco, Wash., reports hearing the following Novices during his recent stay in England: 40 meters, 2400 GMT; *KN1*OYE, QNS, RHS, RNA, SKI; *WV2*PKD, QQF, RFC, SJH, SPK, TBS; KN3MKK, MVY, NEC, OSQ, OTH, OXE, PKY, QZA; *KN4*BIY, NDR, NEE, NOG, NTK, ZVL; KN5FUN; *KN8*VKC, VKN; *KN9*AHX, CJF, DVB, FEN, FHC/1, FKT. On 15 meters eKith heard the following stations at 2400 GMT; *WV2*ROA, SRS; *KN8*YJU, YJV, YKN, ZIM and KNØFRJ. Thanks again Keith, I hope all goes well at college.

Band conditions have been extremely bad in Europe and few reports have been forthcoming. However, Tima Popovic, YU-1-RS-357, Banat Novo Selo, Yugoslavia, found the following stations in his log had not been sent to your editor. They are for 15 meters and all times are in GMT: Sept. 12, 1960, 1914 to 1920- KN4WVK, KN8TDR. Sept. 18, 1960, 2016 to 2038; KN1OLZ, WV2JFH, KEK, LUD, MPY, WP4AVW, KN4VFN, KN5BWE, KNØBAD. Sept. 28, 1960, 1910 to 2012- KN1KSG, MQW, NBW, NOT, OFN, OXB, WV2JLP, KKK, KXX, MOB, NPR, TWW, KN3MKL/3, MNJ, MNP, KN4AUX, QLZ, TSJ, TTA, VVT, WTT, KN5OMK, KN9KXX, ZF1. Oct. 21, 1960, 1640 to 1903—KN1MNP, OBR, OPQ, WV2NAF, NAY, NXZ, KN3LAD, MUI, NFT, KN4AGL, DHD, PKR, QYS, KN5FWN, KN7MST, KN8RQO, RWY, UVU, VAY, VCF, VKF, KN9ZAD, ZCR, YDU, KNØYCS. November 9, 1960, 1749 to 1802—KN1OFN, KN4YXT, KN9UHF/KP4. April 30, 1961, 1540 to 1550—KN1PCC, QVX, KN3MHH, MXH, OLA, WP4AWN. July 23, 1961, 1806 to 1818-KN1PSX, WP4BBW.

Congratulations are in order for our old friend Ivor Stafford, 16 Byron St., Box Hill South, E. 11, Victoria, Australia. Ivor, VK3XB, has just completed his Novice WAS completed entirely on the 40 meter band. If you could but hear the horrible mess the commericals make of 40 meters in the South Pacific you would know this is a spectacular accomplishment. Ivor's 50th contact was KN7NXS in Utah and was preceded by 439 QSO's! Ivor would like to thank KN1NOT, W2CC, W5UUC, K7KXG, K8IKH and WØCDP, who were especially helpful in making skeds. A glutton for punishment, Ivor, has shifted his operations to 15 meters and will try it again but will continue to work Novices of 40 in his "spare time". The following stations were heard or worked (italics) by Ivor since Feb. 24, 1961, on 40 meters; KN1RJA, *WV2ODO*, OTX, OYK, PHI, QAQ, QAR, QDH, QNH, RJF, SKY, SME, KN3LCH, LJW, *MRJ*, *MTY*, NWM, *OAQ*, OPU, *OSD*, PLQ, KN4AKC, BAA, NEV, NJM, NNL, NOI, NZR, VRI, WNW, YSN, WA4ADM, AOO, WP4AYM, KN5CBG, CYO, DSI, *FQR*, IFZ, IUI, JBC, *WV6KLN*, LKE, LKZ, LUS, MIY, MZU, NET, *NHK*, *NQF*, *NTQ*, *NYZ*, *NXU*, *ODB*, *OFK*, *OXM*, *OYX*, *OZL*, PLA, WH6DWT, EDR, EDW, *KN7LHE*, LUV, *LXG*, *LXJ*, MEQ, *MRO*, *NNB*, NMJ, *NPA*, NUJ, *NXS*, NXX, *OPB*, *YBU*, KN8TQN, *UGL*, *VPY*, VZN, YOB, YWR, KN9BLM, BUG, CGQ, *DEF*, EJW, FUJ, *YSR*, KNØBHW, EKI, *EVZ*, FIB, FXC, IOT, JKD, UJT. Ivor also reports working the following stations on 21 mc; KN5FKA, HBV, IUH, LUJ, LXY, WV6, POX, KN7PBE/KG6. Ivor will be looking for you on 21 mc between 7 and 10 P.M. EST. Give him a call.



These are the stations which make up the Novice 40 meter WAS of Ivor Stafford, VK3XB. Where the heck is WW6CR, Ivor, I've never heard of it (bottom row, second from left).

Help Wanted

W9—Bruce J. Thompson, 115 N. Bonson St., Platteville, Wisconsin, phone DIamond 8-2536.

Letters

Rick Hunt, KN5FWQ, Pettus, Texas, a ferquent visitor to the NOVICE COLUMN, is awaiting word of passing his General examination. Rick, who is 16 and a junior in High School, belongs to AREC, RACES, the RCC and the Beeville Amateur Radio Club.

Gary Johns, WV6RAA, 418 So. Fremont Avenue, Alhambra, Calif., is 24 years old, married and has two boys in his herd. Gary has a WAS of 20/12 and a WACC of 8/6 on the 40 meter band with his 20 watt 6L6 homebrew rig and SX-140 receiver. Licensed since Feb. '61, Gary would like to thank W6IDF, W6REY, WA6OXL and K6KRA for their invaluable assistance with his license.

Pat Henry, WV6PKM, 9 Elsa St., Watsonville, Calif., is also "expecting", having passed his General Class exams. Pat, who is 23, has been a Novice for six months and became interested in ham radio through K6JTR of Santa Cruz. His rig consists of a Globe Scout Deluxe and NC-120 receiver which he uses primarily on 80 and 40.

Dave Rogus, WV2QMJ, 709 Schuyler St., Syracuse, New York, is a member of the fast dwindling 15 meter club. He operates this band with a DX-60, an S-107 receiver and a homebrew 15 meter one-element "beam" about 45' up. Dave, who is 15 and a soph in High School, has the following brag list; WAS 19/14, DXCC 4/4, WAC 2/2 which includes WP4, HK3 and HC2. You can find Dave on 21.111 or 21.147 usually between 2300 and 0100 GMT. During summer vacation, Dave plans on putting up a 40 meter vertical and joining the "exodus" to forty meters.

(*Continued on page 119*)

KNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNWKNW

Noteworthy Novice

Bill Sievers, KN5LDL, 3606 W. Biddison, Fort Worth 9, Texas, contracted the ham radio "bug" from his father who is W5IQJ and received his call in 1939. After considerable practice, Bill sat for his exam and received his Novice license. As he says, "When it arrived, I was ready to go!" Bill "goes" with a Globe DSB-100 and a receiver of Australian make working into a 65 foot end-fed long wire and he receives very good reports everywhere. Bill aspires to get his General ticket and put up a 15 meter beam to supplement his 40 meter operation. He is up to 13 w.p.m. so it shouldn't take long. Bill's main project at the moment is to build a teletype converter for his model #14 printer. To sum it all up, Bill says, "Boy, I can't wait to get my General". Good luck to you Bill, from myself and all the inhabitants of the Novice Shack.

RTTY

BYRON H. KRETZMAN, KØWMR
108 W. TERESA DRIVE,
WEST ST. PAUL 18, MINNESOTA

RTTY Operating Frequencies

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

80 meters	3620 kc
40 meters	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.6 mc

SEVERAL of our readers, newcomers to radioteletype, have written in to suggest that we describe in detail the test instruments and the actual set-ups used to adjust the filter circuits used in the receiving converters, such as the Twin City TU described in the March and April RTTY COLUMN. Some of the fellows are under the impression that the set-ups are very complicated and that the instruments required are the expensive ones ordinarily found in commercial or college laboratories. "Wal, 'taint so," says the Old Man at the Green Keys.

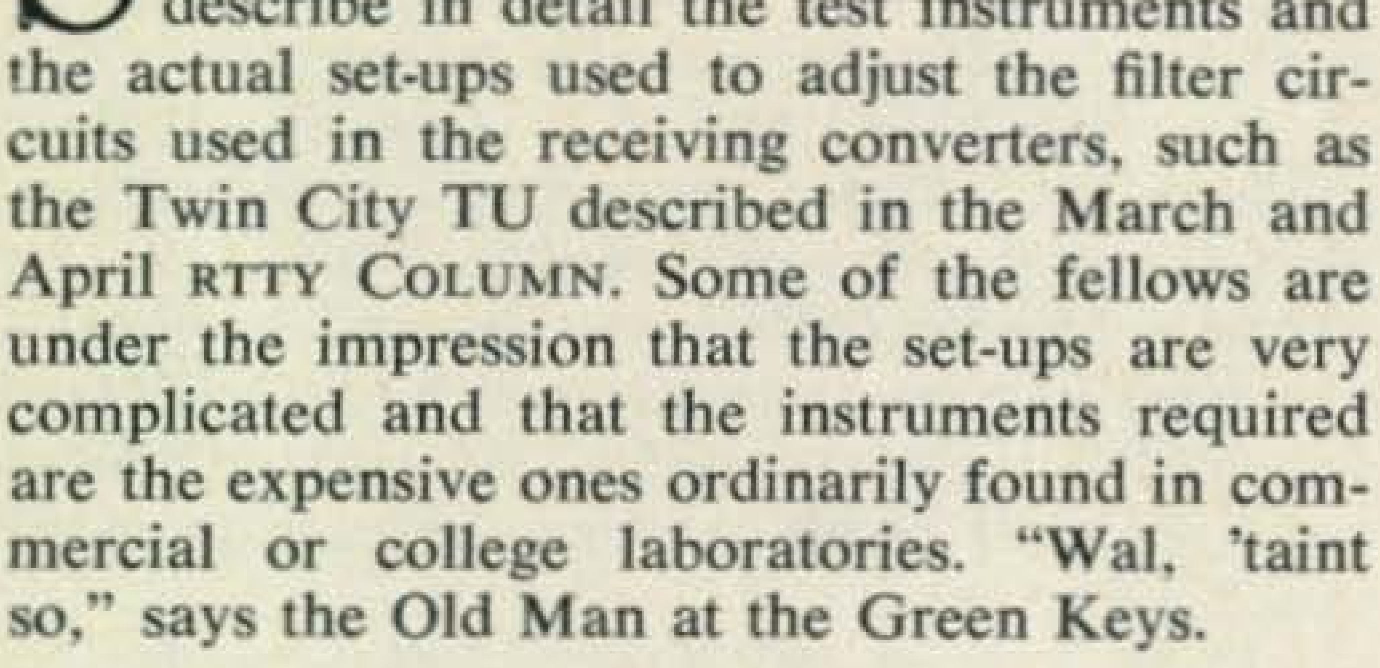
Test Equipment

What do we need for test equipment? Believe it or not, we don't need much; and, while we *could* scratch-build it, mountains of time can be saved (as well as money) by purchasing the inexpensive instrument kits that are available from several sources advertised in *CQ*. These kits, by the way, should not be sneered at by the professional. Their quality, when carefully constructed, approaches that of laboratory instruments costing eight to ten times as much.

Now, let us see specifically just what we need: A variable frequency audio generator, a vacuum tube voltmeter, and an oscilloscope cover the basic needs of the RTTYer. With these three instruments he can do just about anything necessary. The audio generator should be one of those combination sine wave-square wave generators such as the Eico 377K or the Heath AG-10. (The square wave feature is especially useful to the RTTYer, as we will show later on.) The 'scope can be the least expensive Eico 425K or the Heath OM-10, but the v.t.v.m. should be the better Eico 232K or the Heath IM-10. If you already have a v.t.v.m. in the shack, it is strongly suggested that you get the Heath AV-3 *audio* v.t.v.m. kit. This instrument is made for this type of work and is far superior (for our purpose) to the cheaper v.t.v.m., which one is more likely to have than the two better instruments recommended.

As the RTTYer experiments, he becomes more proficient in the use of the three basic instruments listed above. In the normal course of events certain more specialized instruments will suggest themselves. Perhaps, in the interest of a more precise determination of the *mark* and *space* tones, a tuning-fork ascillator will be constructed. Perhaps a phase-shift network will be built and adjusted so that the 'scope can be used as a tuning indicator. Perhaps a telegraph bias measuring set will be built with the aid of the instruments already on hand.

RTTY The Hard Way... No. 4



"Whad'ya know! That's *me* sending CQ!"

Calibration Procedure

The RTTYer is interested mainly in audio frequencies, those between roughly 400 and 3,000 cycles per second. The most important frequencies are 2125 (*mark*) and 2975 (*space*) cycles, of course, with 2550 and 850 of secondary interest. The audio generator can be

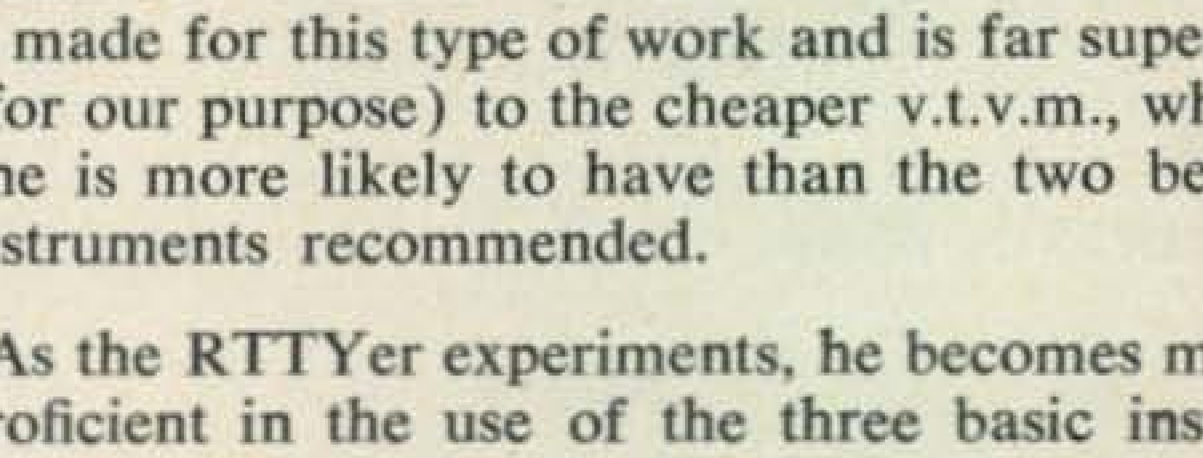


Fig. 1—Calibration set-up

very accurately calibrated by means of *Lissajous* figures on the 'scope. Figure 1 shows the test set-up for this purpose. At the lower frequencies a filament transformer (if a.c. is not provided by the 'scope) can be a convenient 60 cycle "reference signal source." At the higher audio frequencies a receiver tuned to WWV can provide either 440 or 600 cycles as the reference. The pattern on the 'scope then shows the ratio between the audio generator frequency and the reference frequency. If both frequencies are identical a circle is produced as in A of fig. 2. A 2 to 1 ratio produces the

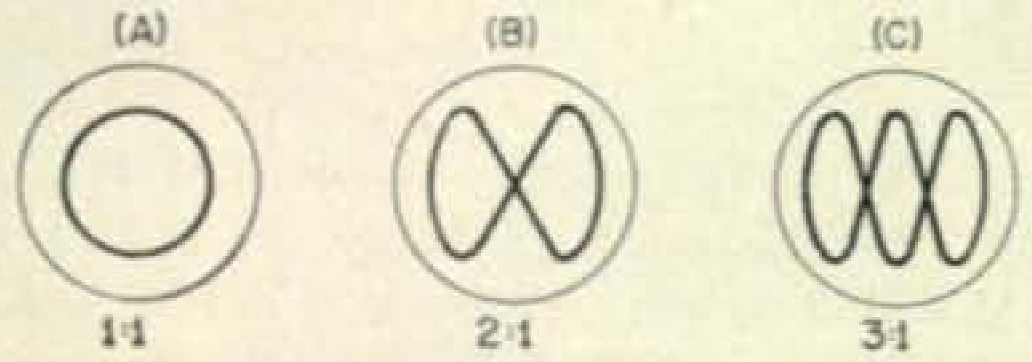


Fig. 2—Lissajous figures

pattern shown in B, and a 3 to 1 ratio produces the pattern shown in C. The ratio is determined by counting the number of loops along the vertical and along the horizontal. For example, with 440 cycles as the reference, and the audio generator tuned to 2200 cycles (the 5th harmonic), there would be one loop along one edge and five loops along the other edge. The 'scope vertical and horizontal gain controls should be adjusted to obtain approximately equal vertical and horizontal deflection. When tuning around with the audio generator looking for the expected pattern, tune *very* slowly near the frequency as the expected pattern can be passed in a flash.

If a tuning fork standard operating on the usual 425 cycles can be borrowed, this will be the perfect reference source as all of the frequencies used are multiples of 425. The *mark* frequency of 2125 cycles is therefore found with a 5 to 1 Lissajous pattern, and 2975 cycles, the *space*, is found with a 7 to 1 ratio of loops. Since most audio generator scales are not that finely calibrated it is suggested that small triangular or "V" shaped pieces of masking tape be used to indicate the scale pointer position for those frequencies most commonly used.

The following table gives the frequency check points made available when the reference sources described above are used. Check points for frequency ratios are given only up to 1:7 as it becomes increasingly difficult to count loops as the ratio is increased.

Ratio	Frequency Check Points			
1:1	60	425	440	600
1:2	120	850	880	1200
1:3	180	1275	1320	1800
1:4	240	1700	1760	2400
1:5	300	2125	2200	3000
1:6	360	2550	2640	3600
1:7	420	2975	3080	4200

Toroid Tuning Procedure

Figure 3 shows the test set-up for resonating an *L-C* circuit for a channel filter. Shown in pictorial form is the common 88 mh telephone loading coil used so widely. The two windings are connected series-aiding by splicing the two wires next to one of the insulating barriers. Circuit connections are then made to the two remaining wires. The audio generator, set to the desired frequency, is fed to the *L-C* combination through a 100K isolating resistor. The audio or a.c. v.t.v.m. is connected across the circuit. An oscilloscope can also be used to show resonance as only an amplitude indication

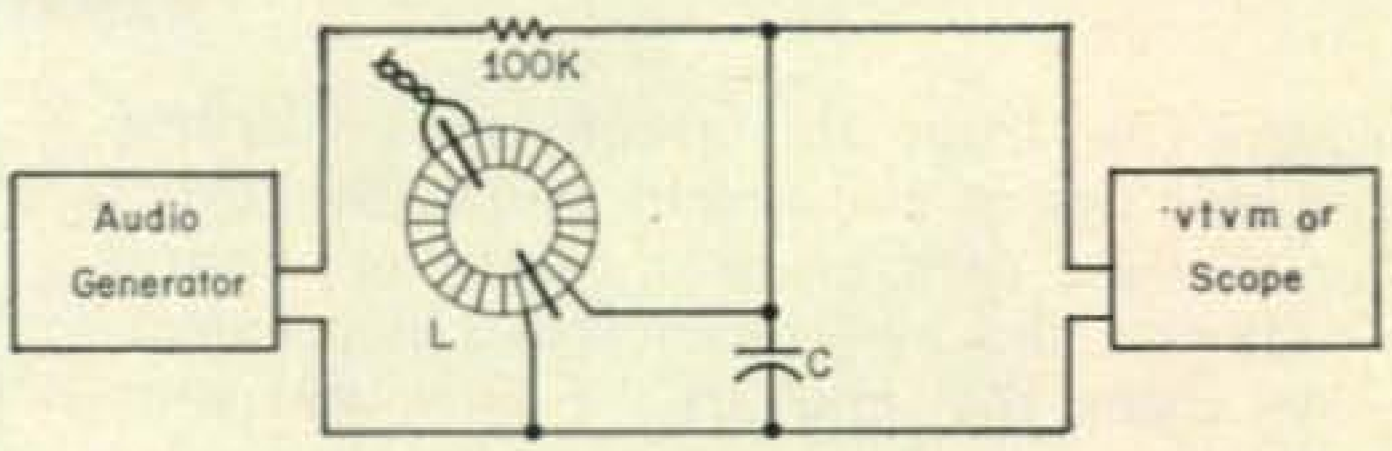


Fig. 3—Test circuit for Tuning Toroids

is required. Pick a capacitor for *C* that is a stock value just a bit more than that calculated to resonate the circuit to the desired frequency. With the generator sine wave output cranked up, tune around the right frequency until a resonance peak is obtained. Resonance will be too low, most likely, so simply remove turns from the toroid until resonance is obtained at the proper frequency.

Band-pass Filter Test

Figure 4 shows the test set-up for checking the frequency response of a band-pass filter at the usual 600 ohm line impedance. The audio

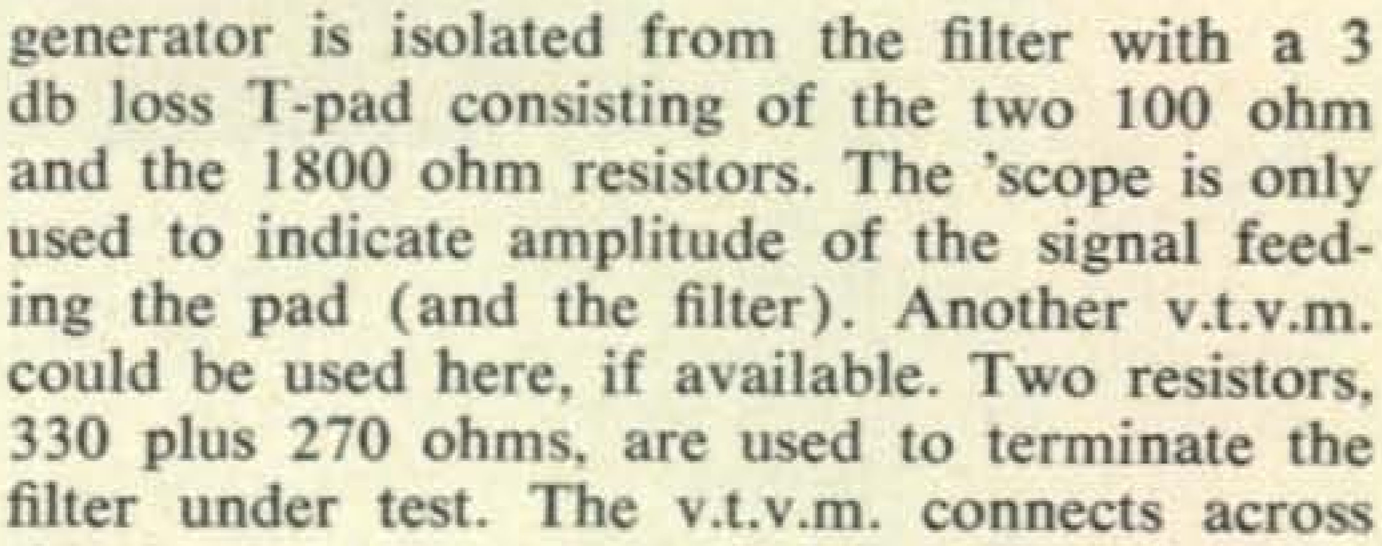


Fig. 4—Test circuit for band-pass filter

generator is isolated from the filter with a 3 db loss T-pad consisting of the two 100 ohm and the 1800 ohm resistors. The 'scope is only used to indicate amplitude of the signal feeding the pad (and the filter). Another v.t.v.m. could be used here, if available. Two resistors, 330 plus 270 ohms, are used to terminate the filter under test. The v.t.v.m. connects across this load.

Sine wave output of the audio generator is set approximately in the center of the calculated band-pass. If it is a band-pass *input* filter that is being checked, set the generator to 2550 cycles and crank up the output as far as it will go without serious distortion. (You can check this with the 'scope.) Set the output so that the v.t.v.m. reads 0 on one of the higher db scales. This is then the reference level. First move the

W2OKO, Livingston, New Jersey

Operator:	Robert M. Mendelson
Transmitters:	32V-2, for the h.f. bands
	QRP and 150 watt for 2 meters
Receivers:	75A-3
	2-meter
Converters:	URA-7 Diversity Unit
	W2OKO
Machines:	Model 26 Page Printer
	Model 14 Perforator
	Model 14 Transmitter-Distributor

generator up from this frequency, recording meter readings at convenient points, say every 50 or 100 kc, then move it below and record the response, changing meter scales as required. Always check the input to the filter and compensate for any variations in generator output as the frequency is changed. Plot the response of the filter on log-linear graph paper, using the linear scale for db and the log scale for frequency.

Telegraph Bias Checks

A reasonably thorough systems check (except for the machine) for telegraph bias can be made with the addition of a WE 255A polar relay to the basic test equipment described above. The procedure is relatively simple. Connect the polar relay coils in series (Nov. '60 RTTY COLUMN) and feed to it the square wave output of the audio generator, set at about 23 cycles. Look at the output of the generator first with the 'scope to make sure the wave is not distorted, then key a flashlight cell with the relay contacts and look at its keyed output. If the relay has been properly adjusted, you should see the same square wave.

To check the f.s.k. circuit in the v.f.o., key it with the polar relay, excited from the square wave output of the audio generator. Tune in the v.f.o. on the receiver and look at the audio output with the 'scope. If your f.s.k. circuit is ok you should see a reasonable facsimile of the same square wave generated. The keying of an a.f.s.k. oscillator can be checked in the same manner. The length of the *mark* and the *space* pulses should always be the same.

Assuming the v.f.o. to be ok, pick it up in the receiver and feed it to the TU exactly as a received signal. The final test is made by substituting a 100 ohm 1 watt resistor for the machine selector magnets in the d.c. loop circuit. Connect the 'scope across this resistor. If the TU hasn't added anything, like bias, essentially the same square wave should be seen.

On the Bauds

W2LFL of Merrick, New York, is on 20 with 300 watts and a Model 26, plus tape gear. W4ZUS is now KA2EM and is building the Twin City TU to go with his KWM-1. The Florida net meets each Sunday at 1300 on 7137 kc. W4MJI is on 20 from Fort Gordon, Georgia. W5PHN of Tulsa, Oklahoma, is building the JAV converter. W5BOO of Waco, Texas, editor of the *Texas Army MARS Bulletin*, reports many Model 15's issued in that area.

W7SMB is still /6 from Yuba City, California, poking a walloping signal into the midwest on 20. K7NIP of Bozeman Montana now has a Model 15. K8OFJ of Wakeman, Ohio, is building the JAV TU. K8WGA of Cleveland, Ohio, has a strange Model 15 that has all digits in the lower case! W9ERW of Eau Claire, Wisconsin, received his TG-26 (Model 14) tape set through MARS. WØLHS of Fargo, North Dakota, now has a Model 19. KØGHI of Industrial Electronics of Omaha 4 (6614 Blondo St.) Nebraska is handling the sale of 500 Model 15 machines. WØNOY of St. Ann, Missouri, is on 40 as is WØNXY.

PY2BCD in Brazil has an Olivetti machine. PY1KU was on 20 in August. KZ5DS and KZ5GA are on 15 and 20 from the Canal Zone. KM6BU and KR6MF are also on RTTY. YV5ABH is on from Venezuela.

Caveat Emptor!

It is surprising, in the light of so many legitimate sources of machines these days, that that one-man "national" radioteletype (unincorporated) "society" is still in operation from the New York area. Old timers are well aware of this operation—it is the newcomer that gets hurt.

If you are looking for a Teletype machine, get it from MARS or through one of the legitimate incorporated societies, such as RTTY, Inc. via W6AEE, MARTS, Inc. via WØATM, and the Florida RTTY Society, Inc. via W4RWM. There are also several highly respected individuals, hams, who do machine work and who also can be the source of a machine. Contact one of the legitimate societies to find which one is closest to you.

Recommended reading is the *CQ* Editorial on page 9 of the April 1958 issue; and, "A Word to the Wise . . .." on page 38 of the November 1957 issue of *CQ*.

73, Byron, KØWMR

YL

BY LOUISA B. SANDO, W5RZJ
4417 ELEVENTH ST., N.W.,
ALBUQUERQUE, N. M.

15th Annual AWTAR

THE annual All-Woman Transcontinental Air Race, popularly called the Powder Puff Derby, is always a thrilling race for the younger gals, and even grandmothers, flying their light planes on the designated route across the country. The 1961 race is one that will never be forgotten. For the first time in 15 years the race deadline had to be extended twice due to poor weather conditions. And never before had there been so many entrants; 101 were listed in the official TAR program.

The AWTAR contestants took off from Montgomery Field, San Diego on July 8. Covering the take-off were W6VSL, Barbara, radio net chairman for S.D., and K6AWP, Kathy. Working the other end of the 2-meter net at the El Cortez Hotel, Hq. for the race start, were K6JZA, Dottie; K6UHI, Betty; K6VRH, Ellie; WA6CBN, Deri; VE3AZD/W6, Lucille; WA6CQS, Martha; W6GGX, Pat and K6UTO, Betty.

Yuma, Arizona was the first designated stop and here W7ANB was radio net chairman. At Tucson, K7CRO was RNC and helping with the operating were W7DRU, Fran; W7BFE, Joan; K7JTX, Betty, and OMs K7EVE, W7ZFC, W7SQX, and KN7QAU (Fran's son Bob, whose ticket arrived in the mail July 8!). With the kindness of the Wx Bu chief they set up the station in his air-conditioned office on the ground floor of the tower with a view of all that went on. They also used a 2-meter link from the time clock to the radio room.

At the start of the AWTAR, Montyomery Field, San Diego, departures were reported by W6VSL, Barbara (standing) and K6AWP Kathy, via 2 meters to the TAR Hq. hotel where they were put on the net.

The next four designated stops were in Texas. At El Paso, K5ILC was net chairman. Operators included W5's PSB, KOK, CSB, KBP; K5's UXP, TLU, TUT, YOY, GSA, HCD, DGZ, LUG. At Midland, K5ODH was RNC. W5ANK was chairman at Abilene and working with him were W5's AAO, BKH; K5's BKH, YUX.

Members of WHOOT operated in the TAR net at Dallas using a complete S-line station lent by Collins Radio. L. to r., K5GBX, Bernell; K5PLC, Jean; K5KDY, Ginnie.

At Dallas, a "must" stop for all contestants, W5WLO, Grace was net chairman and backing her up as operators were members of WHOOT. W5CNI of Collins Radio lent the club a complete S-Line station, and made and installed the antennas at Addison Airport, where they used Grace's call, W5WLO. With the net operating from 5:30 A.M. till after sundown, two girls were assigned to each of the three shifts per-day, but they found it so fascinating more YLs usually were around! WHOOT operators included W5WLO, Grace; K5PLC, Jean; K5MTF, Estelle; K5GBX, Bernell; K5KDT, Ginnie; K5GHX, Jewel; W5RYX, Lyn, W5SPV, Pat; W5ZUT, Nadine; K5UIH, Helen; K5DLI, Elizabeth; KN5GDA, Dot. All four of the Dallas TV stations covered the Derby and two showed the radio room with the YLs in action.

At the Jackson, Miss. airport W5TXK, Margaret, operated the rig surrounded by grounded AWTAR pilots.

In Louisiana, Shreveport was the designated stop and K5TXQ, Evalyn was RNC here. Using her call and a KWM-2, Evalyn says they had a marvelous time and the 99's were fb to work with. K5UKK, Cory, was her only YL helper, but her OM Walt, W5PJW, was a big help as were K5's VMC, MUV, UKJ, ZBC, ZQY, AQT and GGG.

K4ZNK, Betty, and W4ORX, Vince, operating KWM-2 at TAR Hq., a house trailer at departure line, Dannelly Feld, Montgomery, Ala.

From Jackson, Miss., W5TXK, Margaret, RNC, writes, "It was really some TAR *this* year! We had over 40 planes on the ground for two days and nobody was racing anywhere! The weather here and over Montgomery was terrible and moving up toward Greenville and Hagerstown, so we just sat and waited. I did enjoy the delay for I got to meet and talk with many of the TAR gals; Frances Bera was right here for two days and yet went on to win the race." W5TXK put in three 12-hour days, working from 5:30 A.M. until the fliers were tucked in for the night. OMs helping with operations were W5ITL, W5OFE, K5KCH, W5JVJ, K5DOZ and W5YCT. They used the club station call, W5PFC.

Montgomery, Ala., was another "must" stop and here K4ZNK, Betty, was RNC, backed up by the Montgomery ARC (W4WOO). Ack Radio in Birmingham lent a KWM-2, brought over by W4ORX who assisted in installing it and spent five days from sun-up to way past sun-down as coordinator of the net in Montgomery. K4UTP and K4DPI put up towers and strung an antenna at the airport, and the KWM-2 was installed in an air-conditioned house trailer which served as the 99er's hq. Bad weather slowed the planes but on July 12, seventy-one planes were on the ground at Montgomery and traffic was heavy. For two days they had been looking for planes overdue. One had become lost and landed at Crestview, Fla., one went in at Gainesville, Ga., one at Texarkana, one at Meridian, Miss., one at Selma, Ala., and many had to return to their take-off airports. For a sample of AWTAR net traffic, Montgomery handled 57 formal pieces from pilots; 1442 arrivals, departures and RON's; 7 radio searches for unaccounted for planes, and many informal messages.

Montgomery had two operators on each 4-hour shift from 4:30 A.M. to 7:30 P.M. (one evening it was 10:30 before all ships had been accounted for). Only other YL assisting here was K4YNR, Sara, plus these OMs: W4's OLN, PEV, HWI, AUP, OWQ, SCZ, IOZ, OHQ, ATF, VEK; K4's UTP, DMN, UJH, TCZ, PFM, ZXA, TJM, ETF, BTO, DPR, RST, FHH, OVG, QJF, WQO and ZXJ.

At Greenville, S.C., W4CPX was chairman and assisting him were W4's VIW, BHR; K4's FYS, PFI, DJE, JNT, LBV, LXH, VCA; WN4BRW.

K4QKY was chairman at Lynchburg, Va. Operators included W4's VLT, VLR, FWM, RJH; K4's MKO, YPF, JFG; WN4BIR.

Hagerstown, Md., was another "must" stop and here W3EHA was net chairman with these ops: W3's OYX, JZY, GVN, LII; K3's HPG, DRK.

Terminus of the '61 race was Atlantic City, N.J., and chairman at the National Aviation Facilities Experimental Center was WA2OUJ. Terminus Hq. was the Ritz Carlton Hotel in Atlantic City and here the chairman was K2GGB. Other operators at Atlantic City were W3GTC, Carolyn; W3UUY, Anne; K3GSU, Elaine, and W3's LYP, IVS, EQZ; K5GQF/2. Hammarlund Mfg. lent them a complete station set-up and sales mgr. W2AMJ helped set up and operate it. Hornet Antenna lent a beam. The set-up at the terminus airport was in an old airport tower and Carolyn says it was a beautiful spot, but so terrifying during an electrical storm on Sat. they had to close down for a while.

More details on the race itself would be fascinating, if only space permitted. For instance, one pilot, Nancy Walton, came from Australia, (her second TAR) and a co-pilot, Grazia Sartori, is from Italy (and considered the best woman pilot in her country). And many interesting things happen along the route, such as the pilot who ran out of gas in New Mexico (!) and landed in the hinterlands on a gravel road. She walked into town for gas and became

Net operators at Shreveport, La. used a KWM-2. At left, W5PJW, K5AQT, with K5MUV and K5GGG standing. Right, K5UKK, Cory, and her jr. ops Kirby and Charlie. As planes arrived or departed Charlie ran the time into the terminal where the rig was located.

YLRL 22nd Anniversary Party

C.W.:
Start Oct. 25, 1961, 1200 EST (1700 GMT) and ends Oct. 26, 1961, 1800 EST (2300 GMT).

Phone:
Start Nov. 8, 1961, 1200 EST (1700 GMT) and ends Nov. 9, 1961, 1800 EST (2300 GMT).

Eligibility:
All licensed YL and XYL operators throughout the world are invited to participate. YLRL members only are eligible for the cup awards, non-members will receive certificates. Only YLRL members are eligible for the Corcoran Award. Contacts with OMs will not count.

Operation:
All bands may be used. Cross-band operation is not permitted. Only one contact with each station will be counted in each section of the contest.

Procedure:
Call "CQ YL"

Exchange:
Station worked, QSO number, RS or RST, ARRL Section or Country. Entries in log should also show the time, band, date and transmitter power. Please know your own ARRL Section.

Scoring:
(*a*) C.w. and phone sections will be scored as separate contests. Submit separate logs for each contest. (*b*) multiply number of contacts by total number of ARRL sections and countries worked. (*c*) Contestants running 150 watts input or less at all times may multiply the results of (*b*) by 1.25 (low-power multiplier).

Awards:
Highest c.w. score—gold cup.

Highest phone score—gold cup.

Highest phone log and c.w. log in each section and country will receive a certificate.

Highest combined phone and c.w. score, YLRL member only, will receive the Corcoran Award.

Logs:
Copies of all logs must show claimed score; be signed by the operator and postmarked no later than Nov. 22, 1961, and received no later than Dec. 6, 1961, or they will be disqualified. Send copies of logs to: Onie Woodward, WIZEN, 14 Emmett St., Marlboro, Mass. No logs will be returned; be sure it is a copy of your log you send for confirmation.

a celebrity within minutes, having her picture taken with the mayor before she could get away with the gasoline!

General Chairman for the entire AWTAR amateur radio net, Carolyn Currens, W3GTC, was serving her fourth year in this position. With many more stops in the race this year it meant that many more spots for which Carolyn had to line up chairmen and it was a tremendous job. She said it took her four years to accomplish it but she finally got all the stations on s.s.b. And she adds, "Everything happened that could, even the bands went dead for a while on Monday, but we got most of the information needed." The net frequency was 7.210 (alternate 3.950) mc, with 2-meter links used at several of the airports.

If we seem to have emphasized the YL participation in the AWTAR radio net, please bear with us—this *is* a YL COLUMN. All of those connected with the AWTAR, both in the air and on the ground, appreciate the fine cooperation of *all* the hams across the country who gave time and energy for the safety and convenience of the "Puffs." Carolyn adds that very nice certificates made up by the fellows at NAFEC are being mailed to net participants.

22nd YLRL Anniversary Party

Coming up soon is YLRL's 22nd A.P. Contest—an operating event looked forward to by most YLs. Seems that ops who may not get on at any other time, manage to be on at this

[*Continued on page 124*]

At Atlantic City, Terminus of the race, left, W2AMJ Frank, Sales Mgr. for Hammarlund, with Hammarlund gear lent for the AWTAR in background. Right, W3GTC, Carolyn, chairman for the entire AWTAR radio net, and standing, K5GQF/2.

Don't Ham Much Lately [*from page 63*]

I realized a drastic change in the rig as soon as I turned it on. There was a wild glint in its pilot lights and an erratic swing to its meters. It developed a marked affinity for the band edge and needed a continual stern eye in this respect. More than once I was forced to rap it smartly across its louvers to get back inside the band, where its actions would become sullen and sluggish. Forcibly wrenching it anywhere near the center of the band resulted in it going into a total sulk like a spoiled brat. In this fashion, if chasing DX at the time, it raised nothing but crosstown locals and TVI. My rig, for all the years of ownership and hours of operation, became a stranger—a hostile intruder into the order of my cosy shack.

This transmitter had originally cost a little over $200 new, and already I had laid out almost a third of this amount in dubious "repairs," and it still exhibited all the symptoms of Dementia Praecox. So the next morning, in desperation, I took the rig to a ferry-boat engineer who had taken up amateur radio in his declining years. I explained in detail the list of troubles my rig had accumulated while the old timer, like his predecessors, peered into the fresh jumble of makeshift wiring and parts. After due deliberation he set down his multitester and, pointing to the sufferer with the stem of his pipe, said "well, matey, she's got hoo-rahs in the Cog-Box. 'Pears to me she makes too much steam—you want to hang a monkey wrench on the safety valve."

His wife broke my grip on his throat in the nick of time, I understand.

I'm still too shaken to undertake the rehabilitation of this transmitter. It sits on the operating table gradually acquiring the creakiness of age while its shafts stiffen, and its jeweled pilot lights dim.

A buddy of mine once commented that a car was a good car until it had been to a garage once, and I'm inclined to extend his wisdom to include amateur transmitters. ■

Language Barrier [*from page 54*]

in the mailbox one morning I discovered a reply from my newly-found friend across the ocean. He wrote:

"My Dear OM:

Thank you for your very kind letter. I have studied my errors in your language, and now am most fluent. I am very grateful to you, and wish to make a schedule to show my good English with the help of my dictionary."

Well, somewhat apprehensively I contacted him on schedule, and this is how it went as nearly as I can recall:

"I peruse you loud and clear OM. Hope there is not too much QRM on this portion of the orchestra, since I am surrounded by stones and cannot QSY. I have raised my power to two quarts, and am teaching English to all my friends so they can talk to Americans too . . ."

I'm afraid that's all I remember. They told me much later how I tore that beautiful rig into little pieces and started throwing them at my family. And all the time I was screaming, "CQ DX! CQ DX! CQ DX!"

As I said before, I'm telling this story as a warning to others. They don't allow me to have sharp objects here, so a kind attendant is writing it down for me. This place isn't so bad, but it must be in a valley. I've called CQ for hours each day while sitting in my nice, padded little room, but nobody ever comes back to me. I'm not a bit unhappy, though. The attendant told me that if I behave, someday soon they might even let me have a transmitter. ■

Frequency Meter [*from page 34*]

as a normal a.f. amplifier. The output transformer (T_2) is from a command receiver. Either 600 or 4000 ohm outputs are available; I used 600.

Wanting a simple power supply, three IRC silicon rectifiers, type SD94 having a p.i.v. of 400 volts were used. The Sarkes Tarzian M500 or 40K types may also be used. An 0A2 is employed to stabilize the voltage on the screens of both crystal oscillators.

Switch S_2 serves to switch the unit to OFF, STAND-BY or ON. In the STANDBY position only the filaments of all tubes are on.

Operation

Operation of the unit is simple. First, beat the 100 kc oscillator to WWV using a good communications receiver. Do allow enough warm-up time so that your first setting will be "dead-on." Next, the multivibrator is synchronized by using a low frequency receiver (or even a good low frequency grid-dip meter); a BC-348 covering the 200-300 kc band is ideal. The 50K pot, (R_{20}), in the grid of the left triode of V_2 is adjusted for a 10 kc "kick." Finally, tune the communications receiver to 15 mc and zero in the signal from the 100 kc oscillator. Then switch in the 1 mc crystal and tune its associated trimmer for a good zero beat. Next switch in the 5000 kc crystal and tune it to zero beat. If desired, you can plug in a 3.5 kc crystal and use it for band edge checking.

This completes the tune-up and operation. WWV should be used from time to time to determine frequency counting accuracy.

Building a unit of this type for accurate frequency checking and calibration may seem the "long way around," but there is a lot of satisfaction derived from knowing that your frequency estimations are "right on" rather than "near by."

My thanks and a big 72 to Chuck, W4VZO, for wading through my writing and giving me a lift. ■

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For further information, check number 22, on page 126

40 Meter Station [*from page 75*]

4.035. It takes about 20 mmf to accomplish the job and very little changing was needed. Tuning was done by ear by using a BC-221 coupled into the grid of the 6BE6 on 4035 kc to peak up the i.f. and then coupled into the antenna on 7 megacycles to peak up the r.f. transformer. The r.f. transformer is a 10.7 mc i.f. that is padded down to 7 mc. The bandwidth of this transformer on 7 mc turned out to be about 150 kc, which was adequate for covering the c.w. band.

Construction

The layout that was used for the prototype is a little cramped because it was planned for use in a mobile installation. For the Novice I would recommend a layout that allows plenty of room for wiring as there are really no critical lead lengths on 40 meters. It will be easier to use a front panel to support the main tuning dial. One precaution to take with *any* layout is to keep the detector crystal clear of the chassis. In the layout shown in the photo it was originally planned to clamp the three receiver crystals into a corner inside the chassis. For some reason that is still not clear, the detector refused to regenerate with the crystal in this position and the outboard mounting, as pictured, was used with complete success.

Adjustment

For tuning the plate circuit of the 2E26 a zero to twelve volt voltmeter may be connected across the 300 ohm cathode resistor for an indicator. It must *not* be connected from cathode to ground or the meter will be damaged in the key-up position. The plate tank is then tuned for minimum as in all conventional r.f. amplifiers.

To neutralize, the following procedure may be used. Disconnect the plus 150 volts from the 2E26 screen grid. Be sure the screen bypass is still connected, however. Place a 0-10 milliammter from screen to ground. Apply filament voltage to the oscillator and amplifier, but plate voltage only to the oscillator. Swing the p.a. plate circuit tank through its range and observe the screen current. Adjust C_n until there is no noticeable change in screen current when the plate tank is varied.

Power Supply

The power supply for this transmitter-receiver combination should be capable of supplying 100 ma at between 350 and 400 volts. The 2E26 will draw about 50 ma, key down, and about 10 ma key up; the VR tube and the other tubes will draw approximately 40 ma more. ■

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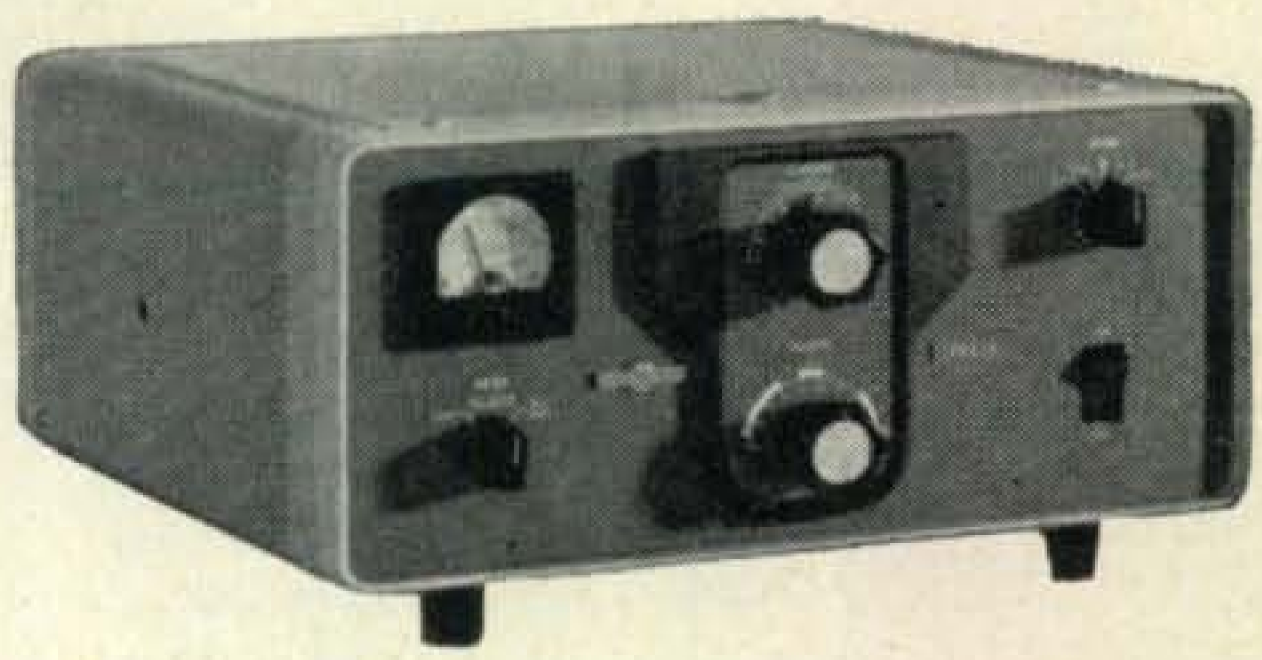

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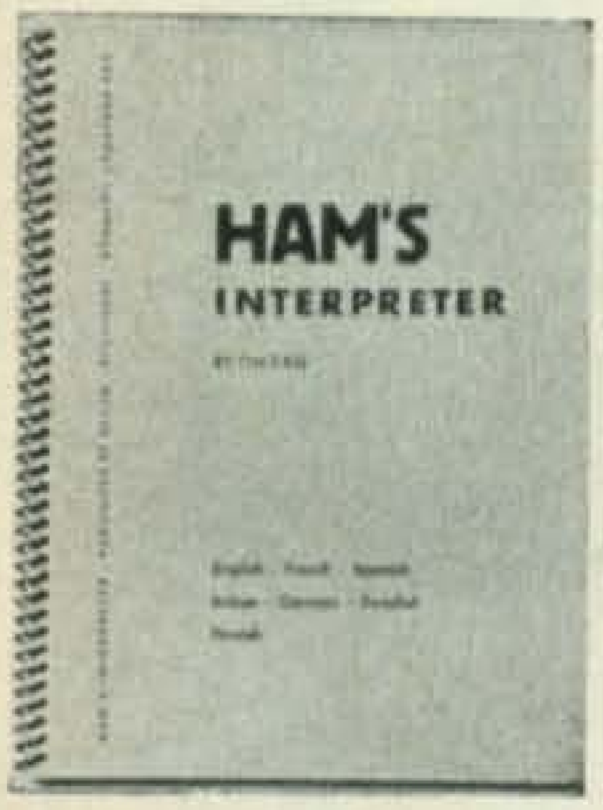

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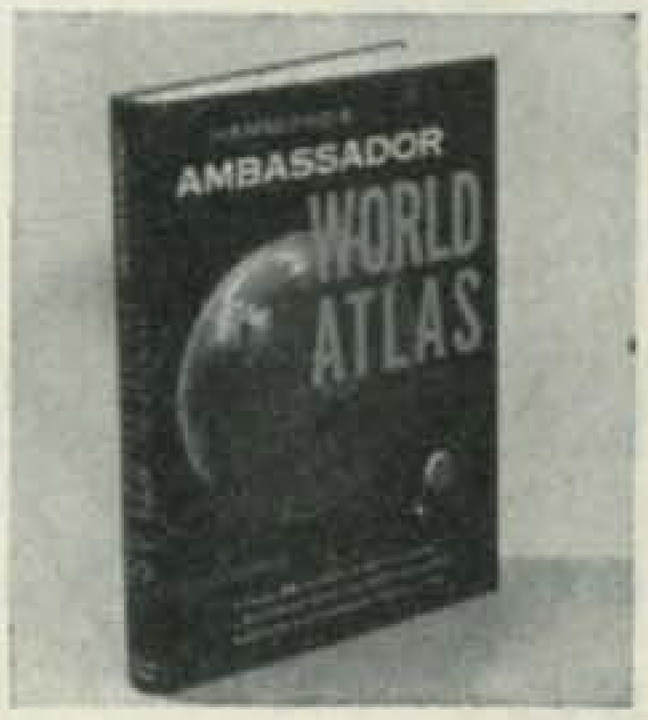

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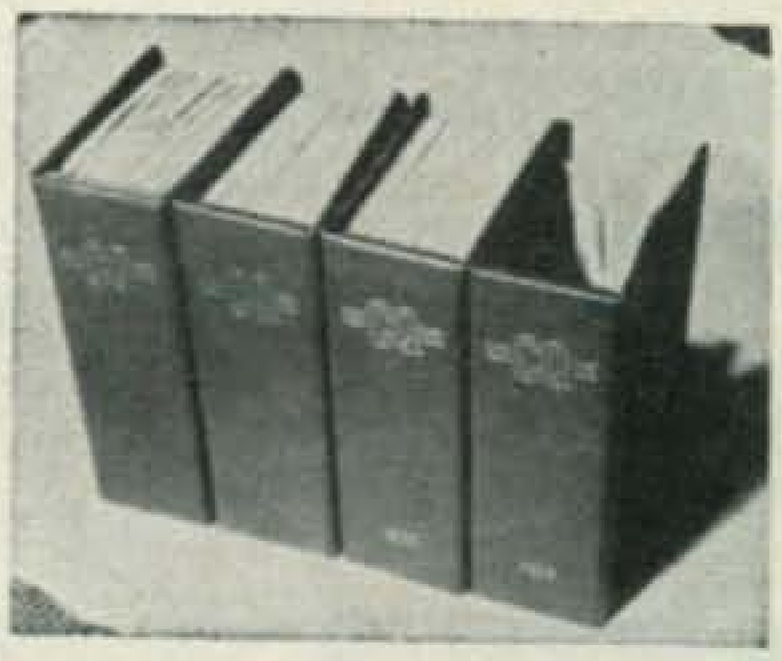
W1DBM's newly written TVI book (2nd edition) covers all aspects of curing TVI from both the Ham's viewpoint and that of the TV viewer or the TV serviceman. It includes 2- and 6-meter TVI as well as Citizen's Band, Industrial, Medical and Utility TVI. Profusely illustrated with diagrams, photos, charts, tables and FCC regulations pertaining to radio and television interference. Price $1.75 postpaid, USA, $2.00 Foreign.



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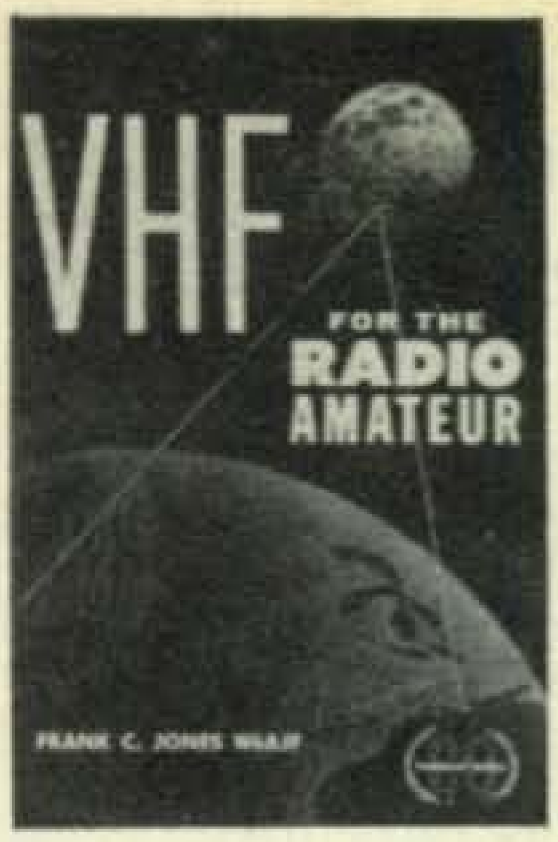

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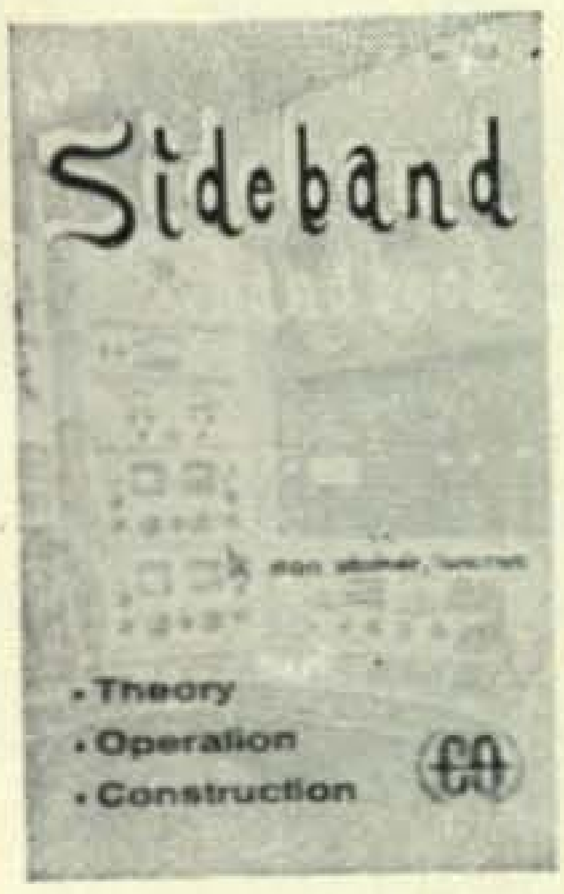

SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, was almost one full year in the preparation of this terrific volume. This is not a technical book. It explains sideband showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots if how to build-it stuff, gadgets, receiving adaptors, exciters, ampliers Price, only $3.00.

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Contest Calendar [*from page 73*]

QCWA Party Results

The QCWA Party held last February was a hugh success reports the Southern California Chapter which sponsored it. It was estimated that a total of 351 members participated; 133 of them turned in logs.

The activity was divided as follows: 1556 contacts were made on c.w., 660 on a.m. and 598 on ssb. 26 states were represented as well as 4 Canadian provinces and 3 foreign countries.

The leaders ended up as follows: W6ZPX 137, W5KC 120, W9UX 105, W1WY 100, W2ZM 100, K6FH 100, W8DLD 93, K8QJH 92, W6FB, 86, W5DWO 83, W9CAS 82, W2AMB 78, W7LQ 73 and K6GIL 72.

So that makes Herbert Gleed, W6ZPX the winner of the QCWA Plaque, which makes the rounds until it is won three times by the same station, who then keeps it permanently.

Ed Note

Time sure flys. Seems we just wrapped up the 1960 "Brawl" and here we are in the middle of the 1961 contest season. Wonder what the future holds for the "Big One" coming up the end of this month and next month.

73 for now, Frank, W1WY

VHF [*from page 76*]

physically and mentally, and construction is under way on a new type of antenna.

"Most of the correspondence in reply to the first letter pointed out that a left circular signal, for example, becomes a right circular signal upon reflection, and hence will be cross polarized with the transmitting antenna, eliminating reception of one's own echoes. Further investigation in *Antennas,* by John Kraus, turned up the type of antenna being used here. It consists of crossed Yagis fed in phase quadrature; *i.e.* two sets of Yagi elements mounted on the same boom, one set vertical and the other horizontal, so that each element forms a cross. If the feedline runs directly to the horizontal element, and a quarter wave loop of transmission line connects the horizontal driven element with the vertical driven so that, viewed from the rear, the elements at 9 o'clock and 12 o'clock are connected together, clockwise transmitted polarization will result. The great advantage of this antenna is that during reception the polarization of the antenna is reversed, permitting reception of a counterclockwise polarized signal. This not only permits reception of one's own echoes, but means that all participants need build only one type of antenna—all transmitted signals will be clockwise, and all received signals counterclockwise. This type of polarization is to be used here. Regular horizontal or vertical Yagis can be used to receive

For further information, check number 26, on page 126

For further information, check number 27, on page 126

the circularly polarized moonbounce signal, but with at least 3 db loss, which will probably be fatal with this weak signal.

"The antenna below is about 60% completed at K1HMU; it has 176 elements and an estimated 26 db gain. Nearly all electronic equipment is already built; target completion date is August 15. By that time we expect to be transmitting on 144.252 mc with 1 kw and receiving with a parametric amplifier. We are open for schedules, and will also be transmitting at set times. Details later. Please write if you want more details on equipment, etc., and will anyone who is building a crossed Yagi please let us know. So far we have heard from many who are "interested" but very few who are willing to set up an antenna and undertake some serious tests.

Ned Conklin, K1HMU
Old Mountain Road
Farmington, Connecticut
Telephone: 203 OR 7-1565

Labrador on 6 Meters

Most of us East Coast 6 meter boys were quite excited to hear the signal of K3MJV/VO2 coming through back in July. Ed sent us the following letter, well worth noting . . .

"On July 15th at 1715 GMT and on July 16th at 0210 GMT, the six meter band was opened to the New England states. The first opening lasted only twenty minutes and the second lasted two hours and thirty minutes to the same area. I have been up here in VO2 land for a period of eighteen months and to my knowledge this is the first time I have ever heard a band opening. I am a Technical Sergeant with the U.S. Air Force and live here with my family.

"My equipment consists of a Gonset Communicator III and a four-element wide spaced beam (elevated approximately 30 feet). I use an Argonne mike and an antenna rotator. I monitor 50.2 each evening and on Saturday and Sunday during the day. At present I am the only operator here on six meters.

"My total amount of contacts was 52, one of which was a VE3."

European V.H.F.—G2DHV

Our old reliable reporter George Haylock, G2DHV, tells us about activity in Europe, DL3YBA worked OH1NL on 2 meters. Also on 144 mc, DL1RX worked SM7ZN, G3GOP/P worked YU1CW (DX record), GW3LJP heard OZ4ZH, GW3LJP worked OZ4ZH using 7 elements and 15 watts input, G3ABZ worked F3NG with 17 watts. EI2W is active in Ireland on 144.18 and 433.08 mc.

Thirty

Once again our sincere thanks for your cooperation over the past year—keep it coming! We always appreciate hearing from you.

73, Bob. K2ZSQ

Now! You can go SSB at a profit!

Right now I can allow you a lot more for your present gear than it is worth–in many cases even more than you paid for it!

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73, *Bil Harrison*, W2AVA

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I want terms on the balance: ☐ $________ a month. ☐ Charge Account.

Name________________ Call________

Address________________

____

Sideband *[from page 93]*

on the air daily and we'll bet that many a visitor to the Fair, counted the amateur radio booth as one of the most interesting spots to visit . . . We'd like to sit in on any trial participated in by Pepos, W5OSG. Blessed with a marvelous sense of humor and great innate wisdom, this San Antonio lawyer should be a whiz in the courtroom.

Leave it to Ed, W2CQA, to do things the right way. Enroute to Europe aboard the Norwegian freighter, *Concordia Taleb*, Ed operated from the top deck with the KWM-2 ensconced in the deck chair right next to his. Luckily, the ocean was calm as a lake and Ed was maritime mobile under tip-top conditions . . . W9 *D*ead *O*n *A*rrival is the new call of Tom Collins, ex-K4USM, and V.P. Nixon's pilot on the 1958 South American Goodwill Tour. Tom and his XYL, Ruth, W9DOL (and there's an appropriate call) are now at Scott AF Base . . . Congratulation to David, W2HTO, and his delightful Scottish XYL, Mary, upon the arrival of their first grandson . . . We urge you to listen for Doc, W3HQJ, of Bryn Mawr, Pa. on 40 meters. Doc, his XYL, Grace, and his brother-in-law, Frank, W3LNQ, devote much of their spare time to working with Tom, W3DD, in his "Science for the Blind" recording service. Recently, Helen taped excerpts from *Time* and other general interest magazines for the subscribers to Tom's service and this proved to be of great interest. For further information on Tom's work, write to W3DD at Haverford College, Haverford, Pa.

It is with deep regret that we inform their many friends of the passing of Gummy, W4DV, of Augusta, Ga. on August 7 and of Bill, W5JFZ, of New Orleans, La., on August 1. They will both be greatly missed . . . Score another victory for sideband. After the New York Sideband Dinner in March, Eleanor, XYL of Pete, W3SH, of Langhorn, Pa., liked the sidebanders she met so much that she insisted that Pete have a get-together for them during the Summer. So, on August 12, the 40 meter gang converged on Langhorn and a wonderful time was had by all! . . . It was just great to hear Bob, K4BRO, of Miami, Fla., back on the air after almost a year. Come to think of it, there are many people with whom we "grew up" in sideband who have been among the missing lately. We think of them often and hope all goes well with them . . . Jack, K4TRQ/4 in New Berne, N.C., puts out a dandy 40 meter signal with a W2EWL to which he has added some special modifications such as vox, another driver tube, and a tube in the v.f.o. section to enable him to operate on 40 meters. If you're interested, Jack will be happy to share these modifications with you.

73, Irv and Dorothy

COMING! COMING!

Watch for the November CQ. This issue will contain an all-inclusive Buyers Guide for the entire industry. Included will be a complete manufacturer's literature index and a where-to-buy-it Distributor's index and cross reference listing. CQ's fifth Annual classic will be bigger and better than ever.

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SOUTH DAKOTA is traffic-net minded. 3870 kc/s., our main net frequency is monitored regularly as a calling frequency by active net members.

October 1 through April 15, inclusive, the WEATHER NET meets at 8:00amCST Monday through Friday. The "NINE, JACKS, & QUEEN" net meets at 12:15pmCST Monday through Friday. The EMERGENCY PHONE net meets daily at 6:30pmCST.

7225 kc/s is alternate frequency. The SD CW net meets Monday, Wednesday and Friday, 7:00pmCST, 3645 kc/s. Thanks to stations giving us a clear channel for net-work & traffic calls.

Also the sidewinders hang out on 3987.5, the RACES frequency, with a net at 8:00pmCST daily.

Nets reported regularly in ***PICONITE*** the South Dakota Amateur Monthly. Non-profit, $1.00 a year. ***Lester Lauritzen, Centerville, South Dakota.***

Ham Clinic (*from page* 83)

gauge) will occur if long distances are involved. Incidentally, Bill tells me that any amateur may send his CDR-Radiart rotator (TV type) to the factory and they will overhaul it for $7.50 plus transportation (hams *only*, give your call). He also says that the rebuild cost for the HAM M is $17.50, but he hasn't seen any on the rebuild bench yet. Thank you Bill for the assist and 75!

Thirty

It is a sad state of affairs when a large broadcasting chain with its many experts and resources must depend upon *one* ham to intercept and record a broadcast from a manned earth circling capsule. But it did happen and it resulted in some valuable publicity for hamdom-at-large. It proved too that the radio amateur is more than just "a guy who likes to talk on the radio."

How many of you who read this are members of the Military Affiliate Radio System (MARS), a CD or other emergency network? If you are not, look into it; this I urgently urge you to do.

For this month, a sincere 73 and 75 to you fine readers—and 72 to our many DX friends.

Chuck, W4VZO.

Space (*from page* 79)

Calls to the vehicle will do nothing but cause confusion and QRM.

The complete story will probably never be told of the tremendous effort, by a relatively small group of devoted people, that went into getting OSCAR I off the ground. The long hours of designing and building the package, the many moments of frustration in trying to figure out the next step, the usual red tape when Government agencies were approached, the letter writing, the door knocking, the button holing of busy top level Government officials, the long anxious weeks of patiently waiting for a "yes" from a half-dozen Government agencies, climaxed by the anxious moments surrounding launch and the announcement of a successful initial orbit—all of this will have been a very small price to pay if OSCAR proves that today's radio amateur is capable of producing results of a useful scientific nature.

Yesterday OSCAR was the dream of a small handful of amateurs, today it belongs to radio amateurs in every corner of the globe. May its beacon, now sending forth HI, the traditional symbol of friendly greeting and the spirit of joviality, guide the way to newer and greater horizons for radio amateurs and mankind in a spirit of world peace and closer brotherhood among all peoples.

The Editor of this column wishes to acknowledge with much gratitude the excellent cooperation of the ARRL and Project OSCAR Association in making available on a cooperative basis much of the data appearing in this month's column.

Editor's Note: Because of deadline necessities, this colunm was written *before* Project OSCAR was launched. More information on the actual launching, or of any unexpected delays or incidents that may have been encountered, will be reported in next month's column.

73, George, W3ASK

Novice [*from page 97*]

Mike Meenan, WA2QEM, Camp Agawam, RFD, Raymond, Me., took the big plunge and dropped the "N" last March and sure likes being able to swish around with his v.f.o. Mike also says one of his prospective Novices is no longer prospective, Ken von Kohorn received KN1SDH and is now on with an Eico 720 from Greenwich, Conn.

Peter Eaton, Fairhope, Alabama, is one of the new WN4's, WN4AYX to be exact. Pete runs a small 9-watt homebrew rig with an NC-125 as the hearing aid along with an 80 meter dipole and 40 meter longwire. Pete sticks close to 80 and operates 3705 and 3745 kc and has worked 7 states so far.

Dave Edger, KN5JBW, 4006 N. Elgin, Tulsa 6, Okla., plinks away with a Globe Chief Delux and HQ-129X into a Mosley V46 vertical skywire. Dave, who has been on for 3 months has a WAS of 34/27 and will sked for any reason on the 40 or 15 meter band.

Jack Dunn, KN1TCU, 35 So. Prospect St., Lee, Mass., runs a homebrew Novice "kilowatt" and Super-Pro receiver and dipole. So far Jack has made 85 contacts in 2 weeks, with 7 states confirmed. You can find Jack on 80 in the morning and evening.

Ron Tregl, K3LUE, 231 Lurgan Ave., Shippensberg, Pa., dropped the "N" about 3 months ago and has moved his Globe Chief Delux and Knight R-100 down to the 75 meter phone band. His equipment also includes a Knight v.f.o. and modulator with two 6L6's. The antenna farm consists of a doublet up 20 feet. Ron, who is 14, would like to know about feeding a vertical antenna with 300 ohm twinlead.

Eric Wolfbrandt, WV2NZY, So. Main St., Glassboro, N. J. will have dropped the "V" by the time you read this, also. During his Novice career, Eric has 700 QSO's and wonders if this is any sort of record. Eric belongs to MARS (Military Affiliate Radio System) and has a Novice WAS of 37/36.

Gary Brown, 529 Morgan Pkwy, Hamburg, N. Y. points out a boo-boo. In the July issue I listed his call as WV2ROU and it should be WV2ROV. Sorry OM!

That loads our doublet for another month fellows. Be sure to keep those letters and cards coming. Also break out the Brownie, Bob, 'cause the billboard is bare—bub!

73, DE Don, W6TNS

For further information, check number 35, on page 126

For further information, check number 21, on page 126

Ham Shop

Rates for the HAM SHOP are 5¢ per word for advertising which, in our opinion is obviously of a non-commercial nature. A charge of 25¢ per word is made to all commercial advertisers or business organizations.

Your copy should be preferably typewritten, double spaced on one side of the page only.

We do not bill for advertising in the HAM SHOP. Full remittance *must* accompany all orders.

Closing date is the 20th of the 2nd month preceding date of publication.

We reserve the right to reject advertising which we feel is not of an amateur radio nature.

Because the advertisers and equipment contained in the HAM SHOP have not been investigated, the publishers of *CQ* cannot vouch for the merchandise listed therein.

ATTENTION Mobileers! Leece-Neville 6 volt 100 amp system $50; 12 volt 50 amp system $50; 12 volt 60 amp system $60; 12 volt 100 amp system $100. Guaranteed no ex-police car units. Herbert A. Zimmermann, Jr. K2PAT, 1907 Coney Island Ave., Brooklyn 30, N. Y. Tel. DEwey 6-7388.

For Sale: TV Cameras, Teletype, Panadapters, Transmitting Tubes, Transistors, SSB gear. Write for list. Spera Electronics, 37-10 33 Street, L.I.C., N. Y. STilwell 6-2199.

ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog. Fabulous bargains. Meshna, Lynn, Mass.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 P. P. DePaul, 309 South Ashton, Millbrae, Calif.

BEGINNERS: Code bothering you? Now learned in one hour. New Method. Quick approach towards your ham ticket. Used in Armed Services, Ham Radio, Scouting. Ketchum's One Hour Code Course $1.00 postpaid. MONEY BACK GUARANTEED—O. Ketchum, 10125 Flaro Vista, Bellflower, California.

WANTED: Teletype printers, perforators, reperforators transmitter-distributors test equipment: Model #14, #15, #19, #26, #28, etc. All types Collins receivers, 51J, R-388, R-390, 75A, etc. Cash, or trade for NEW amateur equipment. Write Tom, W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048).

WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft. Box 399, Mount Kisco, N. Y.

"The VHF Amateur"—At last a magazine for VHF'ers! Don't miss a single issue! Send $2.00 for year or $1.00 for six big issues . . . 67 Russell, Rahway, N. J.

GARAGE DOOR OPERATORS $59.95. Rugged chain drive automatic units. Highest quality. Free literature. DEMSCO, INC., Sebring 22, Ohio.

Communications, Teletype, unusual surplus bargains. Free flyer, MDC, 923 W. Schiller, Phila. 40.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash for each item that you want preserved. 24-hour service. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N. Y.

CALL LETTERS may be applied to any surface. 2" sets 60¢, 3" set 80¢. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N. Y.

Wanted: R-388/URR receivers, any condition. Electronicraft, Box 399 Mt. Kisco New York.

WANTED: TELETYPE TG-7, Models 14, 15, 19, 26, 28, printers & reperforators: Revrs & xmtrs: BC 610E, I; AN/GRC-3 & higher, RT-66, -67, -69, Collins 51J, 17L3, -4, 18S-2, R-388, -390, -391; ARN-14 and -30; APR-9, -10, ARC-21, -27, -34; APS-10, -31, -33, -42, etc., and TEST EQPT, TS or AN/URM. We pay freight. Amber Industrial Corp., 75 Varick St., New York 13, N. Y.

Collins KW-1 like new many extras terms to responsible purchaser. Lloyd Norberg W7EHQ 2502 Jefferson Avenue, Tacoma, Washington.

Syracuse VHF Club 7th Annual Roundup October 7, 1961 Three Rivers Inn Speakers, Awards, Floorshow, Steak dinner, many prizes. Write K2TXX 233 Ester St., Minoa, N.Y.

Peoria Hamfest, Sept. 17, Peoria Area Amateur Radio Club. Tickets $1.00 until Sept. 9. Write Steve Perry, K9AXG, 505 E. Jefferson St., Washington, Illinois.

Radio and T.V. tubes jobber boxed R.C.A. G.E. Sylvania, Westinghouse 65% off list price, 25% deposit, on all orders, balance C.O.D. F.O.B., N.Y., Sutton Electronics Box 503, Hicksville, N.Y.

Opportunity to volunteer service to a non-profit scientific research project. Object: investigation of electromagnetic phenomena such as radio astronomy, scatter propagation, and moon-bounce. An administrative staff of 25 people with knowledge and skills in electronic and related fields is needed. For details write Radiometric Research, Ltd. Box 4335-Annex, Las Vegas, Nevada.

WANTED: Tektronix scope. Cash or trade. H. T. Cervantes, W2DB, 190 Croton Ave., Mt. Kisco, N. Y.

QSL's four colors glossy stock forty design send $5 for 200 and get surprise of your life. 48 hour service satisfaction guaranteed. Constantine Press, Bladensburg, Md.

GLOSSY 3-color QLS cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, Somerset, N.J.

QSL's SWL's. That are different, colored, embossed card stock and "Kromekote." Samples 10¢. Home Print, 2416 Elmo, Hamilton, Ohio.

QSL's Samples 15¢. Rubber stamps: Name, Call, Address $1.35. Harry Sims, 3227 Missouri Avenue, St. Louis 18, Missouri.

QSL's-SWL's samples 10¢. Malgo Press, 1937 Glendale Avenue, Toledo 14, Ohio.

QSL's, SWL's XYL-OM's (Sample assortment approximately 9¾¢). Covering designing, planning, printing arranging, mailing, eye-catching, comic, sedate, fantabulous, DX-attracting, protoypal, snazzy, unparagoned cards (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minnesota.

QSL's—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

C. Fritz for QSL's that guarantee better DX returns! Samples 25¢ deductible. Box 1684 Scottsdale, Arizona. (formerly Joilet, Illinois)

QSLs. Large selection styles including photos. Lowest prices. Fast service. Samples dime. Ray, K7HLR, 679 Borah, Twin Falls, Idaho.

QSLs . . . Real eye catchers . . . Dime, Filmcrafters, Martins Ferry, Ohio.

QSLs??? Samples 20¢. Sackers, W8DED, Holland, Michigon.

QSLs 1 card 1 color 1 price. Sample stamp. 24 hr. service. K9AHD 426 W. Bertha St., Indianapolis 31, Indiana.

TRADE—HQ-110C rcvr. Top condition for same in Cheyenne transmitter, and Commanche receiver. Sell Apache transmitter. $200 f.o.b. D. Hunter, WA6NBT, R#1 Box 168, Paso Robles, California.

SWAP Henney's latest $25 Radio Engineering Handbook for Hi-Fi Amplifier. Brokloff, Bowling-Green, Cumberland, Md.

Complete 2-meter station Gonset II with Ameco Nuvistor pre-amp. Gonset v.f.o. and audio pre-amp, Gonset Final, Turner 22X mike, stand, extra tubes, $325.00. Swedgal, K2HAM, 211 Albermarle Rd., Brooklyn 26, N.Y.

For further information, check number 33, on page 126

FOR SALE: KWM-1 Perfect condition. First $450.00 gets. K5AON, 867 Berkinshire, Dallas, Texas.

FOR SALE—Heath "Sixer" HW-29A $30.00. Ameco 6 Meter converter Model CB-6 and power supply PS-1 $20.00. Franklin J. Meyers, Honesdale, Pa.

Sell Collins 75S-1 receiver, 32S-1 transmitter, 516F2 supply, 312B3 speaker like new $900. W3NWK, 2150 Greenleaf, Allentown, Pa.

WRITE for big bargain list. Discounts on a.m., s.s.b. gear, new and used. Don't miss out. H&H Electronic Supply. 506-510 Kishwaukee St., Rockford, Illinois.

YL, GENERAL LICENSE seeks position, New York City or vicinity where technical background plus office skills can be applied. GPO Box 1894, New York 1, N.Y.

ESTATE SALE: Complete ham set consisting of Globe Champion-300A, Collins 75A-4 with speaker, B&W 51-SB sideband adaptor, Gelsey VFO, Morrow CD (receiver with conelrad alert), panoramic adaptor, Cesco Regency Tela Patch, Asiatic D-104 with stand, Superior TD-55 Tube checker, Simpson Model 260, Nomad Keyeing Oscillator. For details call or write the Trust Department of The Second National Bank of Richmond, Richmond, Indiana, Administrator.

FOR SALE: Johnson Valiant, Factory wired and in perfect electrical and mechanical condition. $325. Bob Yarmus, K2RGZ, 532 Lefferts Avenue, Brooklyn, N.Y. SL 6-7044.

CLEANING UP! Fifteen tube 220-225 megacycle superhet, good, complete with power supply $25. 20 watt RCA amplifier $10. RCA grid modulator $15, 80 watt, 220 megacycle transmitter W/VFO $20. Other v.h.f. equipment and audio supplies! Olean, 157 Imperial Avenue, Westport, Connecticut.

BC-654A transceiver, 15 watts fone and 30 watts c.w. v.f.o. 3.7 to 6.4 mc works on 6 or 12 v.d.c. with PE-103 dynamotor, PE-104 vibra-pack, spare tubes, vibrator, fuses, brushes. Tech-manual. Less mic and key. You pay shipping. Only $50.00. John Gibson, Napavine, Washington.

FOR SALE: Factory overhauled Heathkit DX-35 transmitter. Guaranteed in perfect operating condition. Includes instruction manual. Write Mr. Alan B. Rogers, W1DVY, 93 Chester St., Allston 34, Mass. $55.00.

FOR SALE: Collins 32S-1 transmitter, serial #1637 complete with instruction book and cables. Will be shipped in original carton, express prepaid upon receipt of the first check or money order for $365. Frank Layton, W7IQS, 731 W. Dana, Mesa, Arizona.

JUST PUBLISHED: "DXer's QSO HANDBOOK" listing scientific techniques and favorite operating times and frequencies of over four thousand DX stations operating on forty, twenty, fifteen, ten meter bands using SSB, CW, AM modes. Earn diplomas quickly and QSO DX stations the easy way. Order today $3.25 postpaid, send check, cash or money order to John Grady, K4TUA, 404 Briarcliff Road, Warner Robins, Georgia.

SALE—HEATH "TENER"—This fine 5 watt rig for sale, including mobile power supply—$45.00—or best offer. Carl Krupp, K2GLK, Apt. 401, West Cherry Hill Apts., Merchantville, N.J., NO 2-6649.

WANTED: Tubes, diodes, transistors, military, commercial lab-grade test equipment, components, PRC, GRC equipment, aircraft equipment by Collins. TOP PRICES. Write details, Bob Sanett, W6REX, V&H Radio & Electronics, 2053 Venice Blvd., Los Angeles 6, California.

WANTED: 500 watt or better supply. State price. Write KØSUB, Box 2245, Pueblo, Colorado.

TELETYPE EQUIPMENT FOR SALE (tested); Model 14 typing-reperferator (some less cover) $80.00. Model 15 page printer (with keyboard) & cover $90.00, with auto-carriage return $100.00. Used, good condition. Synchronous motors. Frank Holloway, Jr. 513 N. Pinehurst, Salisbury, Md.

FOR SALE: Heathkit DX-100 transmitter in excellent condition. Want $150. Robert E. Moore, 27 Cranford Road, Asheville, N.C.

FOR SALE: Surplus electronic equipment, parts, tubes. Free listing. Enormous stocks. U.S. #1 Electronics, 1922 Edgar Road, on U.S. #1, Linden, New Jersey.

FOR SALE: NC-98 receiver with Q-multiplier. Good condition $95.00; W8TVO, 1454 Sattes Circle, Nitro, W. Va.

A-1 RECONDITIONED equipment. On approval. Trades. Terms. Hallicrafters S-85 $79.00. SX-99 $99.00, SX-100 $199.00, SX-111 $199.00, SX-101A, HT-32, HT-37 Hammarlund HQ-100 $129.00, HQ-129 $129.00, HQ-110 $179.00, HQ-145 $199.00, HQ-150 $199.00, HQ-160 $259.00, HQ-170 $389.00; National NC-270 $179.00, NC-183D $199.00, HRO-50T1 $199.00, NC-60, NC-173, NC-300, HRO-60; Central 20A $159.00, 600L $199.00, Collins 75A-2, 75S-1, 32S-1, KWS-1, KWM-2; Elmac, Globe, Gonset, Heath, Johnson, RME, other items. List free. Henry Radio Company, Butler, Missouri.

SELL: HQ-129X with 21 mc band on new bandspread dial, xtal calibrator, speaker, manuals, spare tubes, clean, excellent for SSB, $130. D-104 mike, "F" stand, cable, $16. 20-A xtals, 5003, 5293, 5295 and 5297 KC, $2 each. Lynmar TR switch, type TRS-1 in sealed pack, $6. Sonar 52 ohm LP filter, $6. 10 amp auto-transformer tapped 95 thru 135 volts, $8. 125 watt Kenyon Universal class B modulator output and input transformers, $15, the pair. 1250 volt, 300 mil power supply, $35. 2 RCA 813's, $7, each. Old books, state requirements. George Rulffs, Jr., W2CJY, 38 Brookwold Drive, Manhasset, L.I., New York. MA 7-0407.

FOR SALE: New Valiant transmitter $375. Nice NC-183 receiver with speaker $195. WØRRJ, David Tranberg, Hallock, Minn.

FOR SALE: Tube tester I-177-B and MX-949A/U socket adapter, good condition, $25. FOB. WANTED: Instructograph machine and/or code records, must be bargain! Jerry Felch, 2416 Halmac Drive, Huntsville, Alabama.

DX-100 For sale. Like new. Used only a few hours—$170. Also National NC-98 receiver, excellent condition—$100 or best offer. Need money for school. Mike Marlies, 322 Allaire Ave., Leonia, N.J.

SALE: Johnson Valiant. Looks and operates like new. $275.00. Jerry Chenoweth, 6940 "Y" St., Lincoln, Nebraska.

100 watt dummy load for 75-80 meter bands surplus. Has variable capacitor 18 mmf min, 157 mmf max. Also has 2 non-inductive 12 ohm 40 watt resistors plus other parts $1.50 postpaid. Variable capacitors HF-15-X 60¢, HF-35 40¢ postpaid. QUAKER ELECTRONICS, Mt. Top, Penna.

25 new 1626's, 20¢ each. K1IIK.

PREMIUM QUALITY used equipment. Over 1,000 units—reconditioned with trial plan and full 90 day guarantee. Terms available. Write for free lists and top trade-in offer on your present equipment. World Radio Laboratories, Box 919, Council Bluffs, Iowa.

EARN EXTRA MONEY! 21 successful ways to earn money in your spare time. Thousands satisfied! Send $1. (money back guarantee) Taylor Surveys, Lake Ave., Lake George 7, New York.

Cleaning house—Have several brand new BC-653 A's all tubes less finals (814's), also C-434/GRC field phone units, $18 each plus shipping. Mike Windle, 1603 W. Kamm, Caruthers, California.

FOR SALE: Hammarlund receiving equipment, like-new condition. HQ-150 general coverage receiver, calibrated bandspread, $175. HC-10 sideband adapter, may be used to improve selectivity and s.s.b. performance of any receiver having 450-500 kc i.f., $90. Both for $250. Will pack for shipping. Al Brogdon, K3KMO, RD1, Box 531, State College, Pa.

SELL: Used 200V Like new. $639. Grgans and Electronics, Lockport, Ill.

WANT Collins 75A-2 receiver in good condition. Will trade SX-99 with Heath-kit Q Multiplier, without speaker, Genometer TV -50 a.f. r.f. signal generator, Heath-kit O-11 oscilloscope, Heathkit T-4 signal tracer, Hickok Model 533 mutual conductance tube tester, and Heath-kit geiger counter. Everything in good working condx, and with all manuals. All letters answered. Steve Branyik, W9WFI, 427 Sibley Blvd., Calumet City, Illinois.

COMPLETE KW s.s.b. station—HT-32, HT-33, SX-101, R-46A speaker, Johnson T-R switch, Drake patch, D-104 mike, Jones s.w.r. indicator, Johnson low pass filter, all manuals and cables included $1200.00. Buying Collins S-line. Brownie, W3CJI, 3110 Lehigh, Allentown, Pa. (SWift 7-0650).

CONVERT any television set to sensitive, big screen oscilloscope. Only minor changes necessary. Plans $1.95. Relco Industries, Box 10563 Houston 18, Texas.

For further information, check number 43, on page 126

see page 113

RANGER, with "push-talk" relay. Factory wired, $185. National NC-300 $240. Both excellent condition. Heckman, 92 Lagoon Blvd, Massapequa, N. Y.

W5QUES looking for 51J-3, 51J-4, R-388, R-390, R-391. Cash or trade. 75A-3, 10B + v.f.o. 400 w. linear, 3 or 5 kw pool transformers, 4-1000A's. CU-7296-UPSB, 1438 Adkins Rd., Houston 24, Texas.

HEATH Apache and SB-10 $300.00 W8LKM, 3523 Pickwick Place, Lansing, Mich.

BROOKLYN HAMS! Postcard for list items left from sale of DX-100, NC-300. Melvin Weiner, 5714 Farragut Road, Brooklyn 34, N. Y.

SELL: Hammarlund HC-10 Converter, mint condition, $95. Wanted Collins Vernier tuning knob, 4D32 tube. W8OPA, 3820 Elsmere, Cincinnati 12, Ohio.

NATIONAL NC-183D, excellent condition, just aligned $175.00. Kenneth F. Steffan, 1024 Ninth Street, Santa Monica, California.

COLLINS 75S-1 with noise blanker (cost $125.00 extra), almost new, $449.00; Drake 2-A, warranty, $215. Central Electronics MM-2, $89.00. W8WGA.

HAMS! Hallicrafters S-38-D like new, $35.00. New, 1961 ARRL Radio Amateur's Handbook, $3.00. J. Weygand, 9 Bloomfield Ave., Middleboro, Mass.

JOHNSON Valiant transmitter 4 months old, like new condition, factory wired. Hammarlund HQ-100-C receiver. Globe Chief Deluxe transmitter, factory wired. Screen modulator for Globe Chief. Hy Gain 3 el. beam. Write K4WIS, Ross Houston, 2053 North Bay Rd. Miami Beach 40, Fla.

SURPLUS, Have two new Navy 243 MC transmitters. May be used directly on 220 MC just add crystal and retune or may be converted to 144 MC. Conversion in Sept. 1960 CQ Magazine. One $13.95, both for $27.00. K2UNY, Richard S. Mead, R.D. 1, Owego, New York.

FOR SALE: *QST* 1951 thru 1957, *CQ* 1954 thru 1960, others, will not break year, 20 cents each; S-53A $60; 211 freq meter $55; Onan electric power plant 400 watt $45; power transformer 6000 ct at 500 ma, 4700 ct at 350 ma $15 each; 2300 ct at 500 Ma $10; Filament transformer 2.5v. at 10 amp $4; Sola constant voltage transformers one 250 watts $15, one 500 watts $20; Aircraft communications Set AVT-112A, AVR-20A and AVA-120 $35; 6 or 12 volts vib. power supply $10; Transmitter Blower 110v $6; 10h choke 400 Ma. 12v 400 ma $5 each. High voltage filter condensers $5 each. W1ZOU, Box 574, Belton, Missouri.

PHILCO v.h.f. to u.h.f. signal generator G8000. UHF audio level sweep generator G8002. Several new. Sell or trade. Dale Snell, Blue Mound, Illinois.

813 roller-coil Pi Final with 2500 volt Supply: $60; 175 watt speech amplifier Modulator with supply $30; 80% finished 150-watt transmitter all new parts $40; Meissner VFO $18. K2KGU, MO 6-8513.

DX-100 for sale, $160, has worked DXCC. Will also sell HQ-140X, relay Millen preamplifier, 50kc calibrator, and phone patch. Don Strong, Rt. 2, Batavia, New York.

YL *[from page 103]*

time, in addition to the hundreds of really active ones. So come meet your old friends, and make many new ones!

As last year, the c.w. section is being held first, on Oct. 25-26. The phone section will be held on Nov. 8-9. Note the contest dates fall on Wednesday and Thursday. ARRL sections will be used in scoring U.S.A. contacts. Remember, a combined c.w.-phone score is required for the Corcoran Award. All YLs everywhere, whether or not members of YLRL, are invited to participate in this contest. Rules are given elsewhere, and also please note the standard procedure to be used in log checking; see that your's complies. See you in the A.P.!

More operating at W5WLO/5 Dallas, l. to r., K5GBX, Bernell; W5WLO, Grace; W5SPV Patt.

YLRL Log Checking Procedure

The following is standard procedure to be used in checking YLRL contest logs. It has been set up by YLRL V.P., Onie Woodward, W1ZEN, working togther with a group of YLRL officers, V.P.'s committee and past V.P.'s who have checked logs in previous contests. Onie comments she realizes it may be incomplete and subject to change, and suggests that if you have any comments she'd appreciate it if you'd send them along with your contest logs.

1. Multiplication will be checked carefully.

2. Logs will be checked for duplicate contacts and duplicate multipliers.

3. According to YLRL contest rules, your log is supposed to show call, number (given and received), RST or RS and section. If any one of these is missing the contact may be considered incomplete. (Time and band are also required.)

a) All c.w. contacts must show RST and all phone contacts must show RS to be a completed contact.

b) The numbers are used for crosschecking. How you keep your log during contest is up to you but your copy submitted for the contest should show your contacts numbered consecutively. Number your page ahead of time, give consecutive numbers to contacts. If contact completed okay, if not completed draw a line through that number and forget it. Give your next number to your next contact. Once a number is given, or skipped, never change the numbers on your log for any reason. This is because logs are crosschecked by the numbers you send and receive. Make a note at the end of your log of any irregularities.

c) Sections—please know your own section and take time to be sure your contact has received it. (Official section list available for an s.a.s.e. from W1ZEN, Onie Woodward, 14 Emmett St., Marlboro, Mass.).

4. Watch your carbon copies. Carbon copies of logs are very hard for a YLRL V.P. to check. The copy may look fine when you mail it, but by the time it has been folded, mailed and then shuffled among 300 other logs, it has become very definitely messed up and practically illegible. If you send a carbon copy of your log and it should become unreadable the V.P. and her committee may disqualify it.

Any one of the above may be a reason for changing your score as submitted on a YLRL contest log.

ALAMO YL Week

The Alamo YL Club of San Antonio, Tex. has designated the week of Nov. 5-11 as "Alamo YL Week." All members will be active on all bands for those who may be seeking the Alamo certificate. 33—W5RZJ

READER SERVICE

CQ Magazine, Dept. RS

300 WEST 43rd STREET
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Coupon J
Void after
October 27, 1961

Please send me more information on your ads in the October 1961 CQ keyed as follows:

1	2	3	4	5	6	7	8	9	10	A
11	12	13	14	15	16	17	18	19	20	B
21	22	23	24	25	26	27	28	29	30	C
31	32	33	34	35	36	37	38	39	40	D
41	42	43	44	45	46	47	48	49	50	E
51	52	53	54	55	56	57	58	59	60	

NAME ____________________
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Call ____________________ Engineer ☐

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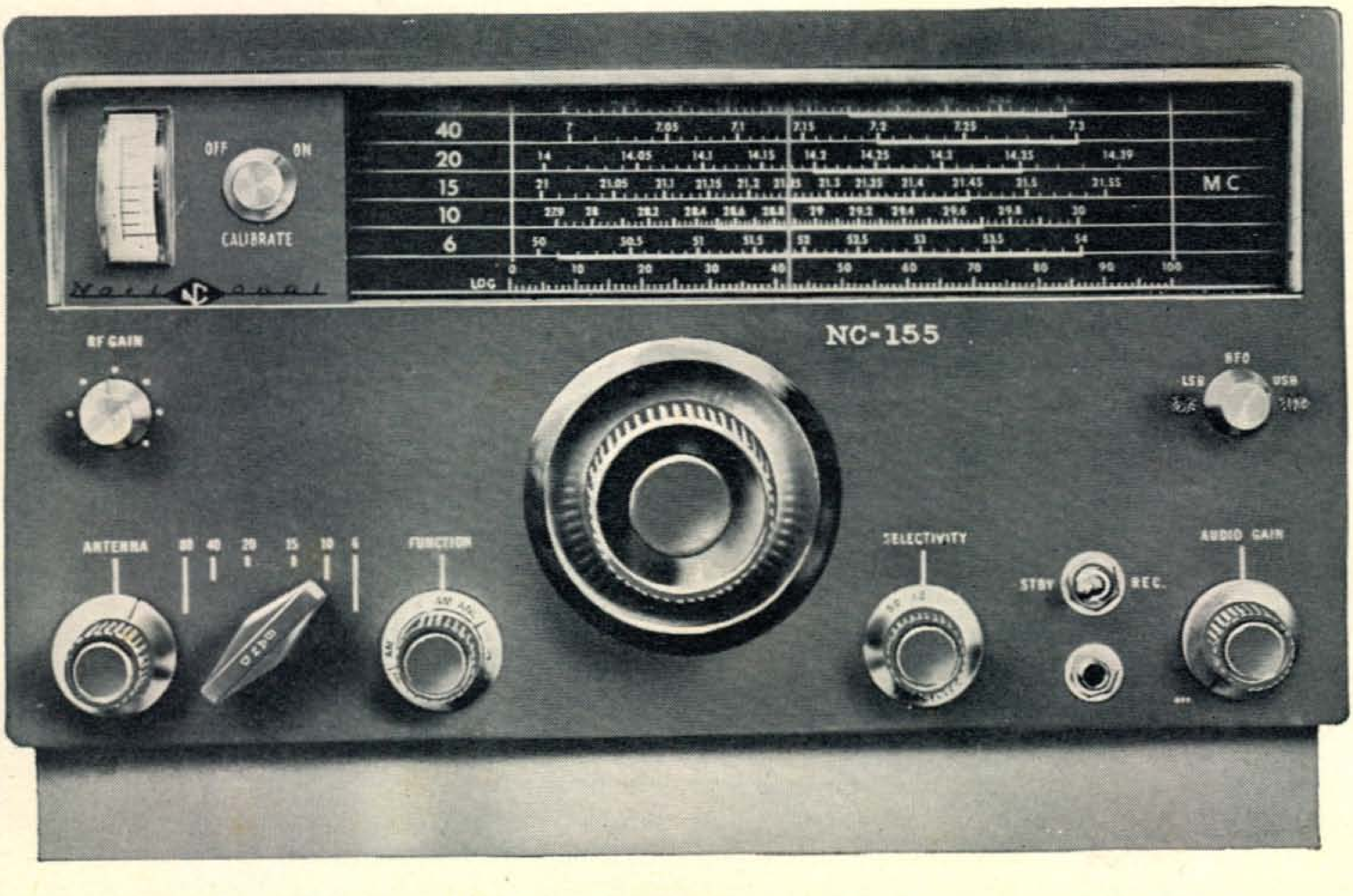
ADVERTISING INDEX

For further information, check number 41, on page 126

MC



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