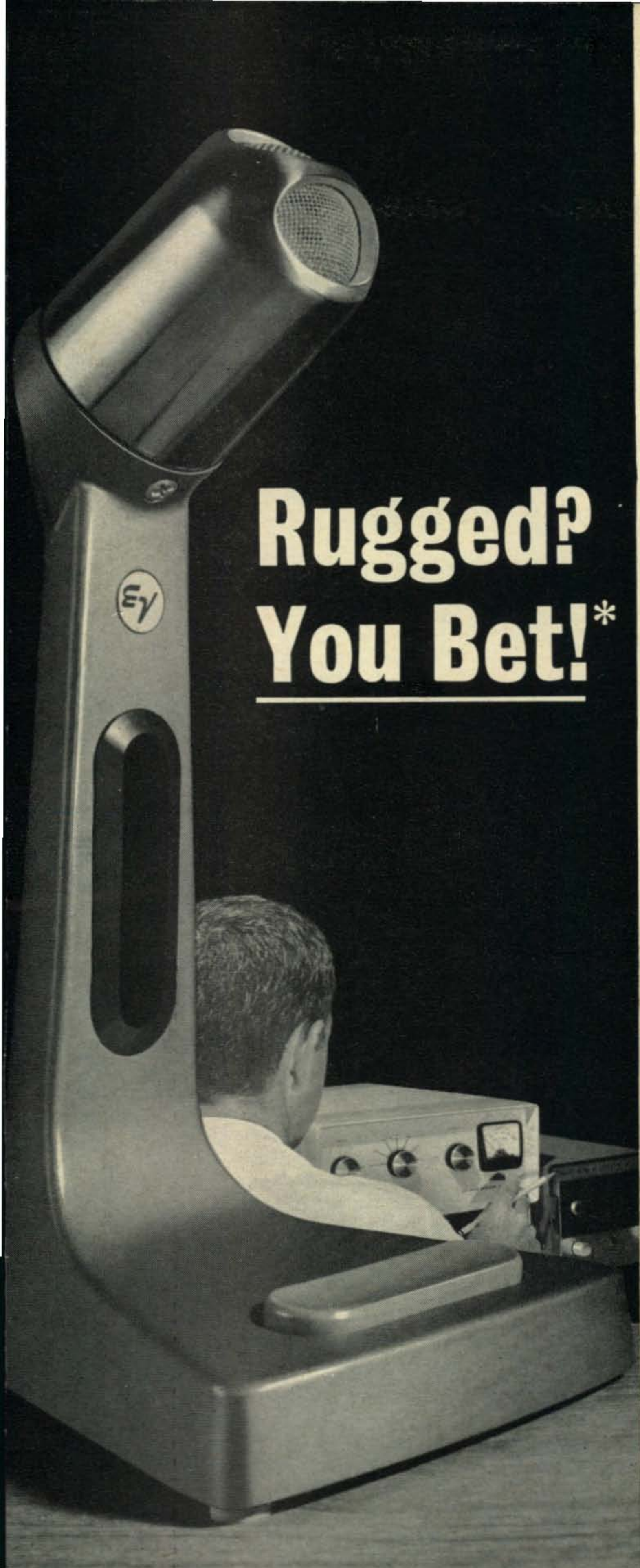
CQ

December 1965

75¢

The Radio Amateur's Journal

Happy Holidays old man



Rugged? You Bet!*

TOUCH-TO-TALK
COMMUNICATIONS
MICROPHONES

Model 619 Dynamic $28.50 net

Model 719 Ceramic $16.50 net

These new beauties are tough. No fragile plastics or lightweight metal. A 400-ton high-pressure die casting machine turns two pounds of molten metal into a solid stand that laughs at heavy service. And tough baked enamel plus heavy chrome plating guarantees lasting good looks.

Just touch the big bar to talk. It latches on with a simple, sliding motion. Or move it to the grip-to-talk position on the stand riser in just minutes, with only a screwdriver. The DPDT telephone-type leaf switch will last a million calls or more. It operates both voice and relay circuits, with optional electronic switching available at the end of the 619 (Hi-Z) and 719 cable.

All models are omnidirectional, and come complete with heavy-duty cable. Most economical is the Model 719 ceramic. Response is from 80 to 7,000 cps at —56 db output.

For top quality, choose the Model 619 dynamic models with exclusive E-V Acoustalloy diaphragms. Smooth, peak-free response from 70 to 10,000 cps at —56 db output insures highest talk power and full modulation. Choose either Hi-Z or balanced Lo-Z model.

Try one of these rugged new beauties today. You'll find that your rig never sounded — or looked — so good!

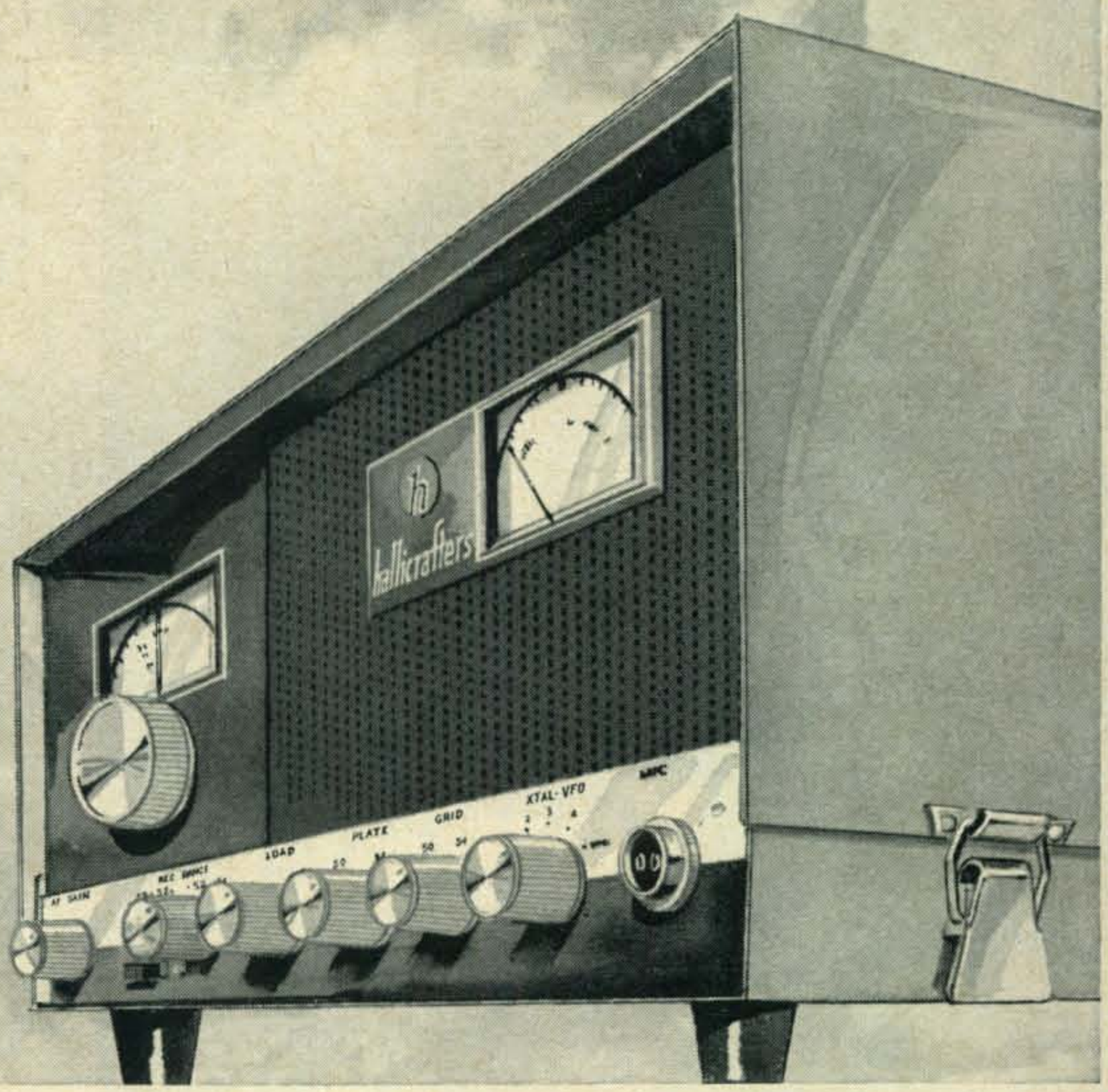
ELECTRO-VOICE, INC.
Dept. 1252G, 618 Cecil Street
Buchanan, Michigan 49107

Electro-Voice®
SETTING NEW STANDARDS IN SOUND

*We cover our bet with a *lifetime* guarantee. If any 619 or 719 ever fails, just send it to us. We'll repair it at nominal cost. But if there's even a hint that our workmanship or materials weren't up to par, the repair is on the house — even 30 years from now! Fair enough?

For further information,
check number 1, on page 106

Bye Bye Birdie



Efficient filters and selected injection frequencies make the NEW SR-46 and SR-42 VHF transceivers virtually immune to FM and TV interference.

Interference-free reception is only one of many advantages in the new SR-46. Complete six meter band coverage is another. Or full two meter coverage, if you prefer, in the companion SR-42 unit. Both give you double the usual bandspread, through use of dual tuning ranges. A neutralized nuvistor front end boosts sensitivity, and eleven tuned circuits increase selectivity while suppressing interference. Push to talk, of course.

Thorough field testing, before production, by hundreds of operators, assures you of years of trouble-free performance. It all adds up to your top VHF value. See the SR-46, or the SR-42, at your distributor today.

FEATURES

Frequency Coverage: 50 to 52 Mc and 52 to 54 Mc (144 to 146 Mc and 146 to 148 Mc in the SR-42). **Power Input:** 10-12 watts. **Power Supply:** 115 VAC and 12 VDC (vibrator and line cord optional extra). **Transmitter Crystals:** high frequency type; provision for four (one furnished), plus external VFO, switch-selected from front panel. **Tubes:** 10, plus zener diode oscillator control and four diodes (11 tubes, 2 zeners and four diodes in the SR-42). **"S" Meter** automatically switches to RFO. **Cabinet:** "snap-off" type for easy access. **Size:** 5½" high, 12⅛" wide, 8¼" deep. **Shipping Weight:** 17 lbs. **Amateur Net Price:** $189.95.

New **SR-46**

SIX METER VHF TRANSCEIVER and SR-42 for two meters

"Quality through Craftsmanship"

hallicrafters

Export: International Div., Hallicrafters.
"Available from Gould Sales in Canada"

5th & Kostner Aves., Chicago, Ill. 60624

For further information, check number 2, on page 106

CQ

DECEMBER 1965 VOL. 21, No. 12

The Radio Amateur's Journal

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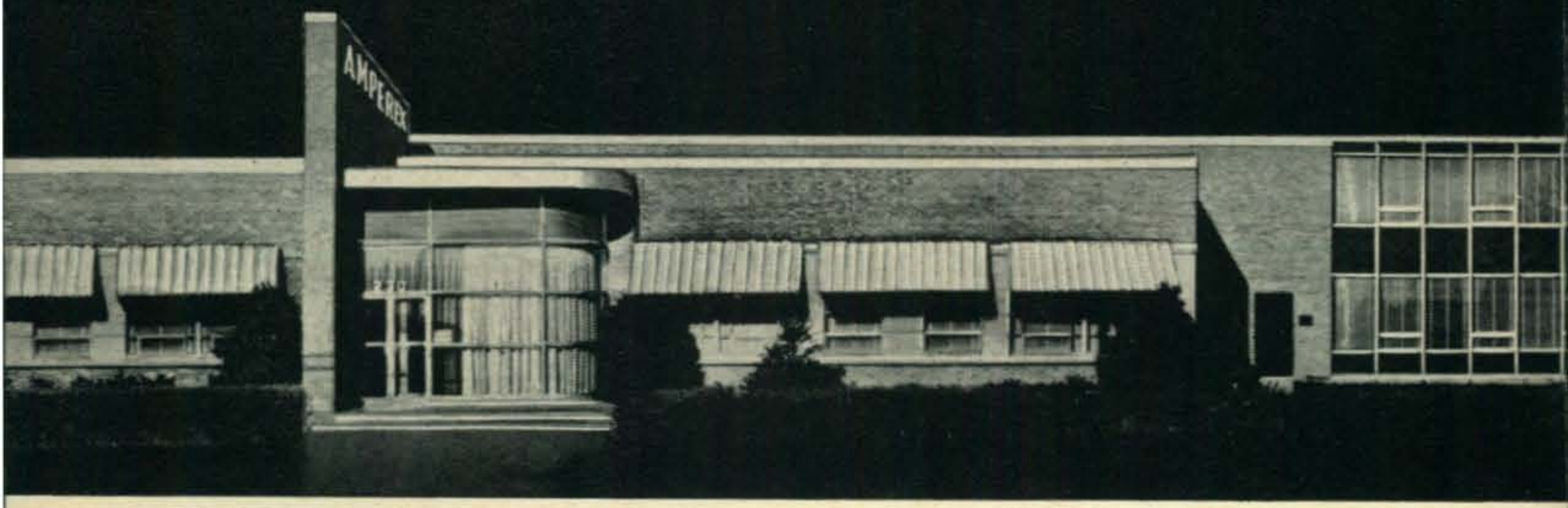
DEPARTMENTS

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

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

SSB problems solved here



Amperex status as the source of more tube types for Single Sideband Suppressed Carrier Service than any other producer, didn't just happen. Leadership has been achieved as the result of a deliberate and continuing program of engineering research and intensive laboratory testing from which has emerged a distinctive and clearly superior comprehension of SSB technology and SSB applications for any power level from 5 watts to 5 kilowatts PEP.

From internal tube geometry to overall envelope design, AMPEREX SSB Tubes are *Performance Tested, Performance Rated* and *Performance Guaranteed* for optimum linearity and minimum intermodulation distortion at *full Single Sideband power ratings.*

like this...

SSB TYPE NO.	7378	SD568*	8637	8505	8579	8163
Useful Peak Envelope Plate Power Output *(watts)*	167	180	76 (PTTS)	57	110	700
3rd Order Intermodulation Distortion *(db)* (without feedback)	35	30	25	30	30	35
5th Order Intermodulation Distortion *(db)* (without feedback)	40	35	35	43	40	40
Typical D.C. Plate Voltage *(volts)*	750	2000	600	750	600	2500

*Conduction cooled version of the 8321/4CX350 in development.

Illustrated are six new communication types of a line of more than 20 AMPEREX "Performance-Rated" SSB tubes with power ratings from 5 W. to 5 Kw. PEP. Watch for releases of new SSB tubes now in prototype stage. Write for technical data sheets. Applications engineering assistance available. AMPEREX Electronic Corp., Tube Division, Hicksville, L. I., N. Y. 11802.

Amperex®

For further information, check number 5, on page 106

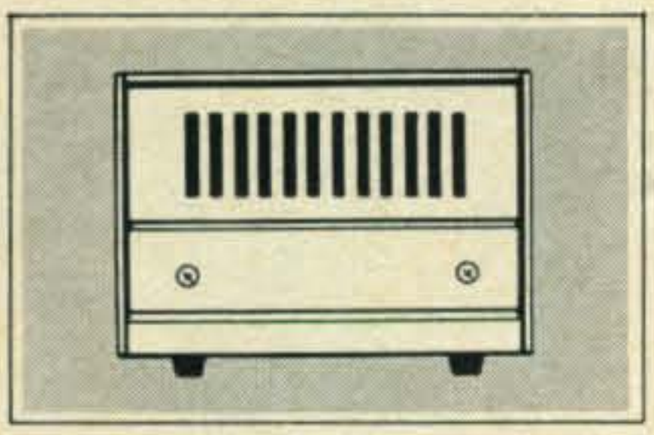
NOW! A TRI-BAND SSB TRANSCEIVER KIT FOR 179.9

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

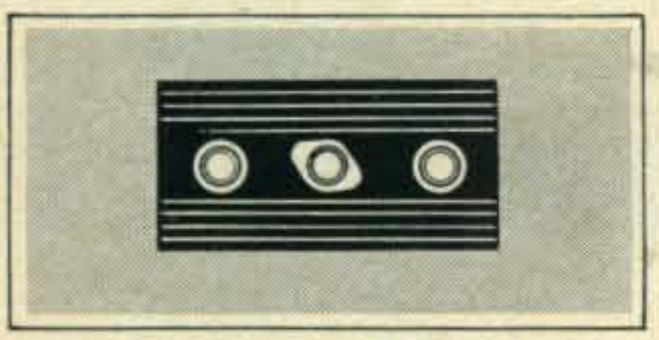
Build the finest of SSB/AM/CW tri-band transceivers with 200 watts of SSB punch and every wanted operating facility, plus the extra reliability and maintenance ease inherent in kit design. Assembly is made faster and easier by VFO and IF circuit boards, plus preassembled crystal lattice filter. Rigid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

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

Power Supplies Tailored for Optimum Performance of the 753.



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



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

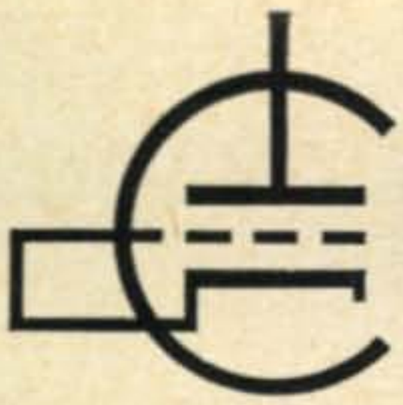
ADDITIONAL SPECIFICATIONS

FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal lattice filter; bandwidth 2.7kc at 6db. STABILITY: 400 cps after warm-up. SUPPRESSION: Carrier-50db; unwanted sideband-40db. RECEIVER: Sensitivity 1uv for 10db S/N ratio: selectivity 2.7kc at 6db; audio output over 2 watts (3.2 ohms). PANEL CONTROLS & CONNECTORS: Tuning, Band Selector, AF Gain, RF Gain, MIC Gain with calibrator switch at extreme CCW rotation, Hairline Set (capped), Mode (SSB, AM, CW, Tune), Function (Off, Standby, PTT, VOX), Carrier Balance, Exciter Tune, PA Tune, PA Load, Receiver Offset Tune, MIC input, phone jack. REAR CONTROLS & CONNECTORS: VOX Threshold, VOX delay, VOX sensitivity, Anti-VOX sensitivity, PA Bias adjust, S-Meter zero adjust, power socket, external relay, antenna connector, key jack, accessory calibrator socket. METERING: PA cathode on transmit, S-Meter on receive. SIZE (HWD): 5 13/16" x 14 1/4" x 11 1/4". POWER REQUIREMENTS: 750 VDC at 300 ma, 250 VDC at 170 ma, -100 VDC at 5 ma, 12.6 VAC at 3.8 amps.

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

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-12, 131-01 39th Ave., Flushing, N. Y. 11352

For further information, check number 6, on page 106



ZERO BIAS

As the year 1965 approaches an end, I find myself with a lot of random thoughts about *CQ* and ham radio, many of which could be the basis of a full-blown editorial. But lacking the room to fully expound upon the wonders of the ham world, bear with me as I wander aimlessly through my thoughts . . .

1965 saw the delivery of every last one of the long-promised Arne Trossman Top Honors CHC Plaques. Contrary to K6BX fabrications, *CQ* was not about to force plaque winners to purchase their own awards . . . FCC Docket 15928 will probably go unruled on for most of 1966. The sometimes angry and well-researched commentaries on the proposal by hundreds of amateurs have evidently given the Commission a vast number of new views to consider. My guess is that a second, more palatable proposed rule-making will be offered up by next fall . . .

Whatever happened to the Institute of Amateur Radio (frequently referred to as the W2NSD Benevolent Society)? Great promises were made for a new order in amateur radio, but it seems that none have materialized. Where's the money? . . .

Some great publicity recently for ham radio in New York: Station WHN (50,000 watts, 1050 kc, New York) featured "H for Ham Radio" on its "Information From A to Z" series Oct. 27 and 28. Tapes of the 6½ minute broadcast (prepared by the *CQ* staff) are available in very limited quantity from *CQ* for a 3½" reel of good recording tape and return postage. Permission has been granted for other stations to use the tape after proper editing . . . And speaking of publicity, "The Bedford Incident" publicity tie-in for ham radio, announced last month, is doing a fantastic job in all parts of the US except our own New York City area. A few clubs such as the Westchester ARA have tackled the job locally, but most remain cool to the idea. Can't figure out why, when reports coming in from coast-to-coast indicate stations being set up in the lobbies of over 125 theaters by November 10. If you missed last month's ZERO BIAS, dig out November's *CQ* and read it . . .

Congratulations to EICO on their 20th Anniversary. It's no mean feat to compete for 20 years in the radio and electronic business. Ask our publisher, he's been at it for 21 years now with *CQ* . . .

Two live-wire groups have come into their own in 1965: The International Amateur Radio Club (IARC), and the fledgling National Award Hunters Club (NAHC). IARC is based in Geneva and is most ably directed by John Gayer, HB9AEQ. The club's station, 4U1ITU at ITU Headquarters needs no introduction. IARC is dedicated to improved international understanding through amateur radio, and improved international understanding *of* amateur radio through personal diplomacy. I'd be hard put to name a man I'd rather see represent ham radio internationally than HB9AEQ. Membership is open to all amateurs . . .

The NAHC is a group of dedicated wallpaper seekers who have joined together to pursue this exciting hobby-within-a-hobby in a progressive and unencumbered manner—unencumbered by the self styled "fearless leader," K6BX, that is. The 200 member club was formed in January of this year by WB2FEQ and WA2SAZ, who were promptly drummed out of CHC by K6BX for daring to take issue with his policies. NAHC President is WB2FEQ. Membership is open to all amateurs, and with membership goes the right to vote for the men who will guide the club's policy. A monarchy is thus a practical impossibility, unlike CHC . . .

Project OSCAR has been honored for its efforts in promoting peaceful international communication among radio amateurs, by the Institute of International Communications of Genoa, Italy. On Columbus Day, Oct. 12, the "Christopher Columbus Award" was received for Project OSCAR by W6SAI and W6UF. OSCAR IV is now being readied for launch. For late information on what form the new satellite is likely to take, see page 83.

The year 1965 has witnessed a tremendous rate of growth in the number of *CQ* achievement awards issued. The WAZ Rolls increased by about 280, WPX gained 130 and USA-CA surprised us all with nearly a 50% increase in awards to 696, up from 479 last year. That alone is enough to make one wonder about the true value of K6BX's high pressure PR tactics. Space prevents us from including the WPX Honor Roll this month, but it will appear in January.

We'd like to take this opportunity to wish the thousands of fine folks that read *CQ* a Very Merry Christmas, from all the people who have the pleasure of preparing it for you each month: Bill, W2AEF; Al, K2EEK; Irv Tepper; Hal, WA2OBR; Dick, WA2LRO; Jack, WA2FPE; Marcia; and myself. 73, Dick, K2MGA

PRESENTING THE COMPLET

MARK I LINEAR AMPLIFIER

Five Band, 2000 watts PEP input. Uses two Eimac 3-400z or two Amperex 8163 triodes.

PRICE $425

TUBES $ 68

SWANTENNA 5 BAND MOBILE ANTENNA

Remote switching from inside car. 500 watt rating.

MODEL 55 . . $95

MATCHING AC SUPPLY

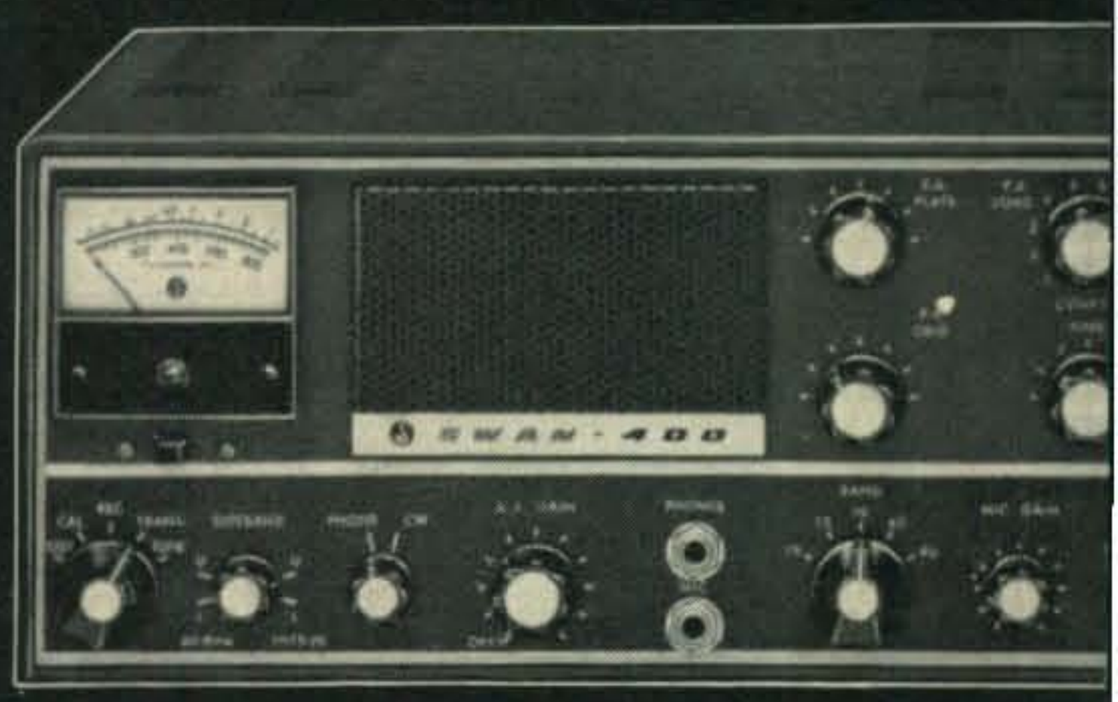
with speaker, phone jack.

MODEL 117-XC $85

MODEL 230-XC for 230 volts $95

DC MODULE Converts AC supply to 12 volts DC for portable or emergency operation.

MODEL 14X $55



MODEL 400 SSB TRANSCEIVER 5 BANDS 400 WATTS

Includes many deluxe features. Designed t use the highly stable, full coverage Mod 420 VFO in fixed station, the miniatur Model 406 VFO for mobile, or the Mod 405 for MARS operation.

$39

12 VOLT DC SUPPLY

For mobile or portable operation. Negative ground standard. Positive ground available on special order.

MODEL 14-117 . . . $120

PLUG-IN VOX UNIT

for either transceiver

MODEL VX-1 $35

CRYSTAL CALIBRATO

KIT $1

SIDEBAND SELECTO

KIT . . . . . $

Kits for Model only. Model 40 cludes these fea

SWAN SPEAKS YOUR LANGUAGE

ASK THE MAN WHO OWNS ONE

SWAN LINE

MARS OSCILLATOR

5 fixed channels, pre-set and locked to any frequency. May be used directly with Model 400 Transceiver or with Model 350 and Model 22 adaptor.

MODEL 405 . . . . . $45

MOBILE VFO

Miniature size. Covers phone bands. Makes it possible to trunk mount the transceiver.

MODEL 406 . . . . . $75

REMOTE CONTROL KIT

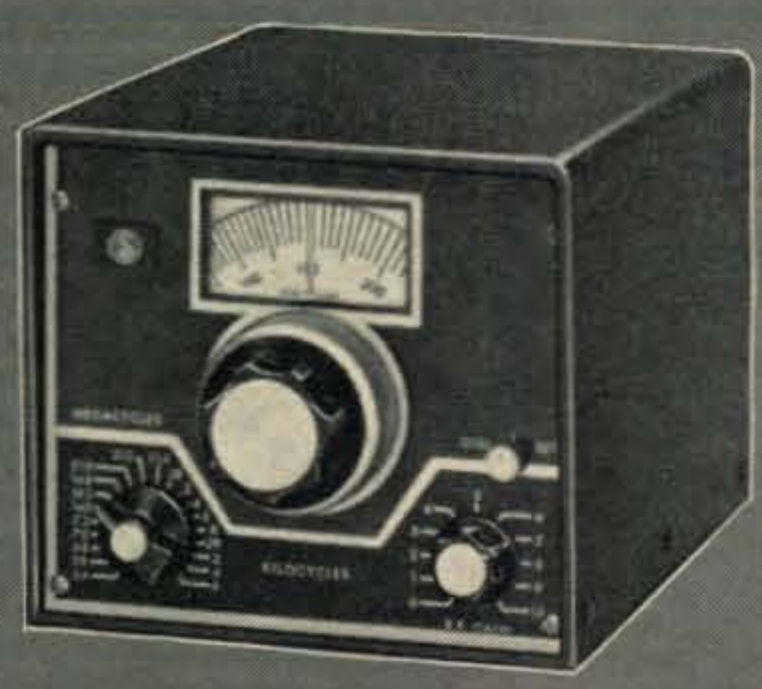
For trunk mounting of transceiver.

MODEL RC2 . . . . . $25

MODEL 350 SSB TRANSCEIVER 5 BANDS 400 WATTS

Built in full coverage VFO with 5 kc calibration. The greatest transceiver value ever offered the radio amateur.

$395



FULL COVERAGE VFO

20 ranges, 200 kc each, 2 kc calibration. Matches 350 and 400 transceivers in size & styling.

MODEL 420 . . . . . $120

DUAL VFO ADAPTOR

Provides for the addition of second VFO for separate control of transmit and receive frequencies. May plug into either 350 or 400 transceiver.

MODEL 22 . . . . $25

Merry Christmas

from all the gang

at SWAN

For further information, check number 9, on page 106

FOR COMPLETE INFORMATION SEE YOUR DEALER

SWAN ELECTRONICS CORP.
Oceanside, California

Ham Fellowship

AMATEUR Radio to me means Fellowship, pure and simple. Oh, of course, it means other things, too. Like being the most engrossing and enlightening hobby I've ever been engaged in; educational, too.

I'm proud to call myself a member of this grand and glorious fraternity—this fraternity of fellowship and good will. In all my association with Amateur Radio I can say without reservation, I have yet to meet an 'unfriendly ham.'

The following incident, which is by no means incidental, will further attest to the fact that this is true fellowship.

Several months ago, the XYL and I were involved in a near fatal auto accident. After a month of confinement in the hospital, I came home to find a whole new antenna farm planted out in my back yard and on my desk in the ham shack was an SB-33 Transceiver—to supplement my limited one-band ARC-5—ready to go, mine to use and enjoy for the duration of my convalescence! All this, compliments of the Fresno Amateur Radio Club. I can't praise this organization too highly. To give so unselfishly of their time, efforts and treasured equipment is truly an expression of fellowship.

Small wonder why I hesitate not to extend this testimonial to Amateur Radio. *WB6ETR*

Israeli Licensing

A NUMBER of license changes have been made in Israel during the past few years and especially this past year. For any ham planning a vacation in Israel with some intention of firing up his rig during his stay, should read the following and act accordingly.

1. Any foreign ham can operate a station in Israel (his own or an Israeli station) by applying directly to the Ministry of Posts. Address: Ministry of Posts, (Posts, Telegraph, Telephones and Radio), 37 Yehuda Hayamit Street, Jaffa, Israel.

2. The request for permission to operate in Israel must contain the following: a photostatic copy of the ham's license, a statement relating to length of intended operation, *e.g.:* Sept. 1st, 1965 until Nov. 1st, 1965. Intended QTH, *e.g.*, Telaviv, Haifa, etc. If mobile operation is intended, this must also be mentioned at the same time of opplication.

3. So far, foreign hams have not been charged for a temporary license. (Israeli hams are charged $3.00 for a 2 year license.)

There are 3 types of licenses issued (aside from club stations):

A—Class A (equivalent to U.S. Extra Class), permitted up to 500 watts input.

B—Class B (equivalent to U.S. General Class), permitted up to 75 watts input.

C—Class C (equivalent to U.S. Novice Class), permitted up to 10 watts, c.w. only, and limited to the 40 meter band. *Tnx 4X4FV.*

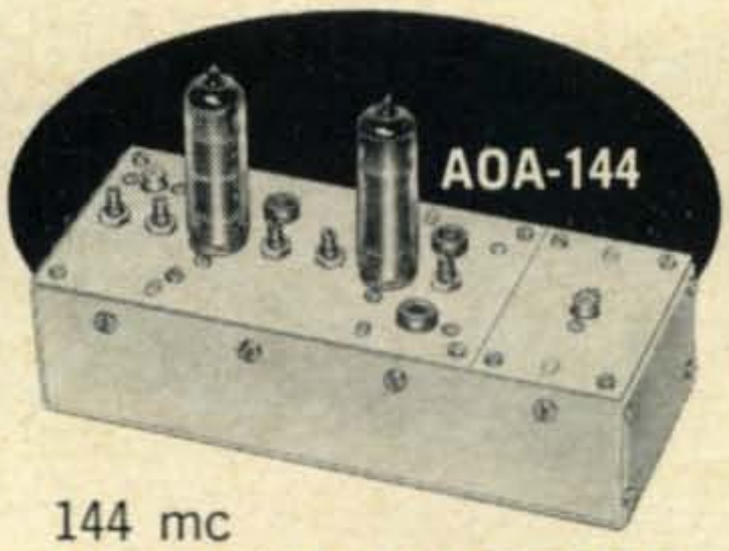
← For further information, check number 10, on page 106

NEW FROM INTERNATIONAL

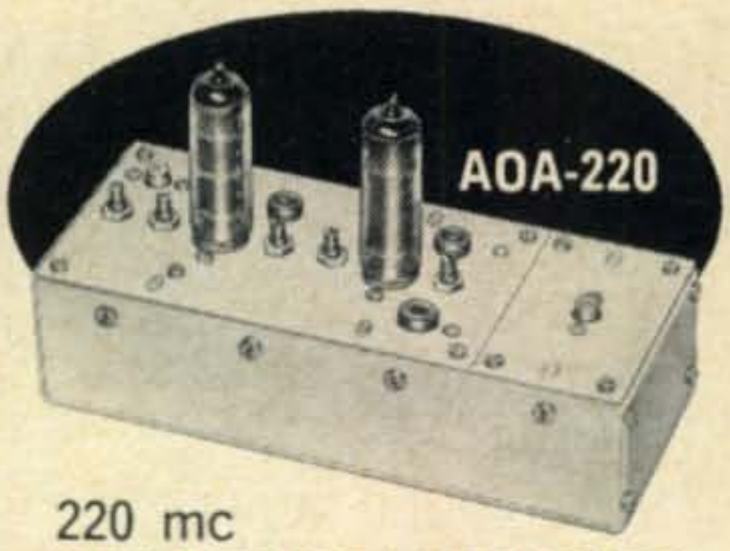
VHF/UHF UNITIZED TRANSMITTERS 50 mc—420 mc

International's new unitized VHF/UHF transmitters make it extremely easy to get on the air in the 50-420 mc range with a solid signal. Start with the basic 50 or 70 mc driver. For higher frequencies add a multiplier-amplifier. All units are completely wired. Plug-in cables are used to interconnect the driver and amplifier.

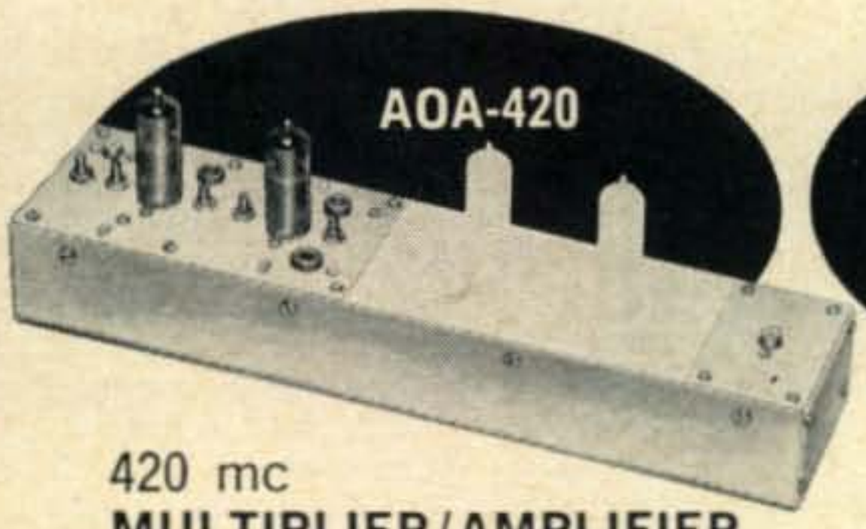
50 or 70 mc
DRIVER/TRANSMITTER
The AOD-57 completely wired with one 6360 tube, two 12BY7 tubes and crystal (specify frequency). Heater power: 6.3 volts @ 1.2 amps. Plate power: 250 vdc @ 50 ma.
AOD-57 complete.....$69.50



144 mc
MULTIPLIER/AMPLIFIER
The AOA-144 uses two 6360 tubes providing 6 to 10 watts output. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate power: 250 vdc @ 180 ma.
AOA-144 complete.....$39.50



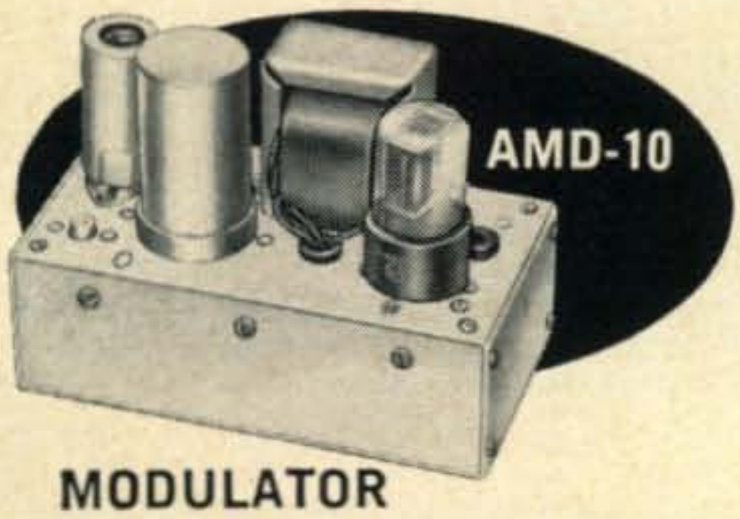
220 mc
MULTIPLIER/AMPLIFIER
The AOA-220 uses two 6360 tubes providing 6 to 8 watts output on 220 mc. Requires AOD-57 for driver. Heater power: 6.3 volts @ 1.64 amps. Plate: 250 vdc @ 150 ma.
AOA-220 complete.....$39.50



420 mc
MULTIPLIER/AMPLIFIER
The AOA-420 uses two 6939 tubes providing 4 to 8 watts output on 420 mc. Requires AOA-57 plus AOA-144 for drive. Heater: 6.3 volts @ 1.2 amps. Plate: 220 vdc @ 130 ma.
AOA-420 complete.....$69.50

RELAY BOX
Four circuit double throw. Includes coil rectifier for 6.3 vac operation.
ARY-4 Relay Box complete.....$12.50

FILAMENT SUPPLY
The APD-610 provides 6.3 vac @ 10 amperes.
APD-610 complete.....$9.50



MODULATOR
The AMD-10 is designed as a companion unit to the AOA series of transmitters. Uses 6AN8 speech amplifier and driver, 1635 modulator. Output: 10 watts. Input: crystal mic. (High Imped.) Requires 300 vdc 20 ma, no signal, 70 ma peak: 6.3 vac @ 1.05 amps.
AMD-10 complete.....$24.50

COMPLETE TRANSMITTER

6 METERS	50 mc	AOD-57
2 METERS	144 mc	AOD-57 PLUS AOA-144
	220 mc	AOD-57 PLUS AOA-220
	420 mc	AOD-57 PLUS AOA-144 PLUS AOA-420

INTERNATIONAL CRYSTAL MFG. CO. INC.
18 NORTH LEE — OKLA. CITY, OKLA.

Order Direct from International

For further information, check number 11, on page 106

LETTERS TO THE EDITOR

The Bedford Incident

Editor, *CQ:*

After reading the leading item in ZERO BIAS in the November issue, I felt constrained to write and share with fellow hams my own rather shattering experience in a similar set-up.

My shack was prominently quartered in the lobby of one of the most modern movie palaces in a large resort town. The manager of the theater was most co-operative in every way, and I felt certain that I would be exposing the face of Amateur Radio to the public in its best possible light, and that this would impel the aforementioned public to clasp Ham Radio to its collective bosom.

I arranged with a friend nearby to borrow his brand new Collins S-Line, and got a crew of three others to help with the antenna installation. We erected a twenty foot mast, rotator and tri-band beam, together with a pair of half-wave dipoles for 40 and 80 meters. Late that night after the last show, we established contacts on all bands and ascertained that our v.s.w.r. was optimum, ranging from unity match to no more than 1.7 to 1. It seemed that everything was just about as perfect as could be, and that our exhibition could not fail to live up to our great expectations.

The theater was literally packed with patrons. The picture was scheduled to start at 7 P.M., and we fired up at 6 o'clock. At 6:15 we started passing the traffic, and were gratified to see a rather long queue of prospective customers. Afterward, we tried to reconstruct the chronology of the thing just as it happened. When the curtains opened and the newsreel went on, we still had about a dozen people in line. We continued with the traffic in a normal fashion. Suddenly we were aware of peculiar sounds coming from the direction of the theater auditorium. A group of uniformed ushers converged like a flight of geese toward our corner of the lobby. Two assistant managers and a security policeman raced toward us. A gaggle of hysterical citizens, irate and abusive, made threatening gestures.

Was this the same group of co-operative, enthusiastic souls who had given their blessing a short half hour ago?

We checked our cable to make sure that we had remembered to install the low-pass filter. Yes, everything was in order. But was it? We shut down, not wishing to compound the situation. A quick phone call to the emergency number of the company which had installed the sound equipment at the theater disclosed the fact that the system had not been filtered.

A classic case of MPI (Motion Picture Interference). That was the end of the noble experiment. We sadly dismantled the station, and slunk away into the darkness. unwept, unsung.

I can hear, in my mind's ear, that menacing snarl, amplified a thousand fold. I can see, in my mind's eye, that threatening and ugly mob, magnified into a multitude.

For further information, check number 13, on page 106

I can see the formation of ad hoc committees, demanding Congressional Investigations. I can imagine Mayors, Aldermen, Councilmen, Committeemen, Freeholders and Busgesses, seeking local injunctions against Amateur Radio within town limits. I can smell the acrid tar, bubbling merrily away, and I can see the slit-open pillows, ready to disgorge their content of eiderdown.

Please, fellows, if you do get in on "The Bedford Incident" make sure that the sound system of the theater is adequately filtered. Run some tests while the projectionist is operating, otherwise you may regret the whole thing.

Dave Mann, K2AGZ/K3WOO
1 Daniel Lane
Kinnelon, N.J. 07405

The National Award Hunters Club

Editor, *CQ:*

The Arne Trossman Top Honors Plaque arrived at my QTH a short while ago. I can't express the thrill I had upon receiving the plaque—you and *CQ* are to be congratulated for the fine work of following up on this award. It already hangs in the shack right above the trophy I received for the World High score in the 1963 *CQ* 12 Hour VHF Contest.

I am no longer a CHC'er, having *resigned* to CHC President WA2PWI on Jan. 19, 1965, contrary to reports published by K6BX that I was "kicked out" of CHC on Feb. 25, 1965. My XYL Louise, WA2SNT, also resigned on that date, but is still carried on the CHC Membership rolls. Perhaps if CHC President WA2PWI/WA1AKE/WB2FTQ (they're all his!) would be more precise in doing his duty, this situation could have been avoided.

I also want to thank you and W2GT for the write-up of the "National Award Hunters Culb" in Sept. *CQ*. Our membership has grown by leaps and bounds—200 members in seven months—and includes 5 Top Honors winners and represents five countries.

The current *Xtra* [sic] *News Letter* (K6BX Editor/Publisher) contains an item claiming that NAHC is being sued by Europe's AHC (Award Hunters Club). On the contrary, we have been pleased to receive a letter of congratulations from AHC General Secretary John Velamo, OH2YV, on the formation of an awards club free of ties with K6BX.

Again, thanks for the Top Honors Plaque and the support given to NAHC.

Harry "Smitty" Smith, WA2SAZ
108-24 71st Avenue
Forest Hills 75, N. Y.

RTTY From A to Z

Editor, *CQ:*

The record seems to show that fine authors of articles such as Durward Tucker's "RTTY From A to Z" series get little enough recognition. My point here is simply to say my own thanks for the tremendous job he has done, and to hazard the guess that the woods are full of grateful RTTY hams like me.

To duffers like me, RTTY is an endless source of wonder and joy, and as a retired attorney, I have plenty

a KW ssb station | only 64½ cents per watt

The brilliant new **SB-34,** SSB 4-band transceiver serves as your receiver and exciter . . . the new matching **SB2-LA** Linear furnishes the big bang! This advanced design power combo costs you only 644.50, unquestionably the lowest cost per watt obtainable! But this is only part of the value story. **SB-34** has a **built-in power supply,** 117V AC **and 12V DC** . . . needs no separate inverter . . . connects directly to the 12V car battery when you want the added pleasure of 4-band mobile transceiver operation. **There's just no comparable value!**

SB2-LA LINEAR AMPLIFIER . . 249.50

Husky, heavy-duty, with 1KW P.E.P. input capability on 80-40-20-meters, 750 watts on 15 meters, this exceptionally compact amplifier matches SB-34 in general size and appearance. Operates perfectly with SB-34 but can boost the output of any SSB exciter to a full KW. AC power supply is built-in.

4-bands, 80, 40, 20, 15 meters • Full band switching • Passive grid input for resistive load to exciter. Drive: 60W or more depending upon the linear amplifier power output • **Low plate voltage** (800 volts) and high plate current • Easier on capacitors, rectifiers, power transformers • Safer under environmental extremes • **High filter capacity** for dynamic regulation • **Built-in antenna relays** (2), **internal blocking bias • HI/LO power and TUNE/OPERATE switches • Panel meters for output and plate current • Six parallel-connected 6JE6's are used in amplifier • 115V AC power supply (built-in) is all-solid-state. Size:** 5¼"H, 11¾"W, 11⅝"D. Wgt, 35 lbs. (apprx).

SB-34 TRANSCEIVER 395.00

New . . . advanced . . . with important plus performance features! Transistors and diodes replace vacuum tubes (except for the 2-6GB5's in PA and 12DQ7 in RF driver) — equipment size is reduced greatly — current drain lowered substantially. Example: **SB-34 draws only 500 ma on receive standby.**

Built-in supply for 12V DC and 117V AC • Power input: 135 watts P.E.P. (Slightly lower on 15 meters) • **Frequency range:** 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc, 21.2-21.45 mc • 23-transistors, 18-diodes, 1-zener, 1-varactor, 2-6GB5's PA, 1-12DQ7 driver • **No relays — solid state switching — breakthrough! USB or LSB selectable by panel switch • Collins mechanical filter — transmit/receive • Delta receiver tuning • Solid-state dial corrector • prewired for VOX/100kc calibrator accessories** — both units are optionally available. **Single-knob dual-speed tuning. Size:** 5"H, 11¼"W, 10"D. Weight 20 lbs. (Approx).

SIDEBAND SBE ENGINEERS

317 ROEBLING ROAD, SOUTH SAN FRANCISCO, CALIF.

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

For further information, check number 15, on page 106

of time to enjoy the everpresent possibilities.

It may well be that RTTY owes its power to generate much of its thrill to the devotion given it by Mr. Tucker and other top hams. There's Merril Swan, Bob Weitbrecht, Herb Hoover, Wayne Green, Irv Hoff, Mr. RTTY in Michigan, Ralph Leland, and locally, Ed Koch who make RTTY the unparalleled ham activity it is. Thanks to Ralph and Ed the state of Michigan leads in RTTY activity and Midland County leads the state in "RTTY Bugs."

As I sit here enjoying the added knowledge of the art of RTTY you have so generously imparted, my wish to you would be that a thousand more of us would write you and extend our deep thanks.

C. E. Price, W8HPR
Pinewood Farm
Hemlock, Mich.

The Big Radiation Controversy

Editor, *CQ:*

I have read the letter by SP4 Gerald V. Griffith (LETTERS, Sept.) relative to the big controversy about K8IKA ("Learn By Mistakes," May, *CQ*) and the reaction he received. Gerald makes several statements which are not true and some assumptions which I do not believe can be substantiated.

In talking of conduction heating, he transfers from inorganic metals to biologic material, some physical facts, and such a transfer cannot be made. The skin effect on a wire or piece of metal is not the same as the skin resistance of the human body. There is a dissipation of r.f. energy in the body which does not take place to the same degree in metal, even in a so-called chassis ground. His wet finger and thumb is still much smaller than the area of mucus membrane in the mouth; and by his theory, all energy went through these points without a burn, yet the small amount which reached the fillings in the teeth was sufficient to cause a burn. I don't believe it.

In Glassers big two volume *Medical Physics* the subject of "Conduction Heating" is not even mentioned. I do not believe it occurs in biological material.

Ultraviolet burn is not a thermal burn; it is frequency dependent, and only certain wave lengths will cause damage. Sunburn is due to ultraviolet, not thermal effect.

X-ray reactions are also not thermal burns, nor are they ultraviolet burns, but are due to ionizing radiation, that is gamma rays, or beta rays, and with some isotopes, alpha rays. Since ionization cannot occur below a voltage of about 15 kvp, this type of reaction can be ruled out.

Harold W. Morgan, M.D., KØJTP
1312 Fourth S.W.
Mason City, Iowa

Sugar Coated Metering

Editor, *CQ:*

Mr. DeMaw, W8HHS, went a bit too far in "Sugar-Coated Metering" in the Sept. issue. This method is fine as long as the meter series resistor is at least 50 times as large as the series resistor across which the voltage drop is developed—that is, down to 50 ma full scale for the 1 ma movement discussed. The error will then not exceed the 2% uncertainty inherent in the meter.

Any attempt to increase the sensitivity beyond this point will result in low reading, however. In Chart 2, for instance, it is evident that when the meter reads full scale there will be 5 ma through the 500 ohm resistor plus 1 ma through the shunting meter for a total of 6 ma, or a 20% error on the low side. Similarly, the error is 10% at 10 ma full scale and 4% at 25 ma full scale.

If round-value resistors, such as 500 ohms, are to be used, accurate measurements on ranges below 50 ma demand a 100 microamp movement.

Remsen T. Schenck
Franklin Hill Road
RFD 3, Bangor, Pa. 18013

Used Callbooks

Editor, *CQ:*

The other day a DX station asked me if I had an old USA *Callbook* which I no longer needed and if so, would I be willing to send it to him. I did not have one but was able to obtain one from a friend and am sending it to this station along with a DX *Callbook* which I am replacing currently. This gave me an idea. I am sure there are numerous *Callbooks* passed from hand to hand and eventually discarded. I am equally certain there are deserving

This HF Single Sideband Transceiver
meets Full Military Requirements
and is available off-the-shelf
at a commercial price.

It is the RF Communications Model RF-301

Now nomenclatured AN/URC-58

The Model RF-301, SSB Transceiver was designed by RF Communications as a company product without government support. It was designed to be used by military customers in military applications. Now in production, it can be bought in quantities from one unit up with short delivery (averaging 30 to 90 days) at a very modest price. The RF-301 costs about one-third of that normally paid for military transceivers with similar characteristics.

RF-301, SSB TRANSCEIVER

Brief Specifications

Frequency Range: 2 to 15 Mc
Synthesizer: Can be tuned to 1 Kc increments. Provisions for unlocking synthesizer and tuning continuously.
Power Output: 100 watts p.e.p. and average
Stability: 1 part 10^6 standard, 5 parts 10^8 optional
Modes: USB, LSB, AM, CW. Also FSK with adapter.
Power Input: 115/230 volts, 50/60 cycles standard. 12 or 24 volt DC with additional built-in module.
Size: 7¾ x 17 x 14¾ inches • **Weight:** 59 pounds

Please contact us for further details.

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

For further information, check number 17, on page 106

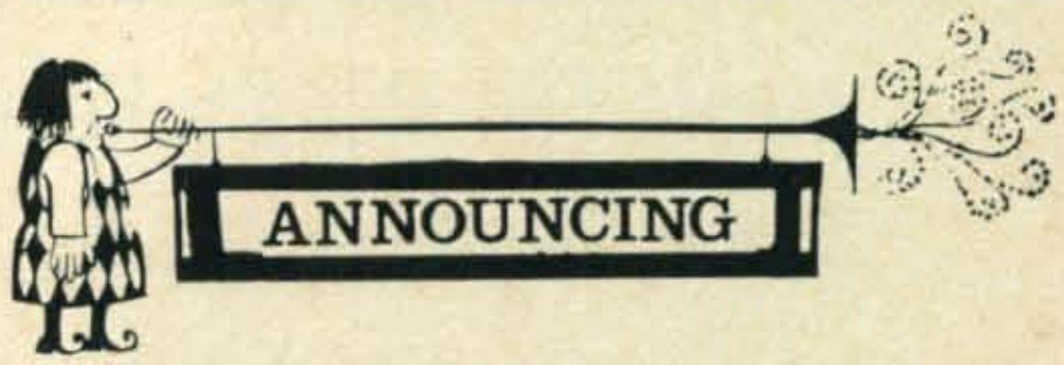
DX stations that cannot obtain *Callbooks* or cannot afford them. I would like to appeal to US hams to send me their outdated or retired *Callbooks*. I, in turn, would offer them to DX stations at no charge, perhaps on a priority basis to clubs and stations in remote parts of the world where the books are not readily available.

If you think this is a worthwhile idea could you help me by appealing to US *CQ* readers to send me their *Callbooks* which they no longer have use for (both US and DX books). I will pass them on to DX stations along with a note informing the recipient of the name, address and call of the donor.

Any comments, suggestions or assistance you might offer will be greatly appreciated.

Mike Grossman, K2JWM
19 Rockledge Road
Hartsdale, New York

Mike, the idea of sending used *Callbooks* to DX stations is certainly a great one, but I've got to dampen your pride a bit by saying that it's not a new thought. For over six years, our own HAM CLINIC doctor, Chuck Schauers, W6QLV (now residing in Luzern, Switzerland) has been soliciting used *Callbooks* for foreign distribution. Others, too, have lent a hand, including K6BX, but Chuck's been at it longest, and is in the best position to channel the books to needy hams. I suggest you drop him a line to see how you can work with him on this worthwhile project. His address is: 4 Lutzelmatt Strasse, Luzern, Switzerland.—*K2MGA*



Berkeley, California

CQ ES QST de KPFA is the title of a new program on amateur radio presented each Sunday at 10:15 a.m. on KPFA (FM 94.1 mc). Gene Bergman, WB6IBU prepares the weekly program, which covers all aspects of amateur radio.

If you have had any interesting experiences as a ham operator, are a specialist in a particular category of ham radio (UHF, RTTY, DX, etc.) or would like to make comments or suggestions for the program, send your communication to WB6IBU, c/o KPFA, 2207 Shattuck Ave., Berkeley 4, Calif.

Gene, is a high school social science teacher and devotes his spare time to programming and preparing the weekly show. KPFA is a non-commercial station and derives all its revenue from listener support. Though not an employee of the station, Gene, spends between 8 and 12 hours a week getting the program together. The subjects of the program are geared strictly for the amateur: announcements of radio clubs, speeches recorded at hamfests and conventions, and general information from periodicals with occasional interviews keep the program interesting and timely.

New Rochelle, New York

The Communications Club of New Rochelle will hold its fifth annual dinner and ham get-together on Saturday evening, December 18, 1965 at the Davenport Club in New Rochelle. There will be prizes offered. For reservations ($6.00 Each) and information contact Henry M. Wymbs, WB2GMN, 100 Joyce Road, Hartsdale, N.Y.

Correction

In the September issue on page 99, W5OMJ is listed as QSL Manager for VP2GL. W5OMJ is not the QSL Manager for VP2GL.

In the Oct. issue on page 55 under "Where You Can Get An APX-6", BC Electronics is listed as selling the unit used, with tubes, for $17.00. BC Electronics, 2333 S. Michigan Ave., Chicago, notifies us that they only have used units, less tubes for sale at $7.50 each.

CLUB FORUM

AL SMITH,* WA2TAQ

Most amateur radio clubs will have completed their elections this month and the newly elected officials will be taking over the reins come January 1st. And . . . most amateur radio clubs will just breeze along with no thought of conducting an installation ceremony of any kind.

This lack of ceremonial splendor in amateur radio is a point the CLUB FORUM will consider this month.

You can go down the line of organizations from local civic groups to world wide veteran and fraternal organizations and you'll find that few do not hold an installation of officers. This swearing in ceremony is an important part of a clubs program and is usually the signal for a big night.

By far the topic mentioned most in the CLUB FORUM mail bag is "how can we keep interest in the club." Also mentioned is the desire for new activities. There's no doubt that fresh ideas are pertinent to club survival. Yet the older activities can still hold member interest if properly conducted.

Many clubs have a problem in finding members who are willing to take on responsibility of leadership. One big reason for this is a lack of incentive (that word again) to take on an office.

If one is expected to do more than the other members of the club then there should be a way to attach the needed prestige to the officers. If there is no air of importance attached to holding office, then your club is missing a good thing.

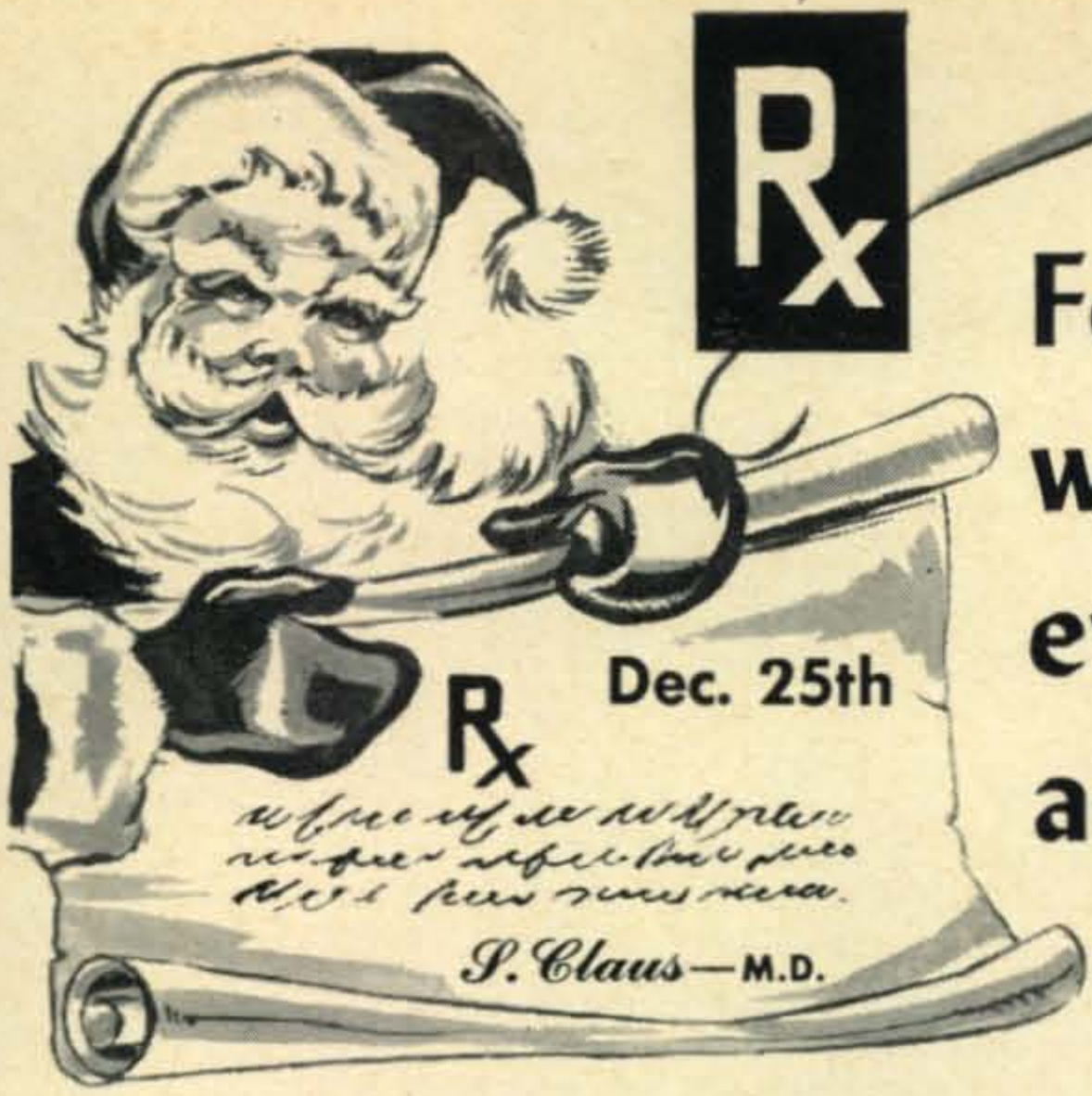
The officer positions in any club should be coveted rather than shunned. The question now is how to find ways to supply the prestige needed.

To start our newly elected officers off on the prestige trail, what could be better than an installation of officers. Actually there is no standard procedure in our avocation. However there is one ceremony authored by this writer which has appeared in the yearly ARRL club bulletin. This procedure seems to fill the bill and we include it here for your consideration.

Installation Procedure

Installing officer takes over the meeting. For the ceremony he (or she) requests the Sgt. at Arms to escort all newly elected officers to the rostrum with the exception of the President. Officers to be installed face the installing officer who says:

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



For the ham who has practically everything... add *Waters*

S. Claus — M.D.

He's a wise cookie, old Doc Santa! Figures every ham to be the smart guy he actually is and prescribes a simple "Add Waters" to improve his amateur operating. Could be Santa himself is something of an operator . . . and a good one, too! How else could he know that any piece of "Convenience Engineered" Waters gear would make even the well-equipped ham the happiest ham on the holidays? And long, long after, for that matter!

Waters AUTO-MATCH™ MOBILE ANTENNA

The structually stronger mobile antenna that puts a stronger signal **out** — way out! Engineered to last car after car, rig after rig! Operates all bands with only a coil change . . . fits any standard mount.

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

Waters CLIPREAMP™

You can give him that increased "talk power" he talks about with the sensational CLIPREAMP. Solid state, self-powered and compact it installs in a jiffy in the mike line of either mobile or fixed rig. Great for that added punch when QRM and band conditions are tough.

Model 372 $21.95 (less batteries)

Waters CODAX™

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

Model 361 $92.50 (less batteries)

Waters PROTAX™

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

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

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

WATERS PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

For further information, check number 21, on page 106

"You have been chosen by your fellow members to lead your club for the coming year. The responsibility of leadership now falls on your shoulders. It is your duty to set the example not only for your fellow club members but to all radio amateurs. This can be done by your faithful attendance at club meetings and activities, and by doing your utmost to support your clubs programs, and as exemplified by your own on the air operating practices. . . . You will now repeat after me, giving your name whre I give mine." Installing officer now gives oath of office as follows:

I, _____, BEING DULY ELECTED SOLEMNLY SWEAR TO UPHOLD THE CONSTITUTION AND BY-LAWS OF THE _____AMATEUR RADIO CLUB, AND THE RULES AND REGULATIONS OF THE FEDERAL COMMUNICATIONS COMMISSION. I WILL DO MY UTMOST TO FURTHER THE PROGRAMS OF THE _____ AMATEUR RADIO CLUB AND PROMISE TO SUPPORT THE CLUB IN ALL ACTIVITIES. I WILL DO ALL POSSIBLE TO KEEP UP THE STANDARDS OF AMATEUR RADIO BY MY OWN OPERATING PRACTICES. I WILL WHEN CALLED FOR ASSIST MY COMMUNITY IN TIME OF NEED.

Following the oath the installing officer proclaims: "I now declare you duly installed." He will then request the group to face the membership and announce: "This is your slate of officers for _____ (year) with your support they will guide your club for the ensuing year."

The installing officer then directs the Sgt. at Arms to seat the installed officers and then requests that the newly elected President be brought before him. The installing officer then repeats the installation ceremony duly installing the club President. Following the oath the President takes over the meeting, makes a short speech or comments, then returns the rostrum to the installing officer for comments. There you have it. You have only to get your group together and make it an enjoyable occasion. Remember that we have few activities in which other than ham members can take part. This is a good chance to invite the XYL and members of the family.

A good recipe for a small installation would possibly be: Take one regular meeting, add a small buffet with soda, coffee and cake. Invite all families, sprinkle a few prominent public officials, add a dias, hold a swearing in ceremony and you have an installation.

Consideration should be given to inviting your ARRL Division Director as installing officer. This will give your club a chance to meet this official and perhaps provide an opportunity for a good question and answer session.

By all means be sure to invite local government officials. This will afford an opportunity to blow amateur radios horn so that others will know of our public service activities. One other very important consideration should be to invite

R-4A
Receiver

T-4X
Transmitter

TR-4
SSB Transceiver

May the joys of this season be yours

along with all the Drake Ham Gear that will fit under your Christmas Tree!

MS-4
Matching Speaker

RV-4
Remote VFO

T-4
"Reciter"

Best Wishes

from all the Radio Amateurs at

R. L. DRAKE COMPANY

MIAMISBURG, OHIO, 45342

For further information, check number 23, on page 106

a distinguished guest such as the editor of the local paper.

With the holiday season approaching I would now like to extend my very best wishes for an enjoyable holiday to all. And wouldn't it be nice if Santa would leave at least a KWM II under every hams Christmas tree. Merry Christmas and a safe and enjoyable New Year.

73 Al, WA2TAQ

"THEY"

A COUPLE of months ago we mentioned in ZERO BIAS an all-powerful group called "They" upon which the blame for most any dastardly deed is always placed. Any reader having a pet gripe was asked to send it along to us; the best "Why Don't They . . ." would win a one year subscription to *CQ*. We received quite a number of these pet gripes and below are a few which we thought were particularly good.

The free one year sub goes to K7NCP.

Ray Winiecke, K7NCP writes Why don't "They" wait until I get on the air before they begin complaining about TVI?

A month ago I moved my mobile home to a new trailer court. The second week I dug the hole for my tower; the third week the tower was assembled and installed. The fourth week, "They" told me that I was ruining TV reception and causing radio's to buzz. All I have up is the tower. No antenna, no lead-in!

Phyllis McCarthy, WA2PVB, says: Why don't "They" learn to carry on a conversation? I go wild when, after talking for 10 minutes on various subjects, "They" come back and say "Fine Business and back to you" with absolutely no comments on any of my QSO!

Dave Williams, K7HMP wonders: Why don't "They" build more rigs using type "45" and "2A3" tubes so I can use all the spare tubes and batteries I've saved?

"Otts" Beyer, K8CIR (again): Why don't "They" use GMT? Imagine a sked, "Meet you on 14300, 1735 PST Wednesday the 18th. Not sure what this is in GMT but sure you can figure it out." Or "1645 MST." That doesn't mean anything to anyone but the mountain people.

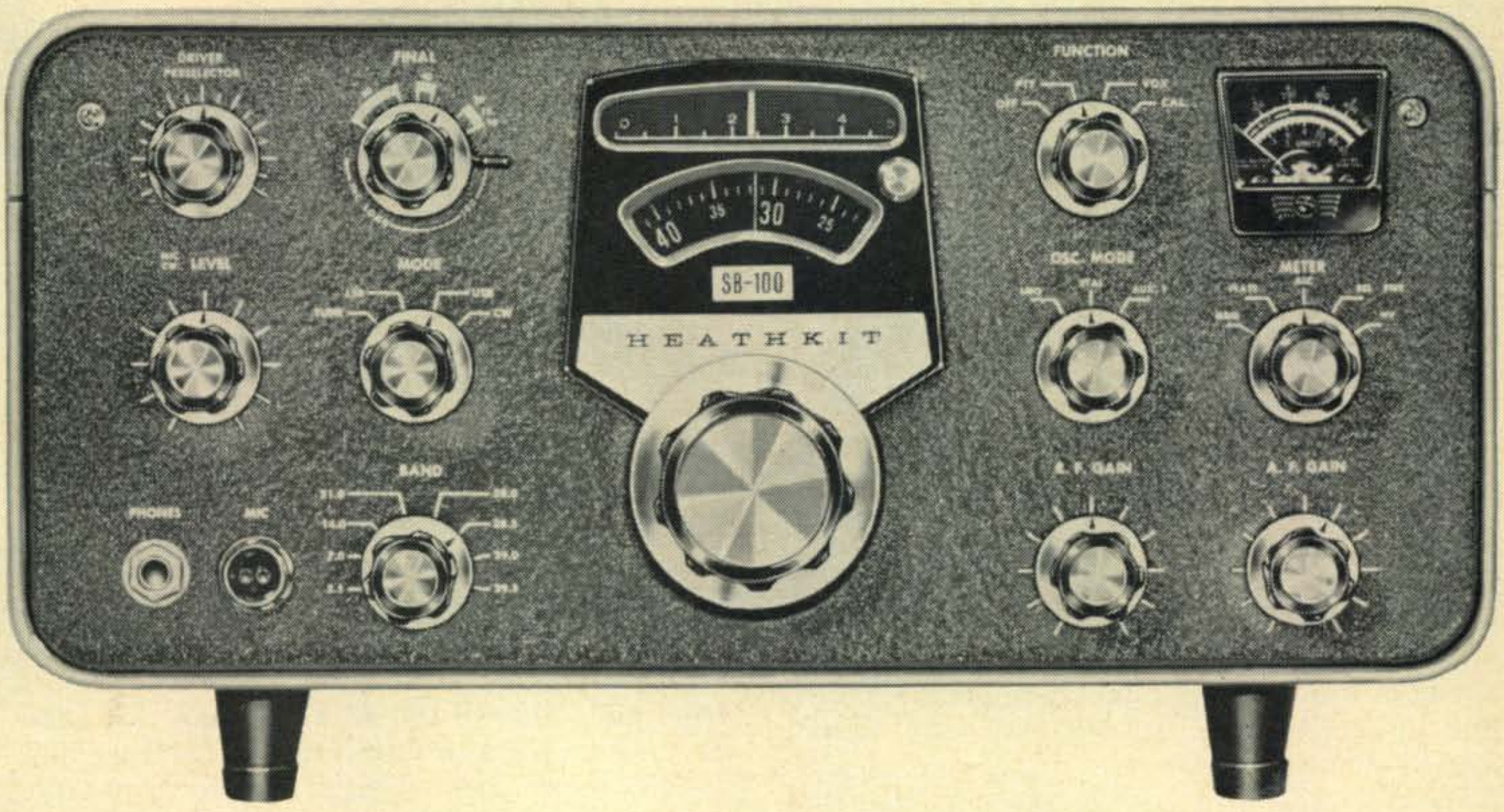
"They" should use GMT for all ham logging and activities.

Asks **Lew Clark, WA2TOV:** Why don't "They" dump the contact who always maintains "We put up a new beam," or "We adjusted the rig." Instead of "I put up a new beam," or "I adjusted the rig?" Where do some of these fellows get all the help?

Says **George Maxey, W6BIL:** My pet gripe is the guy who calls CQ DX over and over again without signing his call. How the devil are you supposed to know if *you* are DX for him or not? After a series of CQ DX CQ DX CQ DX for about three minutes he finally lets you in on the secret of *who* he is! Nuts!

I'm in favor of disqualification for any station that calls CQ DX in a DX Contest!

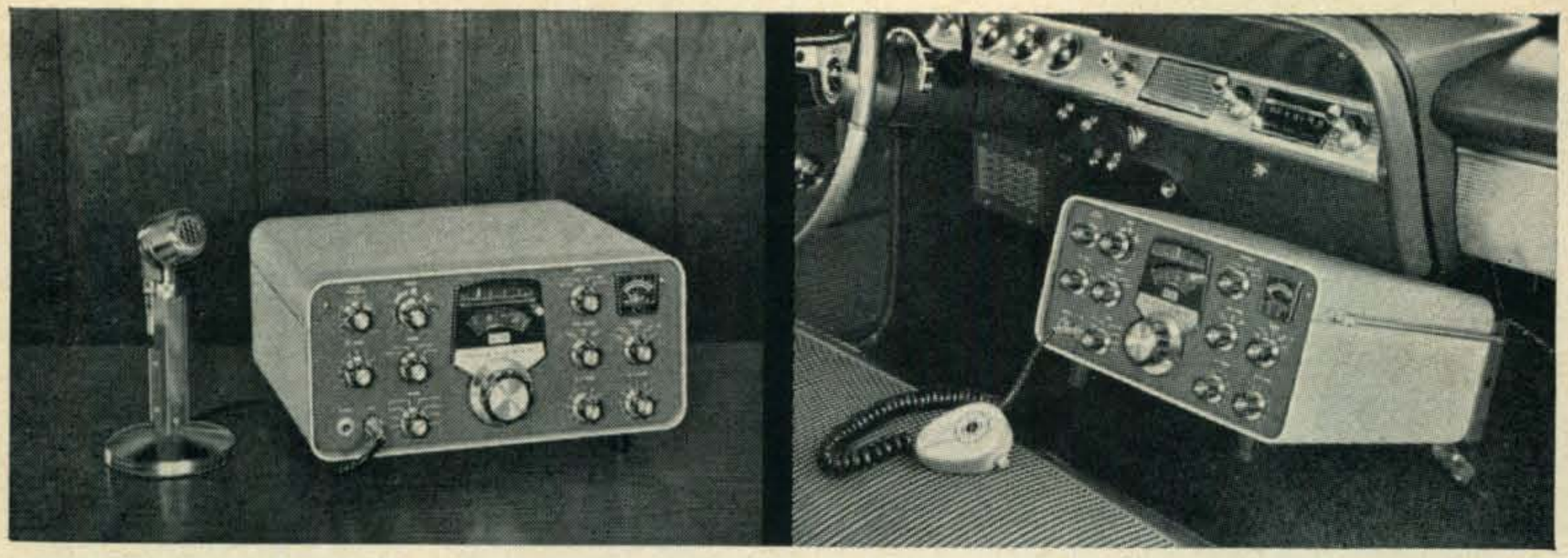
Introducing...
The HEATHKIT® SB-100



180-Watt, 80-10 Meter SSB Transceiver.....$360.00

• Full five band transceive SSB & CW operation, 80-10 meters • 180 watts P.E.P. SSB-170 watts CW • Switch selectable Upper/Lower sideband/CW operation • Operate PTT & VOX • VOX-operated CW with built-in sidetone • Can operate crystal control in the transmit mode with variable tuning of receiver or can operate crystal-controlled transceive mode–excellent for net control • Separate offset CW carrier crystal for clear, pure CW note • Triple Action Level Control™ • Built-in 100 kc crystal caibrator • Enclosed relays for quiet, trouble free operation • Heath SB-Series LMO (Linear Master Oscillator) provides truly linear tuning with 1 kc dial calibration–less than 100 cps per hour drift after warm-up–400 cps accuracy • Perfect companion for HA-14 KW Kompact or SB-200 final amplifiers • Fixed station operation with HP-23 power supply–mobile with HP-13 & SBA-100-1 mobile mount for quick plug-in/quick disconnect mobile installation • Fast circuit board assembly • Simple alignment–requires only a VTVM with RF probe, a dummy load and a broadcast receiver

If you are considering the purchase of an SSB transceiver, we urge you to read every word on the next two pages before deciding.



Heathkit SB-100—The SSB Rig You've Been Waiting For

The Newest And The Hottest Of The SB-Series! Here's a complete 80 through 10 meter 180-watt SSB transceiver. It includes all of the high-performance features you've read, heard talked about, or experienced on the already famous Heathkit SB-Series Amateur Radio Equipment . . . plus 5-band coverage with fast, simple bandswitching and tune-up . . . alternate "remote" power supplies for fixed or mobile operation . . . new Heathkit Switch-Board™ coil and bandswitch assembly . . . and a new ALC control circuit (TALC™) that allows even greater variation in speech level. All this and more in the new SB-100!

Here's Engineering That Sets The Pace For The Industry! The Heath SB-Series crystal filter features a 6 pole lattice filter (6 individual crystals) to produce a superior 2 to 1 shape factor for sharper receiver tuning . . . greater sideband suppression. The filter pass-band is symmetrical . . . for identical characteristics on both upper and lower sideband signals . . . and for optimum SSB reception with steep skirts for adjacent signal rejection. What's more, the entire filter assembly is hermetically sealed to retain its published specifications just as they were when "checked out" at the time of production. Compare these specifications with any other SSB filter on the market!

Improved Heathkit Techniques Produce Better Than Factory Assembled Results! The new Heathkit Switch-Board™ coil and bandswitch assembly virtually eliminates the troublesome point-to-point wiring of tuning circuitry . . . eliminates the critical job of "lead dressing" required in "wired" circuitry. Here the assembly procedure is simplified further by a removable switch shaft which enables easy "stacking" of the individual Switch-Boards. Switch-Board construction is a new step forward in achieving electronically stable circuit construction, plus ready accessibility to tuning coils.

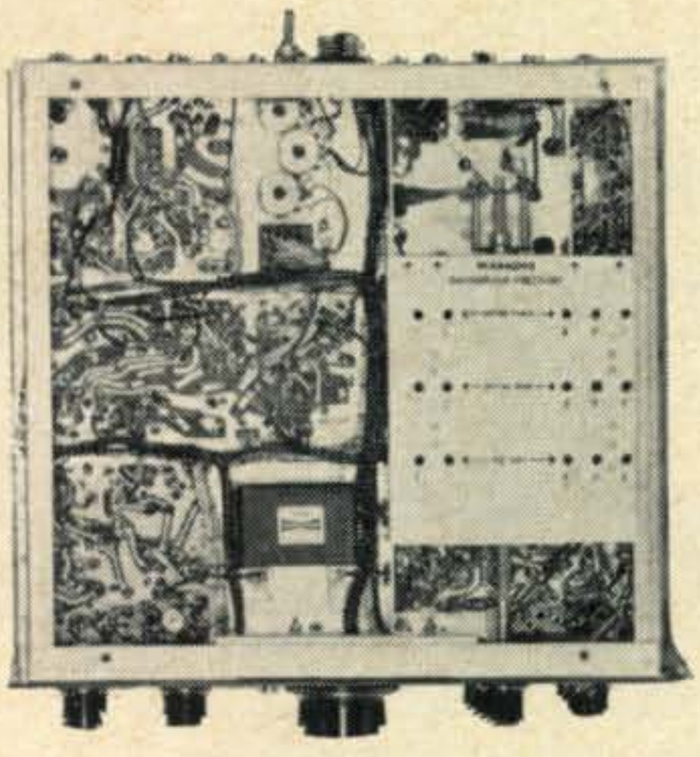
Power Consistent With Maximum Versatility. 180 watts P.E.P. is the best transmitter power level for most hams. This power level permits using the right tubes for the job and does not require eliminating useful features to pay for increased power. The SB-100 produces a "bare-foot" signal comparable to the higher power transceivers and is ideally suited for driving a grounded grid linear for a really big signal without the problems of excessive drive.

TALC™ (Triple Action Level Control) Sets New Standards For Automatic Level Control. Control from three separate circuits is combined in TALC™ to provide greater speech compression . . . allow for even more variation in speech level . . . and boost the performance of the SB-100 still higher.

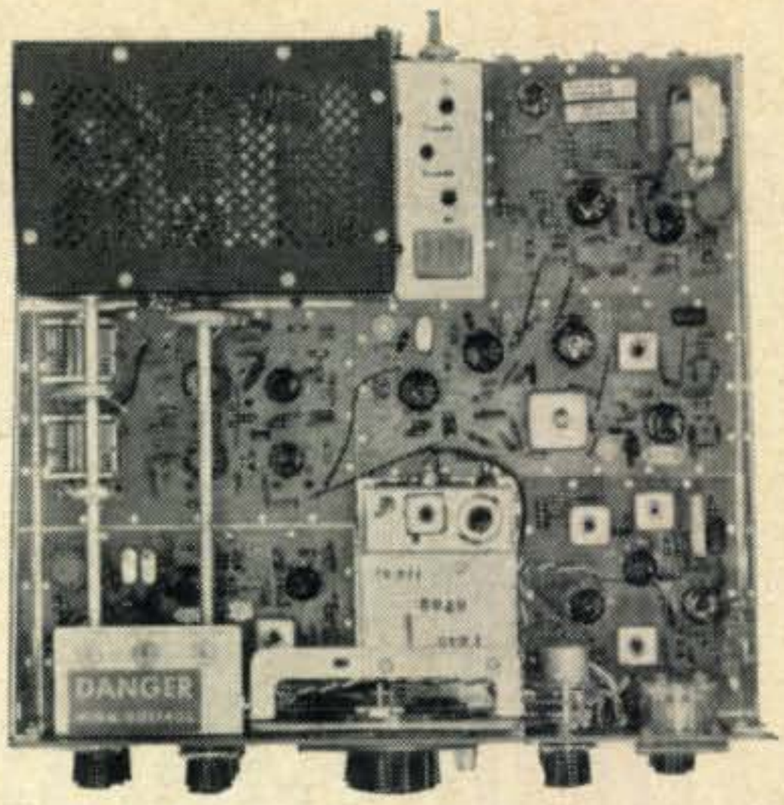
Operating The SB-100 Is A Pleasure . . . Like Driving A Fine Automobile! Select the band, dial the frequency, peak-up the preselector, and tune. Receiver and transmitter bandswitching is simultaneous. The preselector control peaks up the driver. Final tuning is quick, sure, and positive. And for CW op's who prefer headphone listening, there is a separate headphone level control to adjust the headphone audio level independently of speaker volume. In addition, the transmitter and receiver are always on the same frequency . . . no "leap-frogging" around the frequency when you're working round tables.

Order The SB-100 For The Best Value In SSB Transceivers . . . Regardless! We invite comparison of the *complete* SB-100 specs on the next page with those of any other make SSB transceiver. Also consider circuit design as related to inherent stability, use of quality components and fine mechanical construction, cost of companion power supplies and linear amplifiers, band coverage in view of increasing 10 and 15 meter activity, ease of circuit familiarization with regard to possible maintenance, and resale value. You will agree that the SB-100 is the best investment you can make in amateur radio equipment. (Recommended for hams with previous electronic or kit construction experience.)

Kit SB-100, 23 lbs., $36 dn., $31 mo. **$360.00**
SBA-100-1, Mobile Mounting Kit, 6 lbs. . . . . **$ 14.95**
GH-12, Mobile PTT Mike, 2 lbs. . . . . **$ 6.95**
HDP-21, Communications Microphone, 4 lbs. . . . no money dn., $5 mo. . . . . **$ 29.40**
Kit HP-13, DC Power Supply, 7 lbs . . . no money dn., $6 mo. . . . . **$ 59.95**
Kit HP-23, AC Power Supply, 19 lbs. . . . no money dn., $5 mo. . . . . **$ 39.95**



Better than factory assembled!—sectionalized circuit board construction, a minimum of point-to-point wiring, the use of pre-assembled wiring harnesses, plus the personal care given to kit assembly assure the quality you demand.



Just how hot can a SSB transceiver be?—Heath SB-Series leads in amateur radio electronics. Modern circuitry, select components, ample shielding, and the rock-stable Heath LMO give the SB-100 pacesetting high performance.

SB-100 SPECIFICATIONS—Receiver section: Sensitivity: Less than 1 microvolt for 15 db signal plus noise-to-noise ratio for SSB operation. **SSB selectivity:** 2.1 kc minimum at 6 db down, 5 kc maximum at 60 db down—2:1 nominal shape factor—6:60 db. **Input impedance:** Low impedance for unbalanced coaxial input. **Output impedance:** Unbalanced 8 and 600 ohm speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Supurious response:** Image and IF rejection better than 50 db. Internal spurious signals below equivalent antenna input of 1 microvolt. **Transmitter section: DC power input: SSB:** 180 watts P.E.P. continuous voice. **CW:** 170 watts—50% duty-cycle. **RF power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm nonreactive load). **Output impedance:** 50 ohms to 75 ohms with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 db below rated output. **Harmonic radiation:** 35 db below rated output. **Transmit-receive operation: SSB:** Push-to-talk or VOX. **CW:** Provided by operating VOX from a keyed tone, using grid-block keying. **CW side-tone:** Internally switched to speaker in CW mode. Approx. 1000 cps tone. **Microphone input impedance:** High impedance. **Carrier suppression:** 50 db down from single-tone output. **Unwanted sideband suppression:** 55 db down from single-tone output at 1000 cps reference. **Third order distortion:** 30 db down from two-tone output. **Noise level:** At least 40 db below single-tone carrier. **RF compression (TALC™):** 10 db or greater at .1 ma final grid current. **General: Frequency coverage:** 3.5 to 4.0; 7.0 to 7.5; 14.0 to 14.5; 21.1 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megacycles). **Frequency stability:** Less than 100 cps per hour after 20 minutes warmup from normal ambient conditions. Less than 100 cps for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial accuracy—"resettability":** Within 200 cps on all bands. **Electrical dial accuracy:** Within 400 cps after calibration at nearest 100 kc point. **Dial mechanism backlash:** Less than 50 cps. **Calibration:** 100 kc crystal. **Audio frequeny response:** 350 to 2450 cps ±3 db. **Phone patch impedance:** 8 ohm or 600 ohm receiver output to phone patch; high impedance phone patch input to transmitter. **Front panel controls:** Main (LMO) tuning dial; Driver tuning and Preselector; Final tuning; Final loading; Mic and CW Level Control; Mode switch; Band switch; Function switch; OSC Mode switch; Meter switch; RF Gain control; Audio Gain control. **Internal controls:** VOX Sensitivity; VOX Delay; Anti-VOX; Carrier Null (control and capacitor); Meter Zero control; CW Side-Tone Gain control; Relative Power Meter Adjust control; P.A.—Bias; Phone Vol (headphone volume); Neutralizing. **Rear Apron connections:** CW Key jack; 8 ohm output; 600 ohm output; Phone patch input; ALC input; Power and accessory plug; RF output; Antenna switch; Receiver Antenna. **Power requirements:** 700 to 800 volts at 250 ma; 300 volts at 150 ma;—110 volts at 10 ma; 12 volts at 4.76 amps. **Cabinet dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

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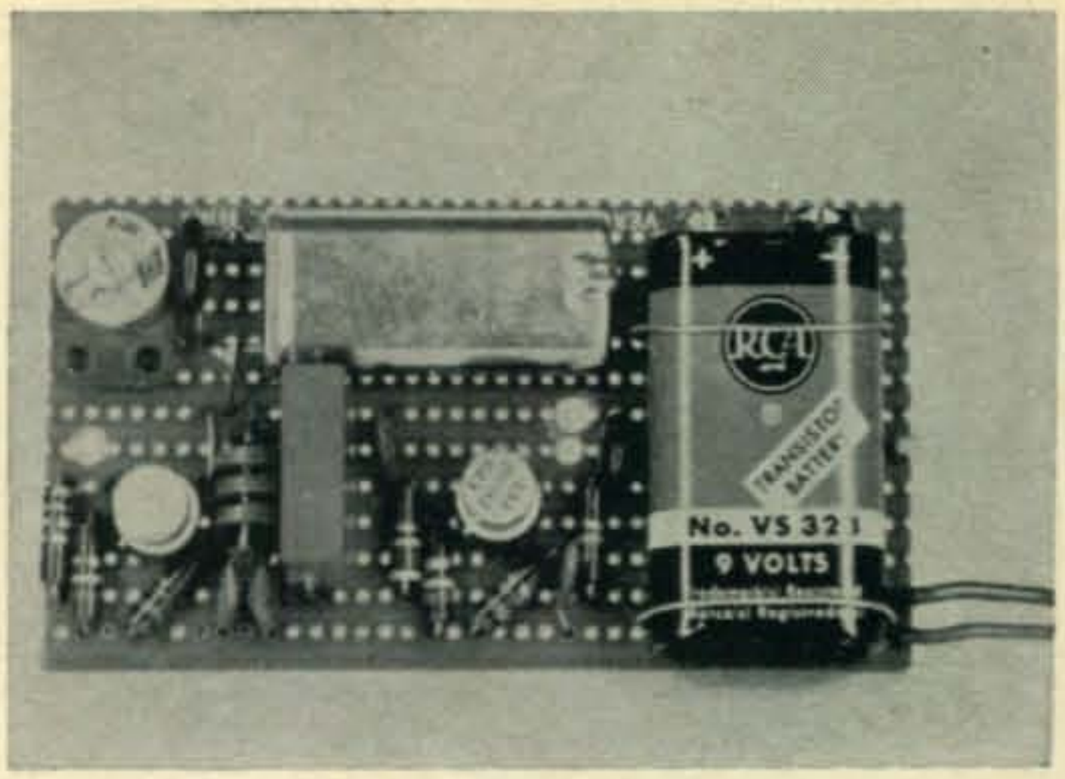


The parts for the 100 kc calibrator as mounted on the printed-circuit board. The oscillator is at the left, the harmonic generator at the center and the 100 kc crystal is at top center.

Harmonic-Rich

100 Kc Crystal Calibrator

BY WILFRED M. SCHERER,* W2AEF

THERE are many occasions when a 100 kc crystal calibrator comes in handy, particularly if you're operating near the band edges or if you wish to otherwise check frequency points for receiver, transmitter or v.f.o. calibration, but many receivers, especially those in the transceiver class, are not so equipped. As an accessory, a transistorized calibrator is about the simplest and most convenient type to build and handle. It also lends itself nicely to mobile use or other portable applications in the field, on the bench or in the laboratory not only as a frequency reference, but also as a signal source for various uses.[1]

Unlike many solid-state calibrator circuits we've tried out, the one in the unit described here is easy to get going, can be rubbered to exact frequency, is stable and has high output with strong harmonics up to at least 150 mc as evidenced by its S4-5 signals on most of the popular 2-meter transceivers. We've also built the calibrator in a completely self-contained and handy package, eliminating the breadboard aspect with dangling battery wires as is so often found with most of the models described heretofore.

Our calibrator has two transistors with circuitry as shown at fig. 1. Q_1 is a 100 kc crystal oscillator and Q_2 is a harmonic generator. The oscillator functions in a tuned-collector circuit with feedback to the base through the crystal which can be adjusted to exactly 100 kc with C_1. A high value collector resistor is used for Q_2 which is then easily driven into saturation by the oscillator to produce an output with a clipped or squared waveform rich in harmonics.

Two output jacks are provided which are connected in parallel in order that the receiver antenna input may at all times be connected to both the operating antenna and the calibrator, thus eliminating the need for interchanging interconnecting cables when the calibrator is to be used, or for digging into the receiver to make permanent connections.

In the event the receiver is part of a transceiver

*Technical Director, *CQ*.

[1]For further details see "A Step Attenuator for Receiver and Test Applications" *CQ*, Oct. '64 page 43.

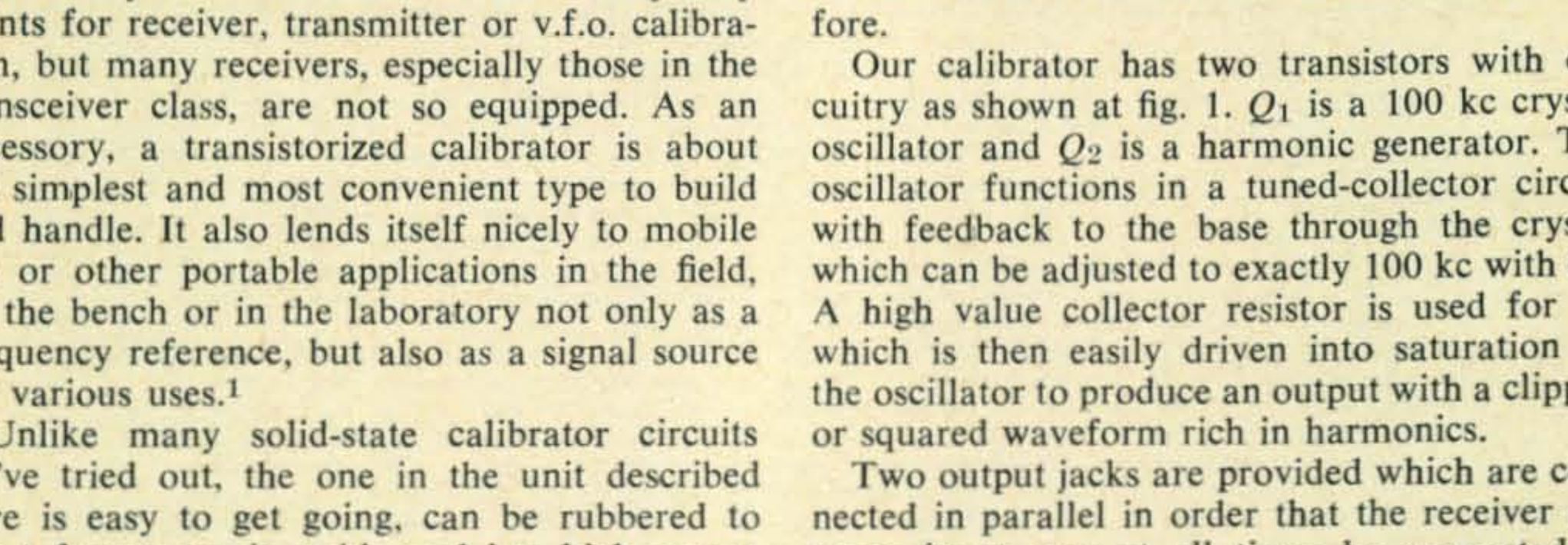


Fig. 1—Circuit diagram for the Harmonic-Rich Calibrator. Specified transistors or their equivalents should be used. Resistors are ½ watt and may vary by ±25%. L_1 is 2.5 mh, Millen #J300-2500 sub-miniature iron core r.f. choke.

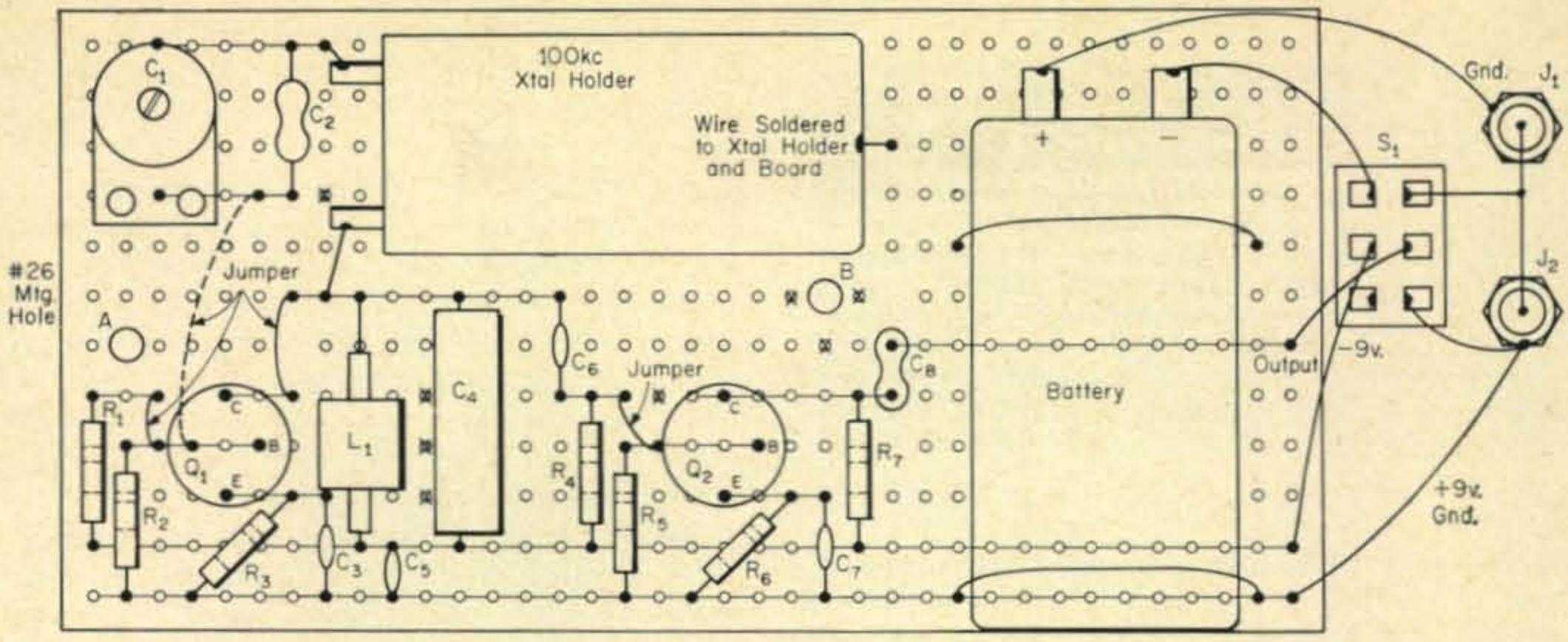


Fig. 2—Placement of calibrator components on the front of the Veroboard. Solid dots indicate soldered connections on the rear. Break in copper strips are made at points marked X. Horizontal lines between holes indicate part of board foils that are actively engaged in the circuit. Holes at *A* and *B* should be drilled to size #26 for 6-32 mounting screws. The two jumpers across the battery hold it in place.

where the transmitter output also is applied to the antenna line, Q_2 ordinarily could be damaged by the r.f. power; however, to avoid this possibility, the calibrator output is disconnected from the antenna circuit and is grounded when the battery switch is turned off. Safe operation is realized as long as you remember to shut off the calibrator! If you tend to be a bit absent minded, it is suggested you substitute a momentary contact push-button type switch that must be held on while the calibrator is in use.

Construction

The components for the calibrator are mounted and wired on a printed-circuit board that is installed in a 2¼" × 2¼" × 4" Minibox. The type board used is a Veroboard which comes backed with strips of printed-circuit foils that eliminate the need for doing your own etching. Details about these "made-to-order" boards may be found elsewhere in this issue.[2]

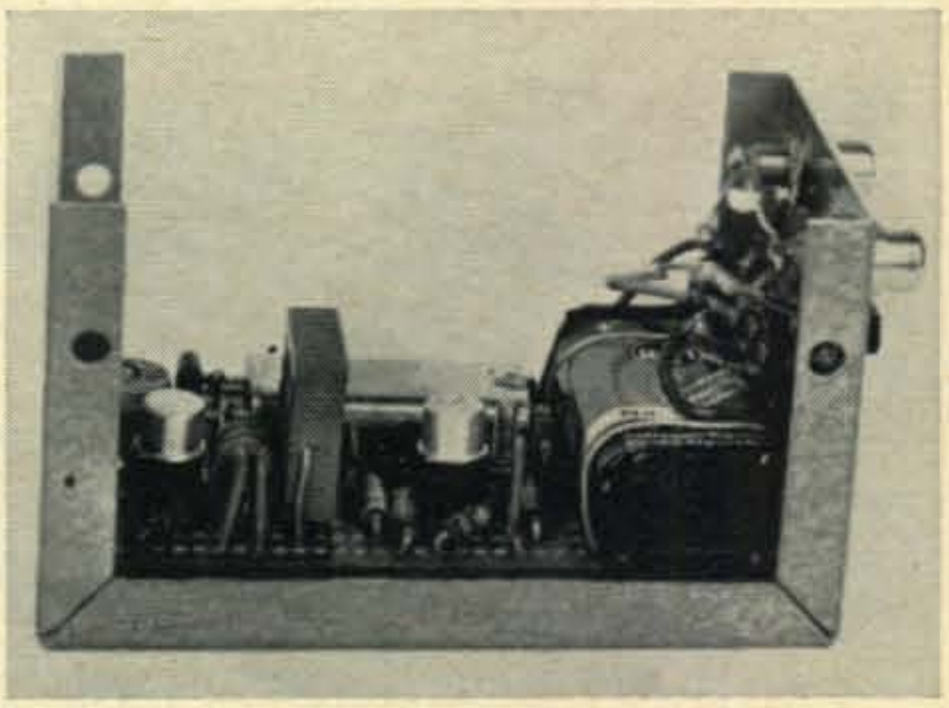
The board should first be cut down to size 2" × 3¾".[3] This may be easily done by using a pair of diagonal cutters to snip along the rows of holes in the Veroboard where the cutting is required.

Next, drill out the specified holes for the two mounting screws. See fig. 2. After this, place the board centered in the Minibox with about 1/16" clearance at the sides so that the cover may slide on properly. Then mark the hole locations on the bottom of the box and drill #26 holes through it accordingly. This will facilitate accurate hole locations for later installation.

Figure 2 shows where the parts are to be mounted and how they are automatically interconnected by the foil strips on the Veroboard. The points at which foil-breaks are to be made are also indicated. The transistors may be wired and soldered directly to the circuit; however, the use of transistor sockets will avoid possible damage to the transistors during soldering, and permit convenient interchanging of transistors. The sockets are the G.C. type 16-918 which have terminal pins that are long enough to be inserted through the board holes. They are available at most parts stores.

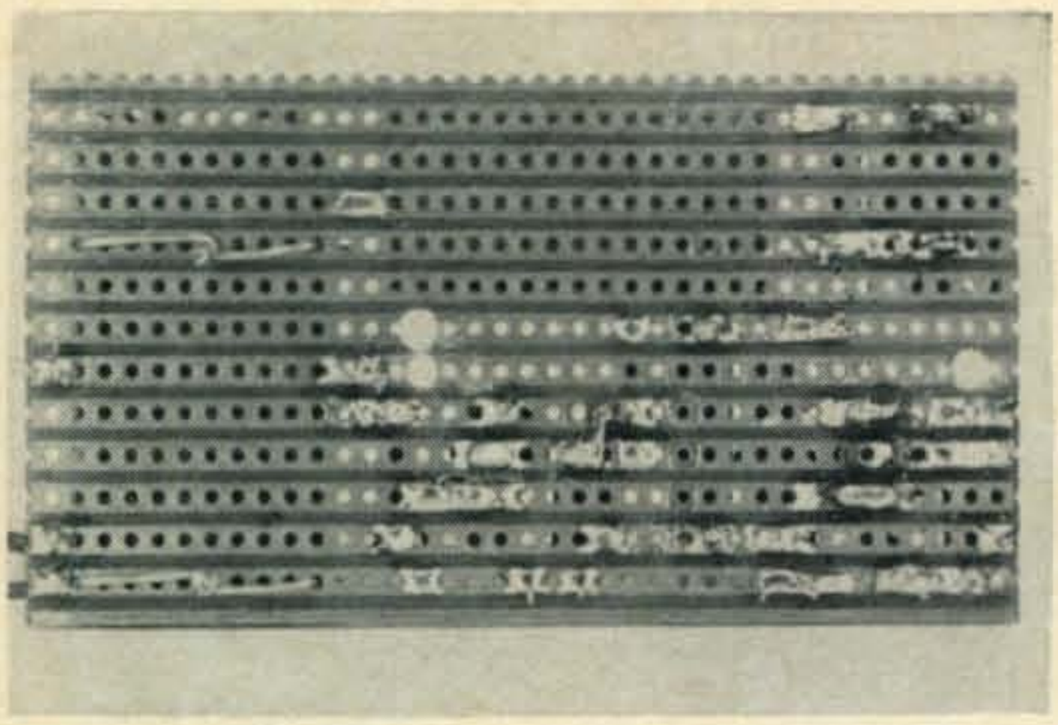
The 100 kc crystal holder is placed flat on the board and is held in place with connecting leads soldered to the board foils and the crystal-holder terminal pins. A wire soldered to the top of the holder case and the board adds additional support.

Instead of using a hard-to-find battery-holder



The circuit board for the calibrator is mounted in a minibox on ¼" spacers. Not shown, is a heat sink made of a small fuse clip which was later installed on the oscillator transistor to thermally stabilize it when power was applied. The phono jacks are at the top of the right side on which the switch is mounted just above the battery.

[2]"Circuit Boards—Quick and Easy" page 35 this issue.
[3]Use 4" board with .156" × .1" hole matrix as furnished in Veroboard Kit BK-6.



Rear view of the Veroboard on which the calibrator is built. The component leads that have been inserted through the holes are soldered to the horizontal copper strips (or foils) that are ready-made on the board. Breaks are made in the strips where necessary to isolate circuit elements. Three of the breaks may be seen to the right of center on the 3rd, 4th and 5th strips from the bottom.

clip, the battery is clamped to the board with two wire loops around the battery with their ends pushed through the board holes and twisted together at the back of the board. A snap-on terminal strip is used for connecting leads to the battery.

Capacitor C_1 is held and soldered to the board by its terminal pins that are inserted through the holes. C_2 may be omitted if a 180 mmf miniaturized compression-type trimmer is used for C_1 instead of the type specified. C_1 and C_4 should be temporarily installed until after the unit is working, as explained later. Phono-type jacks for the antenna connections and a d.p.d.t. slide switch are mounted on one end of the box. The center line for the jacks and the switch should be ⅜" and 1" respectively from the top of the side as shown in the photo. Also, temporarily make the leads between the antenna jacks, circuit board, switch and battery about 6" long, so the calibrator may be conveniently tested before it is mounted in the box.

Adjustment and Operation

While the circuit board is out of the box with its temporary-length leads installed, connect the receiver input to the calibrator. With the receiver b.f.o. turned on, switch on the calibrator and tune the receiver for a beat note near any 100 kc point on a low-frequency range. If the signal cannot be heard and assuming that the unit has been correctly wired, chances are that Q_1 is not oscillating, because C_4 is too small or large to properly resonate with the precise inductance of the particular component used for L_1. The value of C_4 may then have to be changed 100-200 mmf. After the unit is working, permanently install the correct size capacitor for C_4.

Next, connect an antenna to the other jack on the calibrator, shut off the calibrator and tune in WWV or some other signal whose frequency is known to be an accurate multiple of 100 kc (a BC-221 can be used also). Turn on the calibrator and zero beat it with the signal by adjusting C_1.[4] If the crystal cannot be tuned to exact frequency, C_2 is too large or small as can be determined by noting at which end of its range C_1 must be set to approach zero beat. C_2 should then be altered accordingly and until zero beat can be had with C_1 near its mid setting.

The circuit board may now be installed in the box with its leads trimmed down and permanently connected. Fasten the board to the box using 6-32 screws and nuts with ¼" spacers between the board and the box. A fiber washer should be placed on the board-side of each spacer. Make sure that the mounting nuts do not touch the crystal holder or component leads and also see that the edges of the board do not touch the box at any point.

Plastic electrical tape should be attached to the rear side of the battery-terminal clip, or on the inside of the box cover, to prevent shorting of the terminals when the cover is in place. Upon completion, the calibrator should be readjusted to frequency through a ⅜" diameter access hole which should be made in the cover before it is installed. ■

[4]If calibrator signal is too strong to produce a good beat, the coupling between the calibrator and the antenna line will have to be reduced.

New Amateur Product

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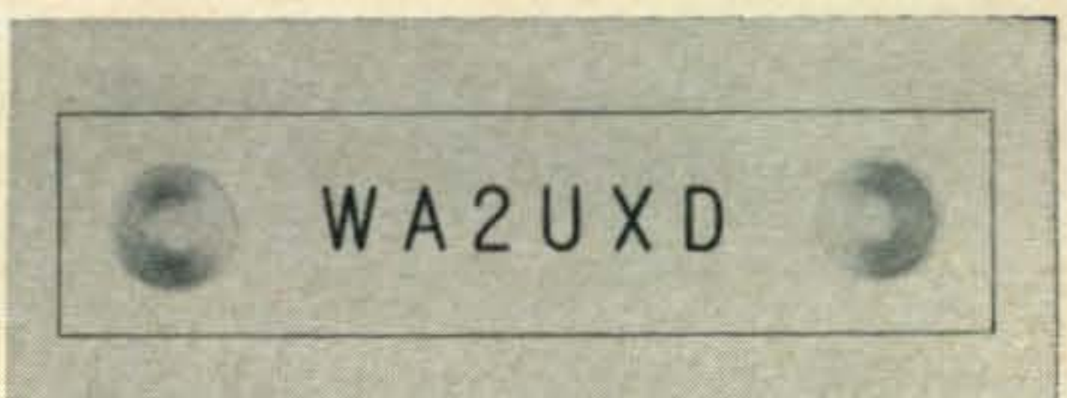

APOLLO Engraving Company has just come out with a new useful idea and we wonder why any one hasn't thought of it before. It is a plastic strip 10" × 12", with your call letters engraved on it. The strip is held to the rear auto windshield by two strong durable suction cups. The item sells for $3.00, two (one as a gift) for $5.00. The colors available are black with white letters or red with white letters. For more information write to Apollo Engraving, P. O. Box 81, Brooklyn, N.Y. or circle 64 on page 106.

Hum Reduction!

BY JAMES ASHE,* W2DXH

A simple approach to a common cause of hum in power supplies.

BUILDING a power supply for a high gain audio circuit? Most of us do, sooner or later and sometimes it happens to produce hum!

A rarely mentioned and more rarely tested point of entry for the hum is by way of the power supply filter choke. The properties of this choke are probably far from ideal; its route to the builder's hands may have obscured its ancestry, and anyhow it's well to be a little suspicious of its properties.

'Phone Test

Try the earphone test. Free both leads of the choke, place it and the power transformer at their planned locations. Energize the transformer and see what comes out of the choke by connecting the phones across it. You are probably in for a surprise! Try this for various transformer and choke positions. Discouraging, isn't it?

But wait! Is this the right test? Is the choke in the same sort of electrical circuit it will see in the finished supply?

Figure 1(A) shows a common filter configuration. Figure 1 (B) shows the easy way to do the test, without thinking. In fig. 2 the irrelevant parts of the circuit are omitted. The choke is drawn as a generator supplying a certain hum voltage, and the two capacitors are drawn as reactances which load the generator. A 26 mf capacitor would have a reactance of about 100 ohms at 60 cycles.

Let's think about fig. 3 for a moment. What does it mean? It means that the hum voltage appears across Z_1 and Z_2 in series. The half appearing across Z_2 is the part seen by the rest of the circuit. That factor of 2 won't make much difference; we're just getting oriented now. The important thing is the magnitude of the load on the choke's hum generator. The magic number is 100 ohms or so.

So when we want to estimate the hum voltage the choke will pick up, we just put a 100 ohm resistor across its leads, and see what voltage it can produce across that load. The result isn't likely to be off by a factor greater than two and if you like large filter capacitors, it will be a good conservative figure.

For example, the following results were taken from a 10 henry choke located 4 inches from a small power transformer, both mounted upright and with their cores in line:

No load, 100 mv hum voltage.

100 ohm resistive load, 2.5 mv hum voltage.

24 mf capacitor load, 2 mv hum voltage.

Oh yes—there is one case where all bets are off. That is if *L* and *C* resonate at 60 or 120 cycles. ■

*Eli Scientific Co., RD 1, Freeville, New York 13068.

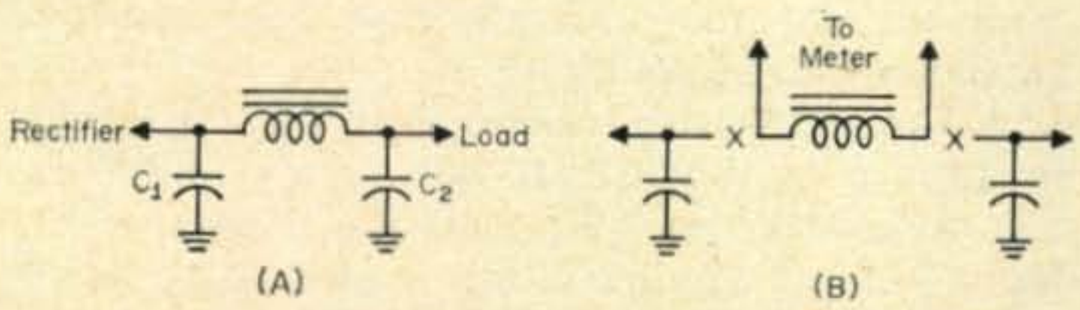

Fig. 1—(A) Basic pi-filter circuit encountered in most power supplies. (B) A simple but inaccurate method of checking the hum voltage pick-up.

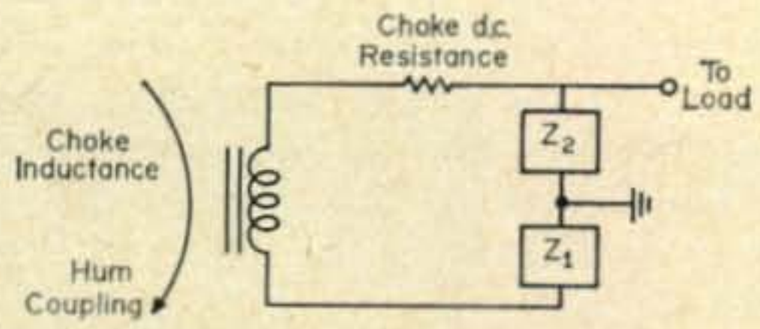

Fig. 2—Equivalent circuit shown above illustrates the choke hum circuit, and shows voltage divider effect of filter capacitors.

OSCAR NOTES

A NUMBER of inquiries have been received concerning the lash-up used for obtaining the oscilloscope displays of OSCAR III's telemetry pulses as shown in the photos on page 56, Sept. '65 *CQ*.

The trace is that of the r.f. envelope of the signals and may be obtained by sampling the i.f. of a receiver that has an i.f. type noise limiter and applying it to a 5 mc d.c. coupled oscilloscope with a trigger sweep. We used a Hallicrafter's SX-115 receiver which has both an i.f. noise limiter and auxiliary terminals for 50 kc i.f. output. The scope was a Heathkit Model OP-1. In this case, a 100 kc scope could have been used, but with higher i.f.'s a wide-band scope must be used. An i.f. type noise limiter is a necessity, not only for levelling off picked-up noise interference, but also for attenuating noise spikes from the inherent noise of the receiver.

Observations of the r.f. envelope were much more satisfactory than those of demodulated a.f. signals from the detector where a conglomeration of waveforms from various beats made visual observations extremely difficult.

Oscalator Notes

In case you've had some questions about the Oscalator described in the August '65 *CQ*, here are the answers to a few queries that came up:

Referring to fig. 2 in the original article, the Oscalator track is a sub-satellite track that has been compensated in relation to a rotating earth. If the earth were standing still, the actual arc, starting at 0° W. Long. on the equator, would go through 270° W. Long. at 70° N. Lat. and over to 180° W. Long. on the opposite side of the equator.

The method described for plotting the track should be correct for near-circular orbits having periods up to about 200 minutes. For very high-altitude or longer-period orbits, the determination, for points A, B and C (fig. 2) is slightly different. We hope to cover this in a subsequent article together with data pertaining to elliptical orbits.

For a Southern projection, the easterly and westerly directions on the range scales (fig. 3) should be reversed. Also, the indicated directions are for the great circle route to the 2000-mile limit only. As the range diminishes, the directivity approaches that of the normal compass points. The points do not indicate the *bearings* in *degrees* as related to the angle with the N-S reference.

To illustrate the comments in the 3rd paragraph, 1st column page 58: fig. 4 shows that although the 40th parallel crossing on the N-S orbit is out of range of Boston (left scale), the orbit otherwise is in range for 12 minutes!

Oscar IV Track

OSCAR IV is expected to be in a near-synchronous equatorial orbit (0° inclination) with a daily eastward progression of about 30°. In this case the sub-satellite track on the Oscalator will follow the equator counterclockwise 30° per 24 hours. The approximate length of time that OSCAR IV will be in or out of range of various latitudes is shown in the table given in the SPACE COMMUNICATIONS column (see page 83). The in-range time will be slightly less for a 30° drift.

It should be noted that the in-range view from various latitudes cannot be determined from the Oscalator. The aforementioned table should be used instead.

As soon as OSCAR IV is launched and the exact orbital parameters are known, we'll gladly send you track data; *provided*, you furnish us with a self-addressed stamped envelope.

Things To Come

Other interesting OSCAR packages that are in the works for future launches are as follows:

A Linear Translator (under construction and test by a group led by Marvin Wahl, K9CHU/6). The translator has an input center frequency of 144.1 mc and an output center frequency of 29.45 mc with a passband of 25 kc. It will also have a 10-meter transmission, and should stimulate further interest in amateur space activity.

An ARIES/OSCAR (Amateur Radio in Experimental Satellite) satellite is in the design stage under the sponsorship of the San Fernando Valley Radio Club. It is expected to be a 2-meter translator with both v.h.f. and u.h.f. beacons.

A joint project of the Melbourne University Astronautical Society of Australia and the Melbourne University Radio Club, VK3ATM, is a solar end battery powered translator satellite operating in the 144 and 432 mc bands with a proposed 8 channel telemetry system along with a pulse h.f. beacon transmitter.

The Euro-OSCAR translator satellite built by DJ4ZC and others is expected to go in a low-altitude launch sometime in 1966. This package is modeled after the successful translator launched by balloon in Holland.

A 144 mc beacon is being built by a group led by John Fox, WØLER. It will have a 144.05 mc c.w. beacon keyed by a separate telemetry system. A novel telemetry unit is also being developed by Jim Fromke, KØMHC. It consists of a 7 channel binary pulse-code modulation system. —*W2AEF*

Using Audio Controlled A.G.C. For Improved Receiver Selectivity

BY JAMES E. TAYLOR,* W2OZH

The use of audio controlled a.g.c. combined with an audio filter can provide superior action and improve the receiver selectivity. How this may be done is described below.

THE "audio hang" a.g.c. circuit developed by Luick[1] appears to be superior to others for communications receiver design. It provides a flat a.g.c. characteristic throughout the normal signal range, eliminates isolation problems, and includes the fast attack and slow release required for proper reception of s.s.b. signals.

For several years, now, I have used this circuit, with a 75A4 receiver, in a manner which permits greater a.g.c. gain and improved effective selectivity of the receiver.

Principles Of Operation

By normal i.f. standards the nominal 3.1 kc mechanical filter has very good skirt selectivity. But, for many years audio filters have been available which display even steeper skirt selectivity characteristics. If such an audio filter is utilized in the audio amplifier of a communications receiver, after the point of origin of the control voltage for audio a.g.c., there can result a "muting" action. This is due to any predominant interfering signal which exists in the frequency range between the selectivity cut-off point of the mechanical filter, and that of the audio filter. However, if the control voltage for the audio a.g.c. is derived from a point *after* the selective audio filter, this muting effect is eliminated and the speaker volume of the desired signal is not decreased due to the presence of the interfering signal.

Figure 1 shows the block diagram of the conventional audio a.g.c. arrangement as used by Luick. Figure 2 indicates the block diagram of the modification with selectivity derived from the audio filter. Connection (A) permits muting as mentioned above, while connection (B) provides the elimination of this effect.

In fig. 3 typical response characteristics of mechanical and audio filters are shown qualitatively together with an assumed interference situation. Here it is desired that a 1 kc signal be received in the presence of an interfering 3.3 kc signal having twice the amplitude of the former.

Table I indicates, in arbitrary units, the a.g.c. output voltage, the corresponding i.f. gain, and the resulting speaker input voltage for three situations: A, for the conventional arrangement of fig. 1; B, for the same arrangement, except with the audio filter added to restrict output response only; and C, with the audio a.g.c. voltage derived from the audio filter output. Here, for simplicity, linearity has been assumed for all parts of the circuit. It is seen that from situation A, with two units of desired signal in the pres-

*Xerox Corporation, Webster, New York 14580.

[1]Luick, G. W., "Improved A.V.C. for Side-Band and C.W.," *QST*, Oct. 1957, p. 46.

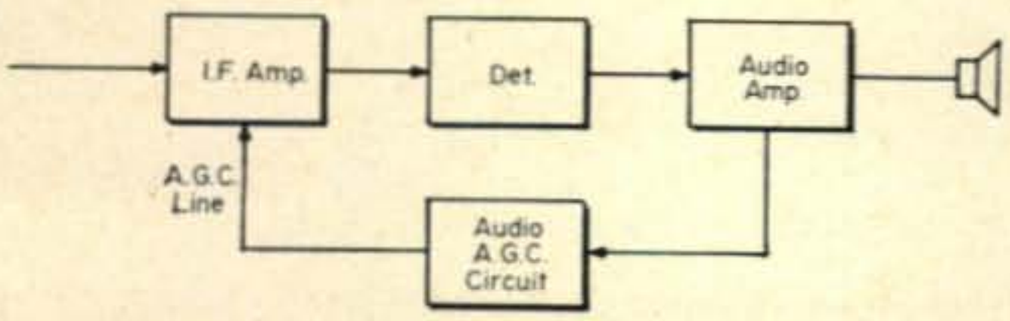

Fig. 1—Block Diagram of the basic a.g.c. circuit.

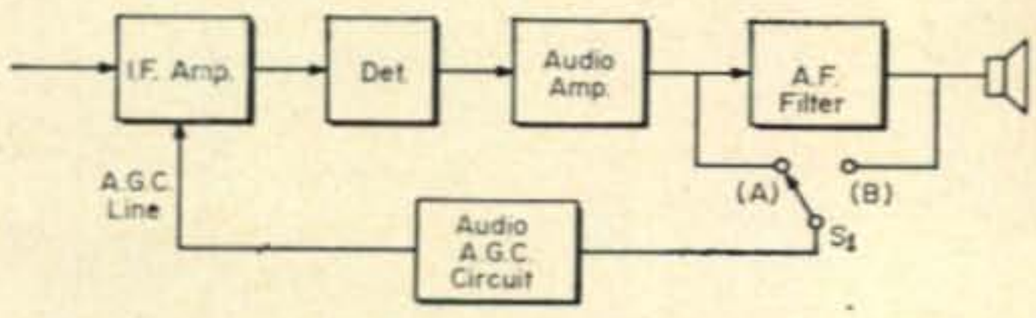

Fig. 2—Block diagram of an audio a.g.c. system using an audio filter for improved performance. Switch S1 permits the filter to be switched out of the a.g.c. loop and in the actual circuit eliminates the filter from the audio circuit also.

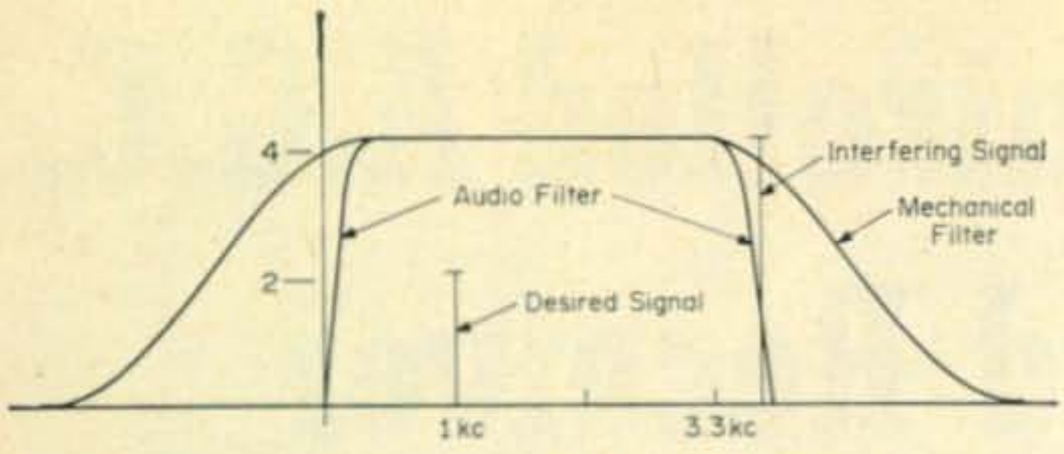

Fig. 3—Shown above are the response characteristics of the receiver with and without the audio filter. The effects upon the desired and undesired signals are described in the text.

Situation	A.G.C. Output	I.F. Gain	Speaker Input	
			Des.	Interf.
A. (fig. 1)	6	1/6	2	4
B. (fig. 2A)	6	1/6	2	1
C. (fig. 2B)	3	1/3	4	2

Table I—The results of the three situations described in the text are listed in arbitrary units.

ence of four units of interference, the mere introduction of the audio filter, situation B, reduces the interference to one unit. However, the "muting" effect is evident here since the level of the desired signal is only two units. However, in situation C, our improved circuit arrangement produces an output level of desired signal of four units, in the presence of two units of interference. Thus, we see that the signal to interference ratio has been completely transposed from an intolerable 2:4 ratio to a tolerable 4:2 proportion.

Circuitry

The schematic diagram of the circuit used is shown in fig. 4. The basic electronic circuit is that developed by Luick and the audio filter used is the Espey No. 16.296 purchased in the surplus market. This filter was used because it was readily available and it displays the desired flat response with a very steep skirt at about 3 kc. (A filter having even steeper skirts and a much smaller physical size could be used farther back in the audio amplifier, since the Espey unit was designed to operate at a relatively high power output level.) The Espey filter operates at a 500 ohm impedance level and, therefore, a transformer is utilized for matching between the filter and the 4 ohm speaker line.

A second matching transformer is utilized between the speaker line and the input grid of the a.g.c. amplifier. A switch is provided to permit switching the filter in or out without otherwise disturbing the operation of the circuitry.

Results

The results using this circuit arrangement have been outstanding. The R.F. GAIN control is always operated wide open, at position 10. There is no pumping action regardless of signal strength.

A dramatic change, which results from the use of this circuit arrangement, concerns the effect of the manual AUDIO GAIN control in the receiver. As this control is advanced to the maximum setting there is no noticeable increase in speaker volume, above the comfortable listening level, although the S-meter reading swings higher. The speaker volume for the weakest mobile signals appears to be just as strong as that for the strongest locals. Both I.F. and AUDIO gain controls could readily be removed from the circuit of the receiver, as they are never used!

There is yet another advantage to be gained from the use of the audio a.g.c. circuit. If i.f. derived a.g.c. is used, there is a decrease in gain whenever a strong carrier is tuned to zero beat. This happens when an a.m. signal is tuned in or when the station transmitter is being set on frequency. The use of audio derived a.g.c. eliminates this decrease of gain. Thus, as the transmitter is brought into zero beat there is no audio output and the receiver gain actually increases! This permits the zeroing of the transmitter with much greater accuracy and it is possible actually to "count cycles" as the rig is zeroed on frequency. ■

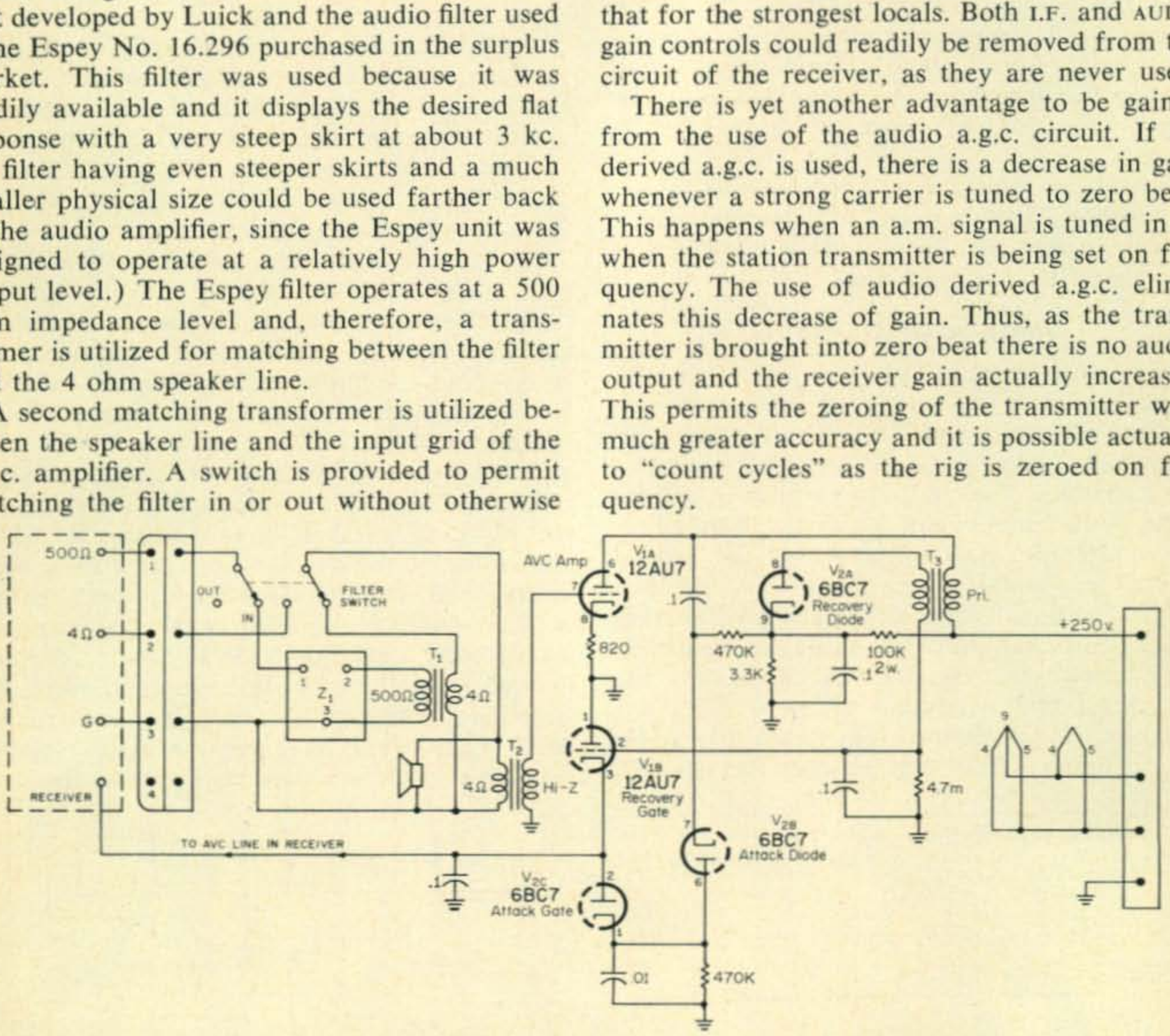

Fig. 4—Circuit of the improved audio a.g.c. circuit. All resistors are ½ watt and all capacitors are in mf.

T_1—Universal Output. Stancor A-3841 or equiv.
T_2—Single plate to voice coil. Stancor A-3327 or equiv.
T_3—Single plate to grid. Stancor A-53 or equiv.

Z_1—Surplus, Espey #16.296 audio filter (see text). The homebrew filter described on page 29, April 1964 CQ may be used with no modification.

Circuit Boards— Quick and Easy

BY WILFRED M. SCHERER,* W2AEF

CONVENTIONAL methods of producing printed circuits require a time consuming and usually messy etching process with chemicals. For this reason there probably are many amateurs who steer away from making their own printed-circuit boards. In view of this we think you'll be interested in hearing about a new technique that does away with the fuss and inconveniences ordinarily encountered; in fact, with the XYL's permission, you could even do the work in the comfort of your own living room! The method makes use of Veroboards, a development originated in England.

Unlike the conventional printed-circuit board, the Veroboard already has the circuit strips which instead of being shaped and routed for a specific circuit, merely consist of parallel rows of copper strips which are bonded to a board made of laminated synthetic-resin-bonded paper. The copper strips and boards are punched with evenly spaced holes through which the leads of components may be inserted and then soldered to the strips. The components are thus installed on the circuit board according to the required interconnections afforded by the copper strips. A simple tool is supplied to break the continuity of the strips where connections are not desired.

Other advantages gained by the use of Veroboards is that extensive layout planning is minimized, errors can be easily corrected and modifications to circuitry can usually be made at any time without discarding an already used board. They should have wide appeal not only for use in home-built gear, but also for commercial and laboratory applications where prototype or even production units are required.

The basic concept and procedure for the Veroboards is shown at fig. 1 using the simple circuit at A; while at B the components are shown as they are mounted on the Veroboard and interconnected with the copper strips. The strips are on the rear of the board with the component leads inserted through the holes from the front of the board. They are soldered to the strips at the holes as indicated by the dark solid dots. Where connections are not required between portions of the circuitry, the copper strips are broken as shown at the points marked X. This is done with the hand tool called a "spot face cutter", or it may be accomplished by drilling or with a penknife. Connections that are required between strips can be made with a wire jumper as shown at Y.

The parts are shown mounted at right angles to the metal strips, but they may also be parallel to the strips as shown by the alternate placement of C_1 (dashed lines), in which case the wire jumper is not needed. Parallel or even diagonal placement, in combination with crosswise-mounted components, often can save space and help compact the layout.

Another arrangement for the same circuitry is shown at C. No breaks in the strips are needed in this partciular case. Less horizontal space, but

*Technical Director, *CQ*

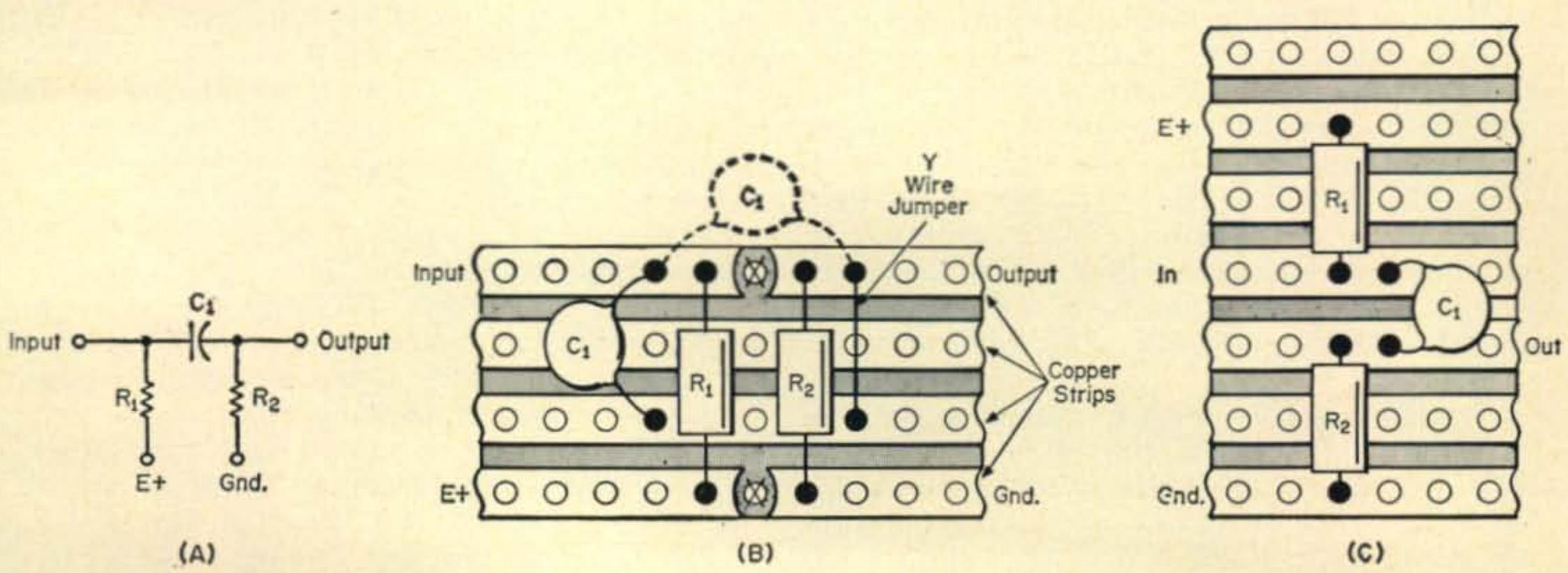

Fig. 1—Basic concept of Veroboard system. Components for circuitry at (A) are shown installed on the Veroboard in two different arrangements at (B) and (C). See text for explanation.

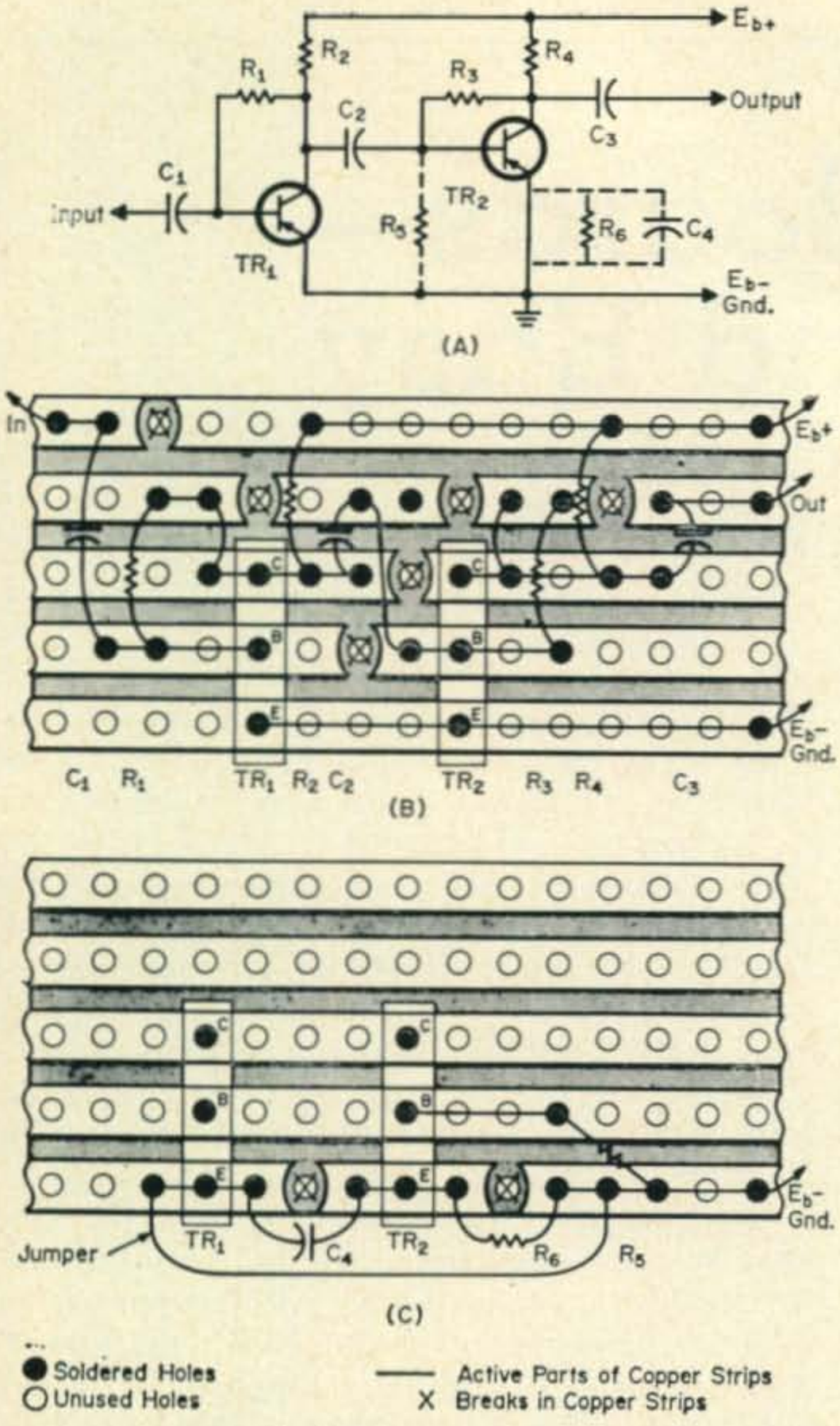

Fig. 2—Circuitry of two-stage transistorized a.f. amplifier (A) as installed on Veroboard at B. At C is shown how circuit modifications (dashed components at A) can be added to the Veroboard.

more vertical space is required on the board; however, as a general rule this layout may be more convenient, running the voltage-supply line on a strip through the center of the board and using the outer strips for the ground busses. Space also may be saved by mounting components vertically in relation to the board itself, in which case they'll stand up "in the air", so to speak. When necessary, the boards easily may be cut down to size by cutting, or they may be drilled for mounting of special components.

Now let us go a bit further and take a look at fig. 2 where the schematic for a simple two-stage transistor a.f. amplifier is shown at A, with the arrangement on the Veroboard at B. Here all the components are placed at right angles to the copper strips. This usually will be the quickest and simplest way of setting up the layout. Note that all the parts are arranged in almost the same sequence as they appear in the schematic.

Now, suppose we wish to rearrange the bias circuitry (R_5) and add emitter bias too (R_6 & R_4). Fig. 2 illustrates how modifications, such as these, can be made to existing circuitry without requiring a new board or a re-etching job which would be the case if conventional printed-circuit board techniques were used. This also shows how components may be placed parallel to or diagonally across the copper strips.

The Veroboard method also simplifies the planning of the layout which may be done on paper beforehand, since you don't have to figure out just where to route the circuitry to avoid short circuits and to get away from a maze of criss-crossed leads. The circuit runs are already there, so all you have to do is link them with the desired components which are laid out sequentially to follow the required circuit. You then indicate where the breaks are needed to be made in the strips.

When planning the Veroboard layout on paper, you can just simply draw a number of parallel lines on the paper to represent the copper strips and then draw evenly spaced small circles along each line to represent the punched holes. On the other hand, you can obtain Veroboard design sheets which already are drawn to represent the boards and on which the rows of holes are identified numerically and alphabetically for easy identification of individual hole locations. These can be correlated to the actual board during assembly by attaching to the board available adhesive cellulose tapes that are similarly marked with numbers and letters.

To see how you may construct units using the Veroboards, we suggest you refer to page 28 where you'll find a "Veroboarded" 100 kc crystal calibrator you can build yourself. It'll be handy to have around the shack or to use in the car.

The Veroboards are available in various sizes and with different width and spaced copper strips along with a number of different "pitches", or spacing between holes.

More sophisticated type Veroboards also can be had with parallel copper strips on both sides of the board, or with the strips on one side at right angles to those on the opposite side. Other variations have the copper strips gold plated at a tongue on one end, so the board can be plugged into an edge-type connector. This, together with plastic guides in a "Verorack" assembly, allows modular construction using plug-in circuit boards. There are many additional accessories such as special terminal pins, transistor and diode holders, component jigs, etc.

Of special interest to the amateur home-constructor is a low-priced kit consisting of six assorted Veroboards ranging in size from 3⅜" × 3½" to 2½" × 7", a spot face cutter and complete instructions on how to design a layout directly on the boards. This kit is the Model BK-6 which sells for $5.95.

A more elaborate package is available for the design engineer. It is the Vero Laboratory Development Kit Model VBK-7 which consists of eight assorted Veroboards up to 18" long, a plain Veroboard with a staggered grid of holes and without copper stripping, 500 terminal pins, terminal-pin insertion tool, a spot face cutter, reproducible design sheet and instructions on the Vero-circuit concept. Price is $29.95.

For further details and catalogue, we suggest you write to Vero Electronics, Inc., 48 Allen Blvd., Farmingdale, N.Y. ■

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

Part XVII

The design and construction of a polar relay keyer test set was covered last month. This part covers the operation of this set. The I-193-C polar relay test set was mentioned in Part X and no further mention was made of the set because of its scarcity at the time. Since that time they have been advertised on the surplus market from a number of sources. It is for this reason that it is worthwhile to devote some space to this very important piece of test equipment.

CONSTRUCTION of the test set was discussed last month and it can now be used to measure distortion percentages as outlined below.

Operation Of The Set

The signal output from a square wave generator should be fed into one of the input jacks (J_1 or J_2) of the polar relay keyer test set. The level of the input triggering signal should be set so that the two 6AQ5 keyer tubes are keying properly as indicated by the regular flashing of the NE-51's.

At this point it might be well to call attention to the fact, by way of review, that the 6AQ5 tubes key (*mark*) on the *negative half* (less positive) of the square wave input signal and the positive half of the input wave represents *space*. If this is not clear, review the operation of V_{1A} and V_{1B} in the section on circuit operation.

The vertical input to the scope should be connected to the set through J_6, with the ground terminal of the scope connected to the sleeve of the plug. This makes it possible to monitor the keying action of the 6AQ5 keyer tubes. The scope should be adjusted so that one cycle can be observed, as in fig. 102. The *mark* and *space* of this signal trace should be equal if the keyer is in proper adjustment. This assumes that the positive and negative halves of the square wave input signal are equal.

If the *mark* and *space* of the scope trace are uneven, with a proper input signal, it indicates that the keyer set is not in proper adjustment. It is possible that the 6AQ5's are biased beyond plate current cut-off. The grid bias potentiometer should be readjusted while watching the trace on the scope. Any distortion present at this point will be passed on to the polar relay under test, since it is the plate current of the keyer tubes that passes through the signal winding of the polar relay. When no distortion is indicated at this point, one is now ready to check the keying action of the relay output terminals 1, 4 and 5.

Remove the scope monitor plug from J_6 and plug it into J_8. It may be necessary to readjust the scope to get a trace such as shown in fig. 102. Don't expect the *mark* and *space* trace to be equal unless the polar relay under test happens to be in *perfect* working order. As in the case of the test sets covered earlier, the object is to adjust the polar relay so that the *mark* and *space* on the scope trace are equal.

Amateurs usually use contacts 1 and 4 so that a closing of the contacts represents *mark* and an opening of these contacts represents *space*, with contact number 5 not being used

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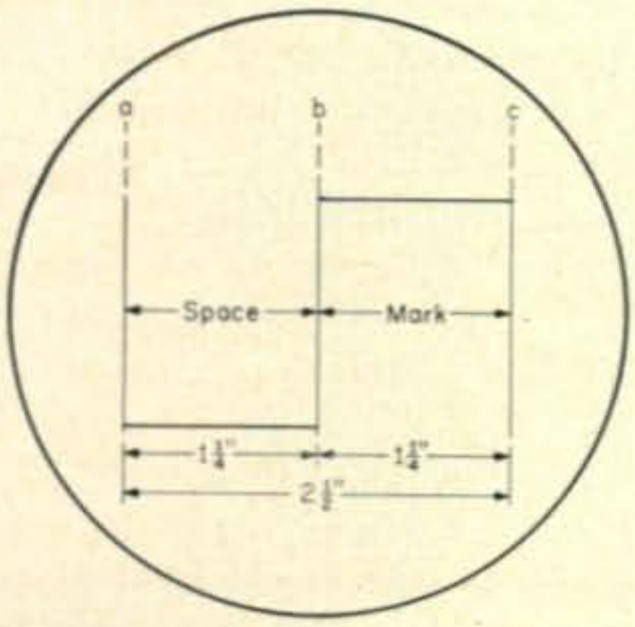


Fig. 102—Scope trace of one cycle of signal in the plate circuit of the keyer tubes.

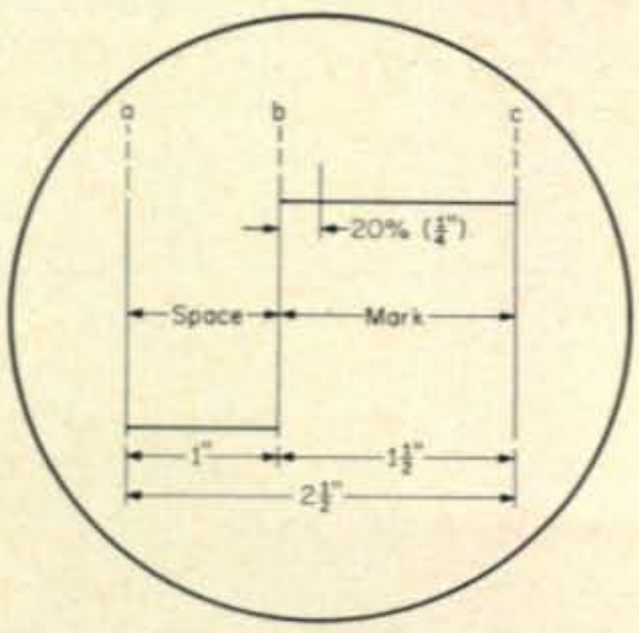


Fig. 103—Scope trace of one cycle of keyed signal, keyed by the polar relay, showing the presence of *mark* distortion. This is indicated by the *mark* trace being longer than the *space*.

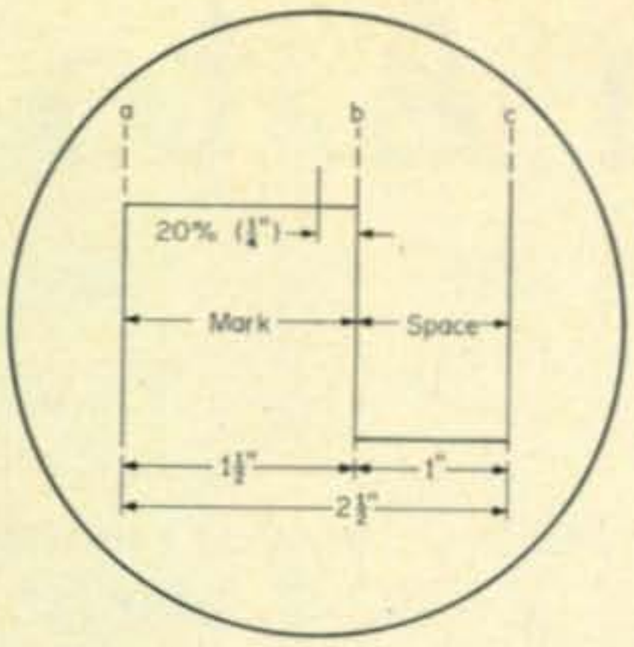


Fig. 104—The same scope trace shown in fig. 105, except the scope is adjusted so that *space* follows, instead of precedes, the *mark* pulse. The scope does not indicate if it is end distortion, as shown here, or bias distortion as shown in fig. 105. This is explained more fully in the text.

except to reverse the action. When the action is reversed, then contact number 4 is not in use. The s.p.d.t. toggle switch on the right side of the front panel marked S and M is for reversing the action so that contacts 1 and 4 or 1 and 5 may be used. Any relay under test should be checked for each condition by operating this switch.

Determining Distortion Percentage

It will be noted that the measurements in inches of the trace on the scope were given in fig. 102. A special scale with percentages marked thereon could be made up and placed over the face of the scope. However, it was considered that it was as easy to use a small ruler and simple arithmetic to determine the percentage of distortion.

Let us consider that distortion is present in the keying circuit of the polar relay under test, as indicated in the trace of fig. 103. It will be recalled, from a study of RTTY bias and end distortion, that a longer *mark* pulse means a shorter *space* pulse or *vice versa*. The exact amount that one or the other is lengthened is the same amount that the other pulse is shortened.

The trace of one cycle (one *space* and one *mark*) as shown in figs. 102 and 103 was 2½ inches long. In fig. 103 the *space* (*a*-*b*) was one inch long, whereas the *mark* (*b*-*c*) pulse was one and one-half inches long. The length of the whole cycle (one *space* and one *mark*) was two and one-half inches. Thus, 2.5/2 = 1¼ inches, which represents 100% as the length of the *mark* and *space* if distortion did not exist as shown in fig. 102. The *mark* space was elongated ¼ inch or 0.25/1.25 or 20%, which indicates 20% mark distortion. The important question is: Is it *bias distortion* indicated by the example of fig. 103, or is it really *end distortion?* The trace on the scope could have been adjusted, just as easily, so that the *mark* pulse came first, as in fig. 104. One must conclude that it takes more sophisticated equipment than this to distinguish between the two. This certainly shouldn't bother the RTTY'er as he shouldn't have a fondness for either. It might satisfy one's curiosity to know if it's bias distortion or end distortion, but it's far more important to get rid of it, whatever it is!

Other Test Set Uses

In monitoring the trace of a polar relay keying action, one not only is able to observe distortion as above outlined, but other relay faults as well. Contact bounce, dirty contacts, or improperly aligned contacts can also be detected. These show up as a ragged, or discontinuous trace, whiskers on the trace, *etc.*, instead of a smooth, straight line, as shown in figs. 102, 103 and 104 In addition, the test set can also be used in connection with a distortion measuring set (plugged into J_9 or J_{10}) to *read* the percentage of distortion present.

I-193-C Polar Relay Test Set

The increasing availability of the I-193-C Polar Relay Test Set on the surplus market, from a number of sources, warrants a general discussion of this important piece of test gear for the RTTY'er. The unbelievable prices at which these units are being advertised on the surplus market makes it one of the best surplus buys around. A further incentive for covering this test set is that it is for the testing of the popular polar relays previously discussed. (215-A, 255-A, and D-164816).

Polar relays are so much a part of RTTY that the addition of an I-193-C polar relay test set to one's shack should certainly enhance one's pleasure of RTTY. This test set is a good companion instrument to the polar relay keyer test set just covered. One is used in checking and measuring relay distortion and the other is used as an aid to getting rid of the distortion.

Basically, the test set has three purposes. Probably the most important of these is in the testing and adjusting of polar relays for bias distortion. The second, and possibly the next in importance is in the use of the set for making proper sensitivity adjustments. Lastly, the test set contains a dot-generator circuit. This signal is of inestimable value around any RTTY'ers shack. All of these features will be covered in detail.

Physical Description

The test set was made in three models: I-193-A, I-193-B and I-193-C. We are principally concerned with the I-193-C model. The test set is considered portable as it is mounted in a trunk type carrying case with handles, although it weighs 63 pounds. The test set panel is standard 19 inches wide and drilled for rack mounting. No adapters are required if one desires to remove the set from its portable carrying case and mount it in a standard 19 inch rack or rack cabinet.

Figure 67 gave a general view of this test set. All of the controls, sockets, power connections, *etc.*, are located on the front panel. The test set uses two polar relays which plug into two of the three sockets located in the compartment under the hinged metal lid located at the left edge of

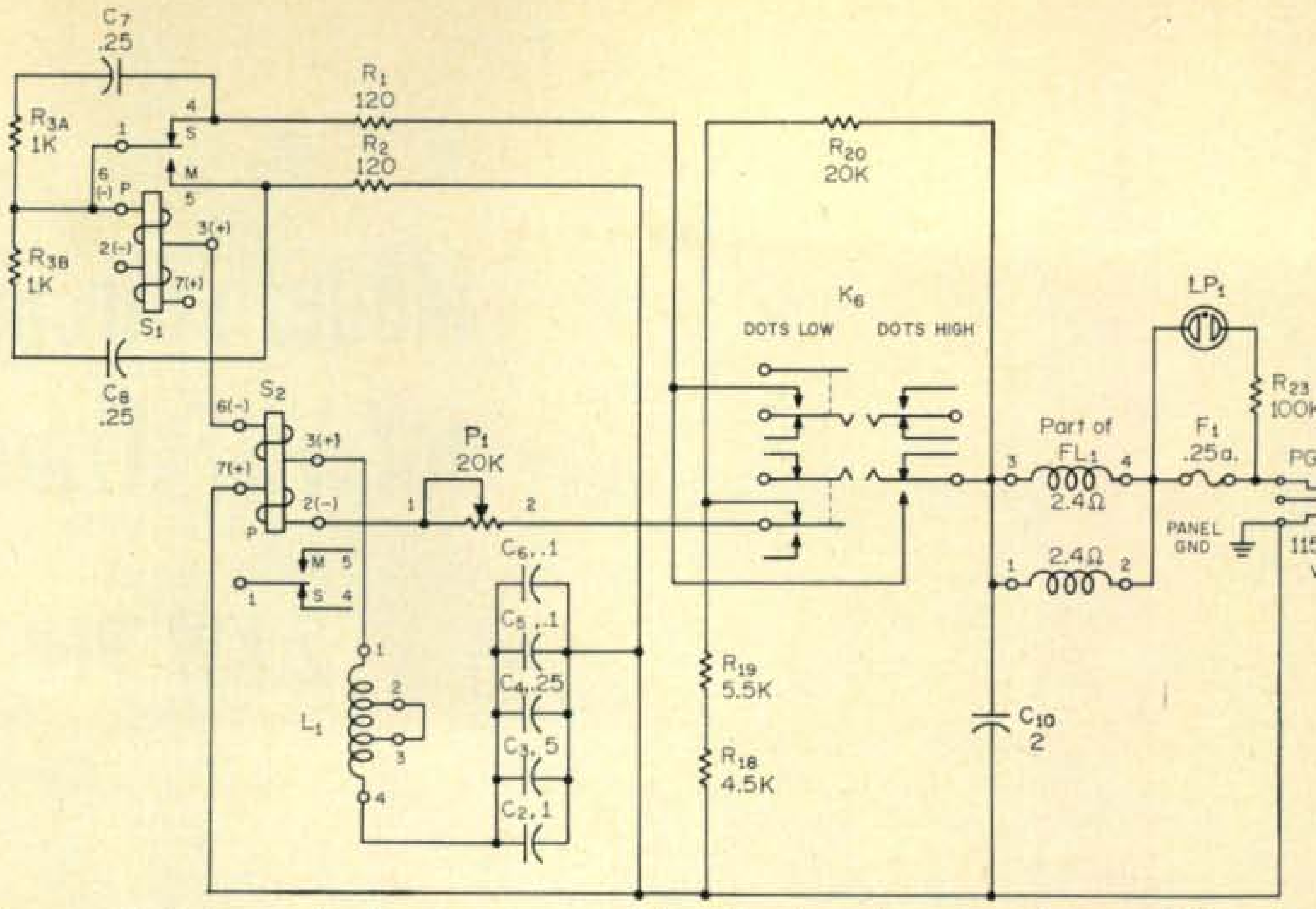


Fig. 105—Schematic of the 20 c.p.s. 1-193-C Test Set oscillator circuit.

the front panel. The extra socket here is for storing a spare relay. Two spare relays are also supplied with the test set and they are stored by being plugged into two of the three sockets for spare relays. This is located in the compartment under the hinged metal lid located at the right edge of the front panel. These compartments allow space for storing the various cords supplied with the set. A permanent type instruction sheet occupies about two-thirds of the inside surface of the lid. The other inside lid space is taken up with a spare fuse and lamp case, and a rather extensive set of polar relay tools. The thickness gauge contains 12 leaves for thicknesses ranging from 0.002 inch to 0.018 inch. These gauges are used for adjustment of the relay contact gap for armature travel, as previously outlined. The burnisher tool is supplied with six burnisher blades and six wire burnishers that all fit into the fountain pen type barrel handle. This tool is used in cleaning and burnishing relay contacts. The adjusting keys are to be used to adjust relay contact gap and pole-piece screws. The file is a jewelers type, #6 cut, and should be *used sparingly* to dress relay contacts. The four polar relays and relay maintenance tools alone are worth a considerable portion of the purchase price being asked for these test sets on the surplus market.

Electrical Description

The chief use for the I-193-C Polar Relay Test Set is, as the name implies, to test and aid in the adjustment of polar relays. The primary tests are for bias and for sensitivity of operate-non-operate current values. In addition, the test set may be used as a source of dot signals which are actually equally spaced on-off electrical impulses. This feature was incorporated into the test sets for lining up other teletype or teletypewriter equipment, besides the polar relay. Such a signal may be used to drive the Polar Relay Keyer Test Set, instead of the square wave generator.

[*Continued on page 90*]

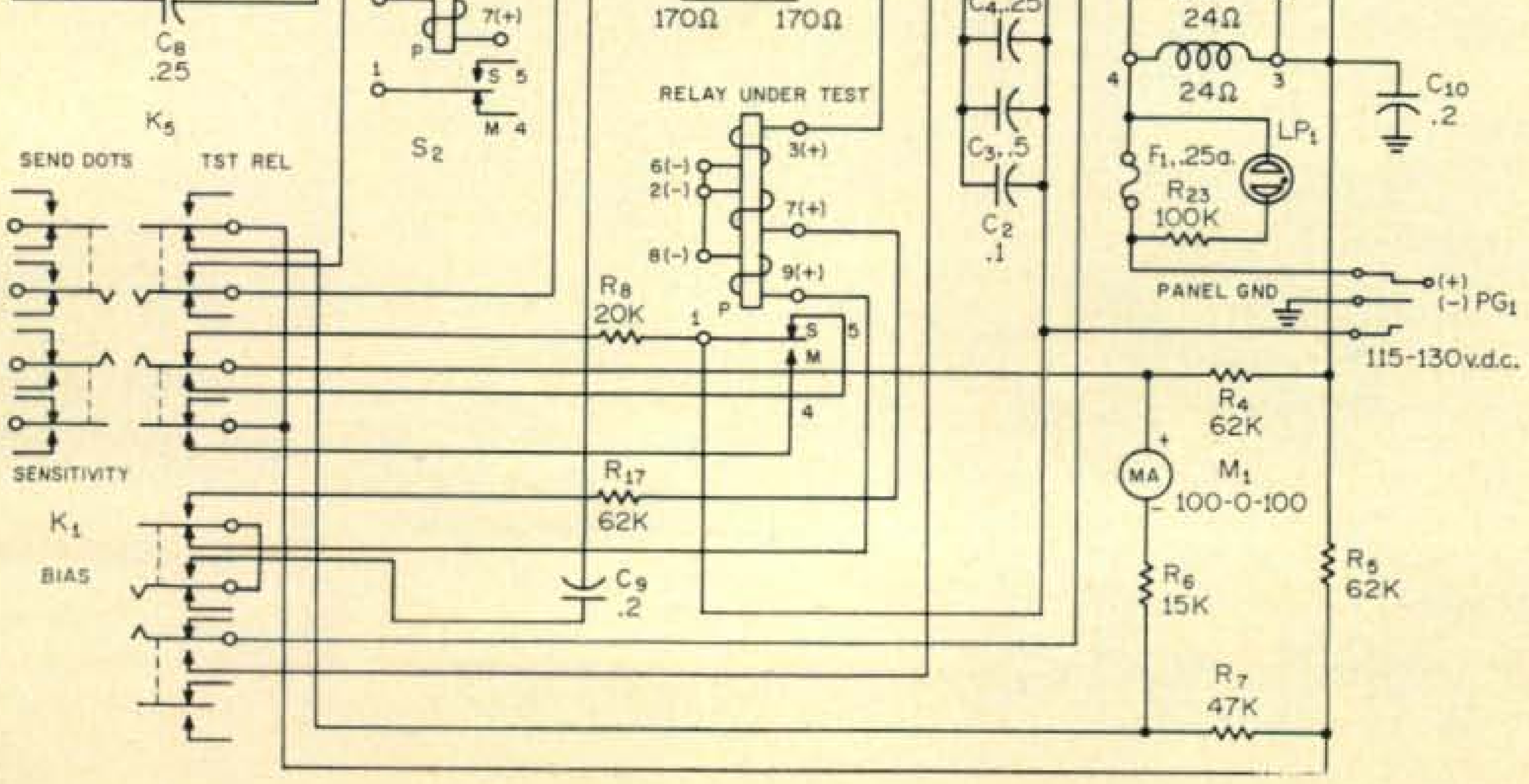
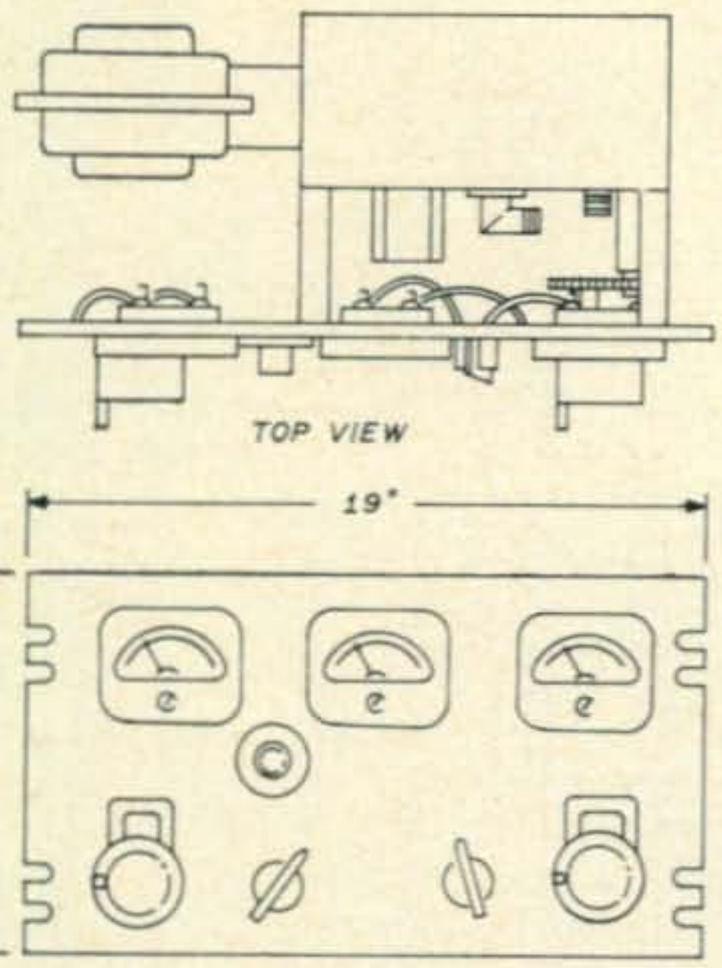


Fig. 106—Schematic diagram of the 1-193-C Test Set circuit for testing bias of a relay under test.



Modern Circuit Design for VHF Transmitters

2 KW PEP on 144 mc

Part II

BY H. C. BARBER,* W6GQK; W. I. ORR,† W6SAI; R. RINAUDO,† W6KEV AND R. SUTHERLAND,† W6UOV.

Part II of this article describes the construction of a 2 kw p.e.p. linear amplifier that loafs along at the legal amateur power level and requires less than ten watts of drive.

THE serious v.h.f. operator has a need for high power transmitting equipment if he is interested in Oscar IV, meteor scatter, moon bounce or other exotic forms of long-distance v.h.f. communication. In addition, if he contemplates s.s.b. operation, he may be desirous of running the "two kilowatt p.e.p." limit.[2] Equipment capable of achieving this power level on a reliable basis is scarce in the world of hamdom, although such gear is fairly commonplace in the commercial fields. Many instances exist where commercial gear has been patterned after equipment designed for radio amateur use, so perhaps there is justification for purely amateur gear designed around a proven item of commercial equipment.

This article describes a unique 144 mc high-power linear amplifier, patterned after a 5 kilowatt amplifier that has proven itself in space communication work in the v.h.f. spectrum. Scaled down to amateur size and power level, and making use of the new Eimac 4CX1000K v.h.f. tetrode, this compact continuous service kilowatt unit combines high power gain, stability and good linearity in a small package. This amplifier design, moreover, may be further scaled down for use at a lower power level, employing a single tube of the 4CX250B family. Requiring no neutralization, and straightforward in adjustment and tune-up, this linear amplifier is an interesting example of up-to-date v.h.f. design techniques. Even though many amateurs may not care to duplicate this unit in its entirety, many of the unique circuits and layout may be well adapted to other v.h.f. equipments.

The previous article[3] discussed some of the problems overcome in the design of a high power v.h.f. linear amplifier and the techniques that were employed to solve these problems. This article describes the construction of a 144 mc linear amplifier employing these previously discussed techniques and which is capable of continuous operation at a maximum power level of 2700 watts (p.e.p.). This margin allows a reasonable safety factor at the maximum amateur power input limit and insures that the equipment will not blow up at a crucial moment when an existing DX record is about to be shattered.

The 4CX1000K amplifier employs a half-wave linear plate tank circuit and the grounded screen

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[2]The F.C.C. definition of the so-called "two kilowatt p.e.p." limit is: "The maximum d.c. plate power input to the radio frequency tube or tubes supplying power to the antenna system of a single-sideband suppressed-carrier transmitter, as indicated by the usual plate voltmeter and plate milliammeter, shall be considered as the "input power" . . . provided the plate meters utilized have a time constant not in excess of approximately 0.25 second, and the linearity of the transmitter has been adjusted to prevent the generation of excessive sidebands. The "input power" shall not exceed one kilowatt on peaks as indicated by the plate meter readings."

[3]Barber et al., "2 KW PEP on 144 mc," *CQ*, Nov. 1965 page 30.

configuration discussed in the previous article. Overall amplifier efficiency in the Class AB-1 linear mode is unusually high for these frequencies, being of the order of 60 percent or better at a plate potential of 2500 volts. As the practical limit of plate efficiency of a Class AB-1 linear amplifier is no more than 68 percent, it can be seen that tank circuit losses of this unusual design consume only about 8 percent of the output power. Most garden variety v.h.f. tank circuits exhibit losses ranging from 20 to 50 percent.

At a plate potential of 3000 volts the power gain of this linear amplifier is over 22 decibels at the maximum power level, and the peak driving signal power is only 9.5 watts. At a two kilowatt p.e.p. level (3000 volts at 666 ma) the peak driving power is about 6.3 watts. For c.w. or f.m. service at one kilowatt input, the amplifier is capable of 625 watts power output with a driving power of 5.2 watts, and as an a.m. linear amplifier at the one kilowatt input level, a fully modulated 250 watts output may be obtained with only 1.25 watts of drive power.

Thus, in these classes of service, this compact "black box" is capable of better than 22 decibels power gain up to the maximum power level of 2700 p.e.p. on a continuous, 24 hour basis. Cost of all components is less than five hundred dollars, including the tube and socket, so on a

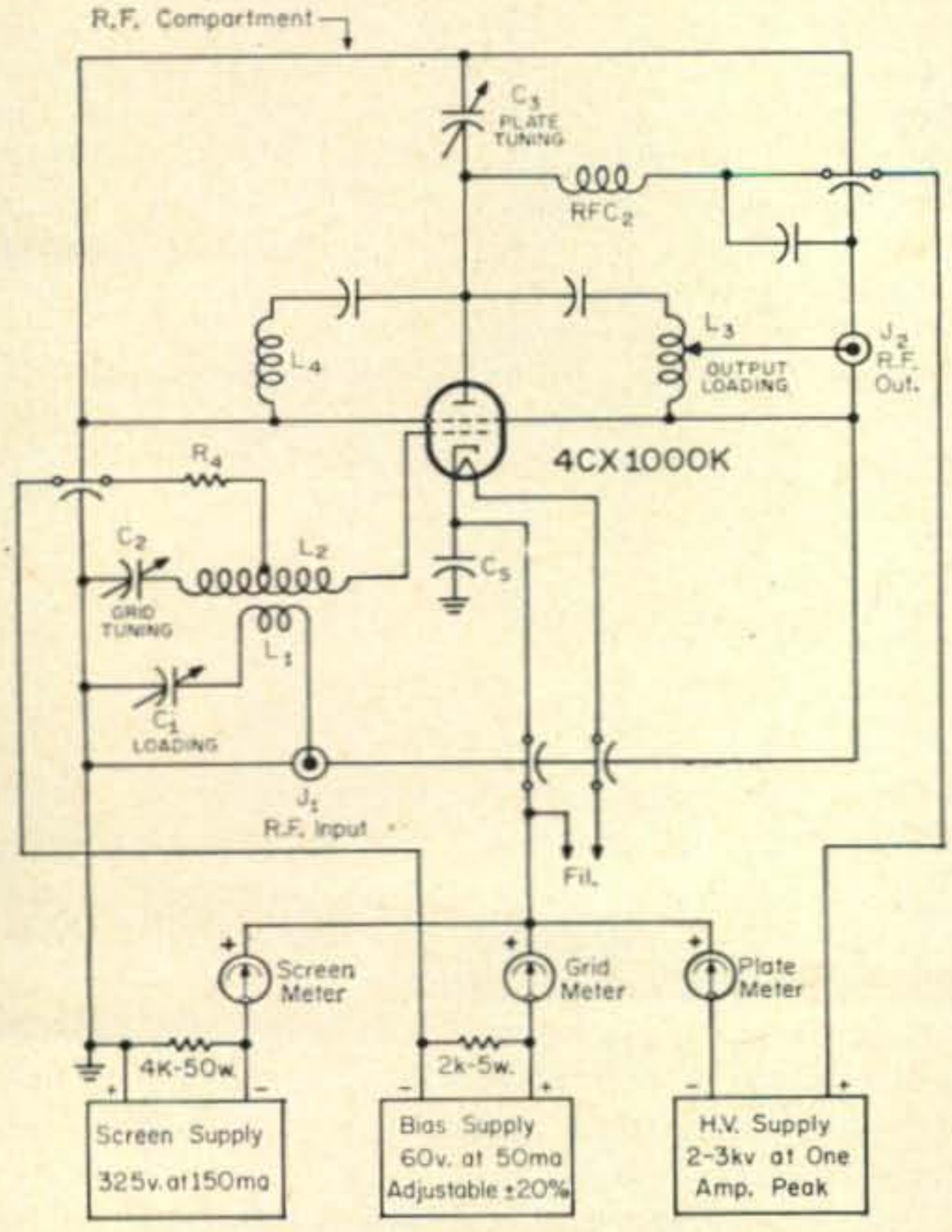


Fig. 7—Simplified schematic of 4CX1000K amplifier. The screen circuit of this v.h.f. amplifier is operated at d.c. and r.f. ground potential with bias and screen supplies placed "below chassis ground". The cathode capacitor (C_5) is an integral part of the Eimac SK-820 socket. Grid circuit components are placed in "r.f. tight" compartment and the special v.h.f. socket prevents intra-stage r.f. currents to flow between plate and grid circuits. The plate tank circuit (L_3, L_4) is a half-wave line with the 4CX1000K placed at the center. All power leads entering the compartments are suitably bypassed to keep the r.f. where it belongs.

Fig. 8—Front view of a compact two kilowatt p.e.p. linear amplifier for the v.h.f. man. This high power 144 mc linear is suitable for s.s.b., a.m., f.m. or c.w. operation, requiring less than 10 watts drive power to reach the maximum legal amateur power level. The amplifier is mounted behind a standard 12¼" relay rack panel. Across the top of the panel (l. to r.) are the plate, grid and screen milliameters, with the grid tuning capacitor (C_2) centered below. At lower left and right are the counter dials for the OUTPUT LOADING control and PLATE TUNING (C_3). Between the counter dials are the grid and screen meter reversing switches. The amplifier enclosure is spaced behind the panel by sections of rectangular aluminum rod and the 4CX1000K mounts in a horizontal position within the enclosure. At the right end of the enclosure are the ventilation holes above the anode of the tube.

watts-per-dollar basis, it is difficult to surpass the high power economy of this modern v.h.f. amplifier package.

Circuit Features

A simplified circuit diagram is shown in fig. 7. The 4CX1000K power tetrode is operated with the screen at d.c. and r.f. ground potential, with the positive terminal of the screen supply grounded and the screen and bias supplies placed "below chassis ground." This is done to eliminate the screen r.f. bypass capacitor in order to achieve maximum intra-stage isolation. Because of the excellent isolation between input and output circuits, neutralization is neither desired nor required.

The plate circuit is composed of a half-wave, shunt-fed, inductor (L_3, L_4) with the tube positioned at the center of the line. The r.f. output loading tap is placed on one segment of the line. Resonance is established at the operating frequency by plate tuning capacitor C_3, which is a simple two plate assembly with one plate mounted to the anode cooler of the tube.

Two ceramic transmitting capacitors in parallel are used as blocking capacitors for each segment of the plate line inductors. So-called "TV-type" ceramic capacitors should *not* be used, as the circulating tank current is of the order of 40 amperes at maximum power level, and a large portion of this r.f. current flows through the blocking capacitors. The TV capacitors are not rated for such severe operating conditions.

The loaded Q of the plate tank circuit is determined almost entirely by the ratio of plate load impedance to reactance of the output ca-

pacitance of the tube. This capacitance is a fixed value and the load impedance is determined by the operating conditions imposed by the tube. Loaded Q therefore is relatively inflexible, although higher than normally encountered at lower frequencies. Even so, good tank circuit efficiency can be readily obtained if the unloaded Q is sufficiently high. It is in this case, being approximately 1000. Unloaded circuit Q of this magnitude is difficult to achieve at lower frequencies as the unloaded Q of good coils usually falls below 400. The loaded Q in this instance must be of the order of 10 to 20 to achieve a reasonable degree of tank circuit efficiency.[4] One disadvantage of high tank circuit Q (usually demanded by high-C v.h.f. tubes) is that a corresponding high value of r.f. circulating current flows. (Restricted bandwidth could also be a disadvantage in some applications). Wide leads having low r.f. resistance are required to carry this current. Ordinary lead solder is *out* as its r.f. resistance is too high, and high temperature silver solder is used for connections in v.h.f. tank circuits operating at power levels in excess of a few hundred watts. Alternatively, the joints may be physically bolted together with brass bolts, provided the r.f. current does not pass through the body of the bolt.

The coaxial output receptacle, J_2, is a *Type N* fitting, with the flexible strap jumper from the moveable tap on inductor L_3 bolted to the center pin of the fitting. Appreciable current flows through the jumper and a soldered joint at the receptacle has sufficient r.f. resistance at 144 mc to run hot enough to melt the solder at full amplifier input. The older SO-239 style coaxial receptacle is *not* recommended at this point, as the matching PL-259 coaxial plug does not make adequate contact to the shield of the coaxial line, which is only soldered at four points within the plug.

The resonant grid circuit is a half-wave line (L_2), capacitance loaded at one end by grid tuning capacitor C_2 and at the opposite end by the input capacitance of the 4CX1000K. Bias is applied to the tube through the grid line, via isolating resistor R_4 placed at the minimum r.f. voltage point of the circuit. Use of a v.h.f. choke at this point instead of the isolating resistor resulted in a violent 10 mc parasitic oscillation which is entirely absent when the resistor is employed.

The point of minimum r.f. voltage is at the electrical center of the half-wave grid line which happens to fall very close to the socket terminals. The input capacitance of the 4CX1000K is approximately 80 mmf and a simple parallel resonant tank tends to "disappear within the tube" at 144 mc. A half-wave line made up of the tube capacitance and lead inductance permits sufficient tank circuit external to the tube to efficiently couple excitation to the tube. To satisfy this requirement, the grid line is made of copper strap and has an unloaded Q of about 300. Loaded Q is close to this figure as the grid circuit is swamped only by the circuit losses and input conductance of the 4CX1000K. Grid driving power is theoretically zero. In practice a few watts are required to develop the proper voltage at the grid of the tube because of the circuit losses.

Because of the high value of circuit Q and the appreciable capacitance of tuning capacitance C_2, grid circuit tuning is quite sharp and resonance must be reestablished for frequency excursions of more than a few hundred kilocycles.

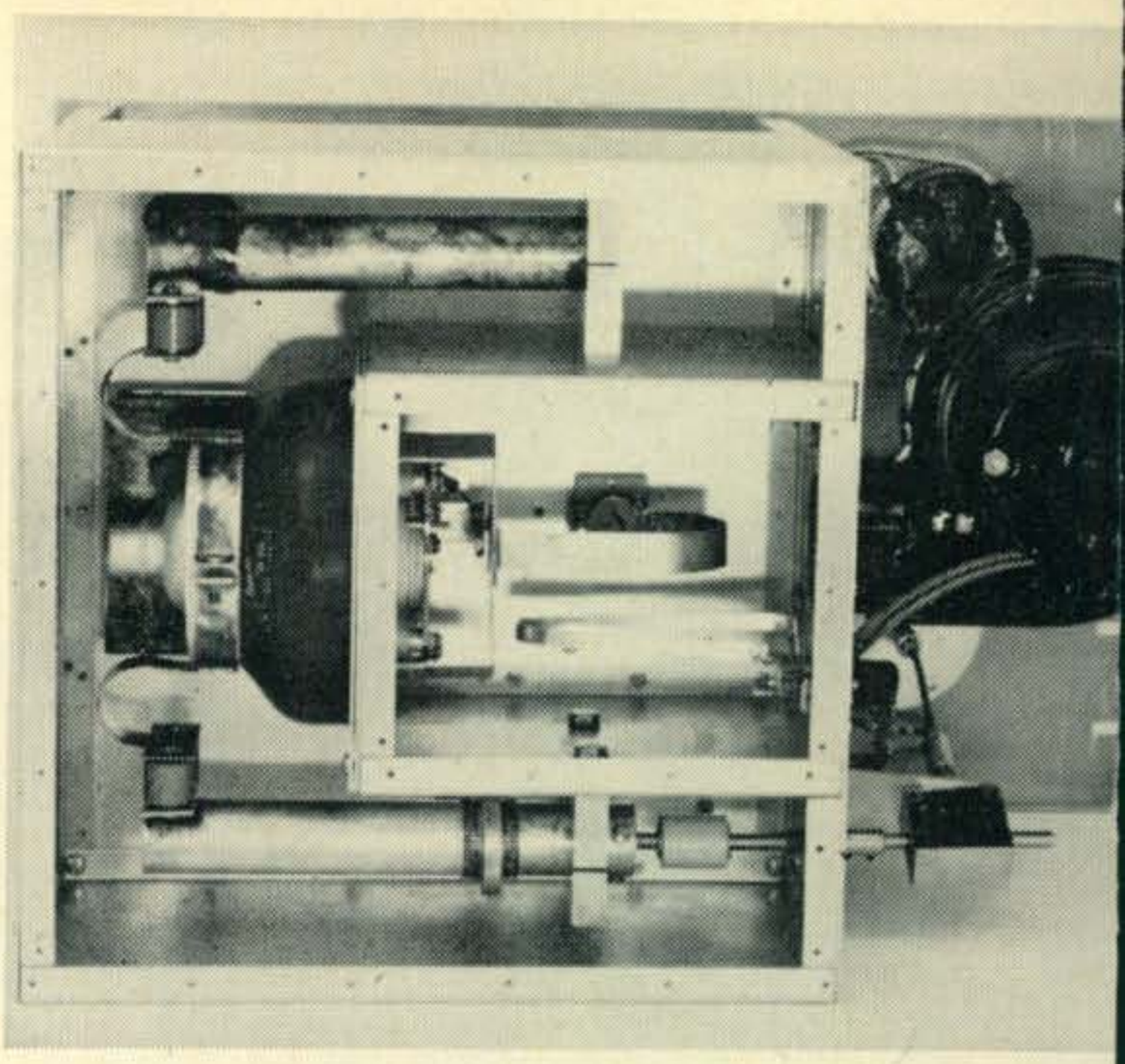


Fig. 9—Interior view of the amplifier enclosure with the rear plate removed. The enclosure normally mounted on its side, is shown in a vertical position. The 4CX1000K, air chimney, and special socket are placed atop the center of the grid compartment, with cooling air passing into the "bottom" of the compartment. The three grid terminals of the 4CX1000K socket are strapped together and the junction is bolted to the U-shaped grid inductor (L_2). The opposite end of L_2 terminates at the GRID TUNING capacitor, C_2, mounted to the front wall of the compartment. Below the grid assembly at one side is the input link (L_1) with LOADING CAPACITOR, C_1, mounted to the wall of the compartment. Mounting brackets for the two plate inductors are affixed to the outer side walls of the compartment. The squirrel-cage blower is mounted with a piece of screening across its mouth to restrict r.f. leakage through the vent opening. At the side of the blower is the right-angle drive and flexible shaft for the OUTPUT LOADING adjustment, visible on one anode inductor. The moveable tap is driven via a threaded rotary shaft integral to the plate line.[5]

Metering and Power Circuits

Separate d.c. milliammeters are used to mon-

[4]Tank circuit efficiency is defined as:

$$\text{Eff} = 100\,\frac{Q_u - Q_1}{Q_u}$$

Where Q_u is the unloaded Q, and Q_1 is the loaded Q.

[5]A set of blueprints is available at a cost of one dollar which covers, in detail, the various plate circuit components. Write: Amateur Service Dept., Eitel-McCullough, Inc., San Carlos, Calif.

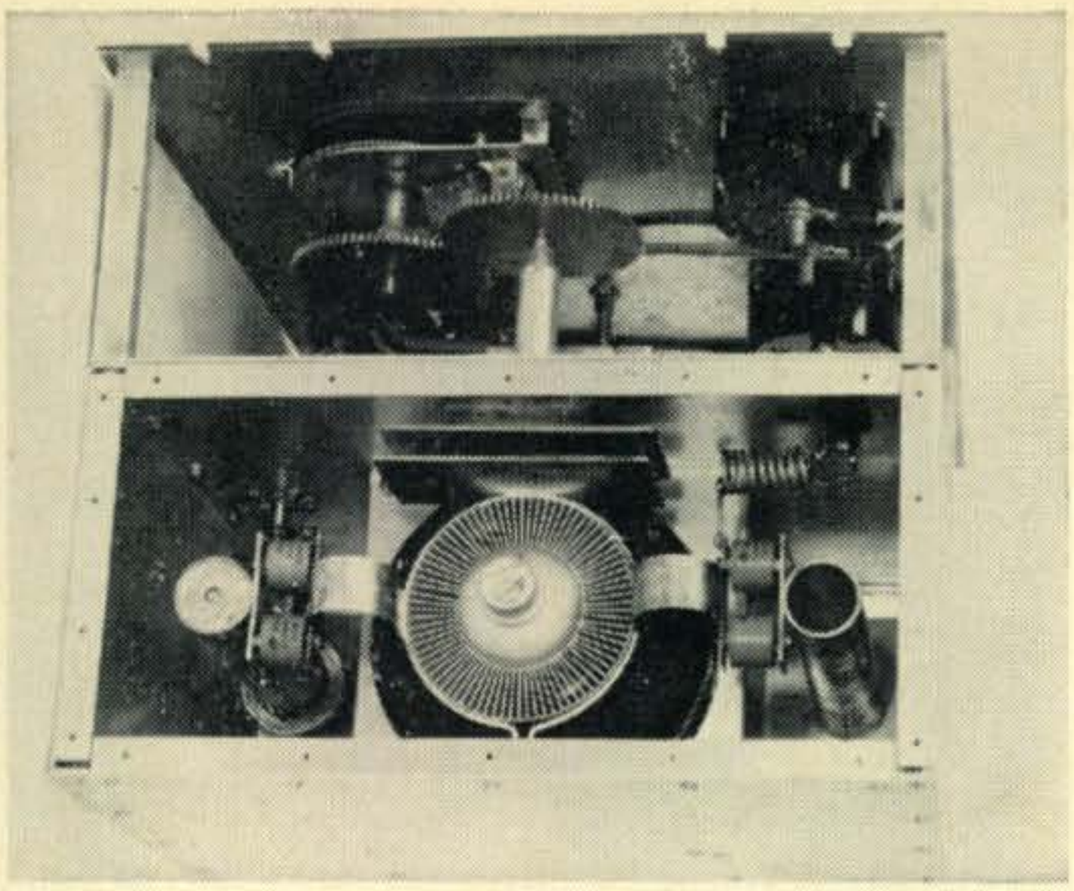


Fig. 10—View into top of plate circuit compartment with the perforated top removed. The PLATE TUNING capacitor (C_3) is immediately in front of the 4CX1000K, driven from the panel-mounted counter dial by two surplus gears. The moveable plate of the capacitor is grounded to the wall of the enclosure by a two-inch wide strap of flashing copper which flexes as the capacitor plate moves closer to the fixed anode plate. The dual plate blocking capacitors are mounted to the sides of the anode strap of the 4CX1000K, and visible at the right is the simple air-wound plate r.f. choke. The bearing of the rotary drive shaft for the OUTPUT LOADING tap is visible at the top of the left plate circuit inductor.

itor grid, screen and plate currents. Normal grid current of the 4CX1000K tetrode is zero in Class AB-1 service; however, small values of current flow during the tune-up process, and grid current excursions up to plus or minus 5 milliamperes may occur. In like fashion, screen current can be either positive or negative in value up to approximately 40 milliamperes or so. Negative current excursions are common in the grid and screen circuits of high gain tetrodes operating in the Class AB-1 mode. To accommodate positive and negative excursions of screen and grid current, zero center meters may be used or a polarity reversing switch can be employed with less expensive positive reading meters. The latter technique is used in this amplifier. Screen and grid metering are accomplished across shunt safety resistors, and rotary meter switches are used in lieu of toggle switches to insure low contact resistance. The safety resistors are placed across the switch arms rather than across the meters so that the circuits are not interrupted during the switching action.

Amplifier Cooling

The 4CX1000K tetrode installed in the SK-820 Air System socket requires an air blast of 25 cubic feet per minute for operation at maximum plate dissipation with inlet air temperatures up to 40 degrees Centigrade. This corresponds to a pressure difference of 0.2 inch of water column. A Dayton #1C-180 blower or Ripley #8472 blower will provide adequate cooling at this level of back pressure. The mouth of the blower is mounted to the under-chassis area as shown in the photograph and r.f. leakage through the blower air vent is prevented by covering the blower opening with a piece of screening. Cooling air passes from the blower into the grid compartment, through the honeycomb vents in the SK-820 air socket, and is conducted to the tube anode by means of a phenolic hood (Eimac SK-806) that slips over the top of the socket assembly. The air is exhausted from the plate circuit compartment through a perforated area in the enclosure located above the tube. The blower is energized as soon as filament voltage is applied to the tube.

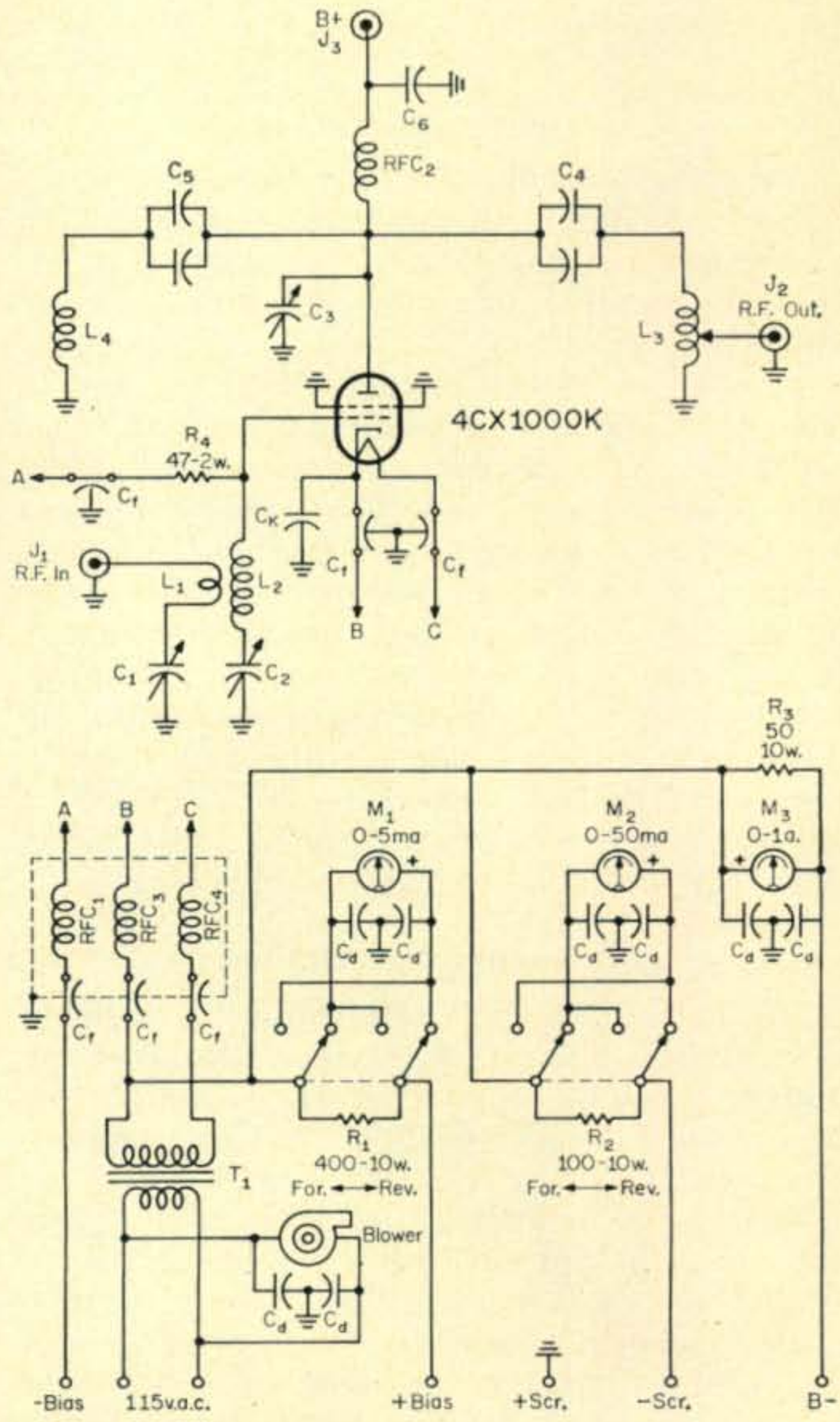


Fig. 11—Circuit of the 2 kw p.e.p. linear amplifier.
C_1—20 mmf, Hammarlund HF-20 or equiv.
C_2—15 mmf, Hammarlund HF-15X or equiv.
C_3—Approx. 3.5 mmf Plate size 2¼" × 4", spaced about ⅜". See text.
C_4—C_5: Each two 100 mmf, 5kv in parallel. Centralab 850S-100 or equiv.
C_6—1000 mmf, 5kv. Centralab 858S-1000 or equiv.
C_d—1000 mmf disc ceramic, 1.6 kv.
C_f—1500 mmf ceramic feedthru. Erie 327-X5U-152M or equiv.
BL_1—25 cubic feet/min. at 0.2" pressure. Dayton #1C-180 or equiv.
RFC_1—1.8 microhenries, Ohmite Z-144 or equiv.
RFC_2, RFC_3, RFC_4—9 t. #12, ½" dia., 1¼" long.
T_1—6.0 volts at 13 amperes. Stancor P-6463 or equiv.
J_1—Receptacle, BNC (UG-1094/U).
J_2—Receptacle, right angle, type N (UG-997A/U).
J_3—High voltage receptacle, Millen 37001 or equiv.
S_1, S_2—D.p.d.t. rotary switch, Centralab 1464 or equiv.

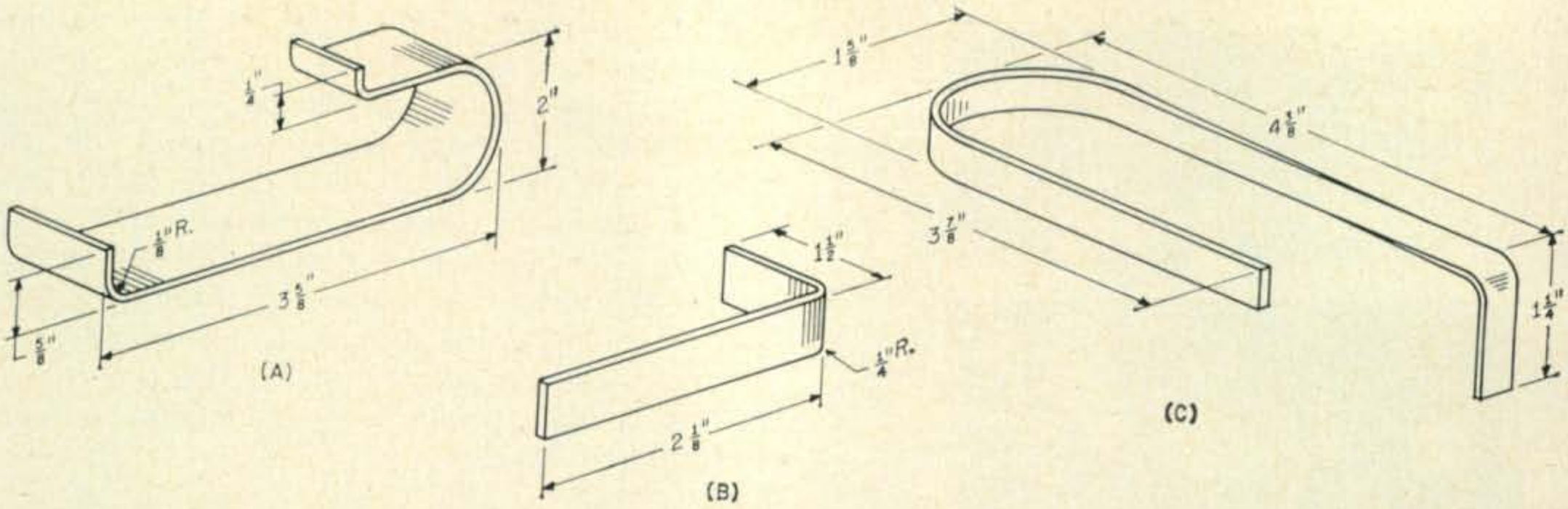


Fig. 12—Structural details for the grid circuit components. (A)—L_2, 5/8" strap, 0.032 material formed to dimensions shown. (B)—Grid connecting strap 5/8" wide, 0.064 material, 3 required. (C)—Input link, L_1, 1/4" strap, 0.032 material.

Amplifier Enclosure

The amplifier mounts behind a standard 12¼" relay rack panel, with the 4CX1000K placed in a horizontal position behind the panel (fig. 9). The r.f. enclosure measures 12 inches square and is 6 inches deep. This aluminum enclosure is spaced 4½ inches behind the panel, and in this panel space are located the various meter switches, the meters and counter dials, the filament transformer and a small aluminum box containing the filament and grid isolation networks. The SK-820 air socket is mounted atop the grid compartment box which measures 6 inches wide, 7 inches high and 6 inches deep. The front and back panels of the amplifier enclosure also form the panels of the grid compartment box. As the enclosures are not standard size items, they were made up of 0.062 inches aluminum sheet, formed into simple panels.

Plate Circuit Assembly

The half-wave plate inductor is made up of two 7½ inch lengths of 1⅛ inch outside diameter copper water pipe (fig. 9). The pipes are clamped to the outer walls of the grid compartment box by means of heavy dural blocks, as shown in the photographs. A special sliding fitting is required on one plate line to allow adjustment of antenna coupling. This fitting consists of a copper ring which slides over the pipe and makes contact to the pipe by virtue of a circular section of flexible "finger stock" which is soldered to the inner circumference of the ring. The ring is driven along the length of the pipe by means of a threaded brass rod internal to the pipe, which is controlled from the front panel through an insulated coupling, a right-angle gear drive and a length of flexible shaft.[5]

The anode collar assembly is shown in fig. 13. It is made up of a circle of ¾-inch wide copper strap to which "ears" have been silver soldered. The ears form mounting brackets for the twin plate blocking capacitors. The stator plate of the variable tuning capacitor (C_3) is also silver soldered to this assembly.

The moveable plate of the tuning capacitor is panel driven by means of a simple bearing that translates rotary motion into thrust (fig. 10). The capacitor plate is prevented from turning by a wide ground strap as shown in fig. 10. To preserve panel symmetry, the capacitor is driven off-center from the counter dial by a set of surplus gears.

Grid Circuit Assembly

Three grid terminals are provided on the SK-820 socket and these are connected in parallel by ½ inch wide lengths of ⅝ inch wide copper strap silver soldered to the projecting socket terminals. The junction of the three straps is bolted to the grid inductor (L_2), which consists of a single length of copper strap bent into a hairpin which terminates at the stator lugs of the grid tuning capacitor, C_{12}. The composition isolating resistor R_4 is attached to the junction of the straps which is close to the point of minimum r.f. voltage in the grid circuit.

The input coupling loop (L_1) is about an inch away from the grid inductor and consists of a section of ¼ inch copper strap formed in a hairpin and connected between the input coaxial receptable (J_1) and the loading capacitor, C_1. Aside from the isolating resistor and the two tuned circuits, no other components are mounted within the grid circuit enclosure. Filament and bias leads exit via feedthrough capacitors into a small aluminum box which houses simple r.f. decoupling networks. With a stage gain of over 20 decibels, it is important that no

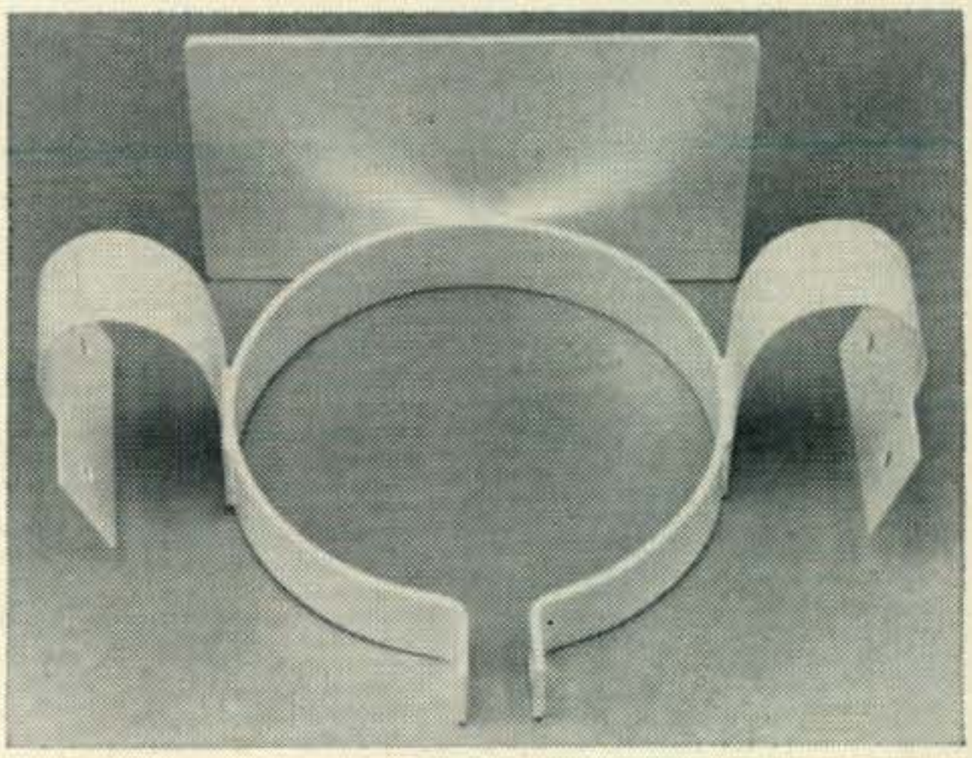


Fig. 13—Anode collar assembly. The anode assembly of the 4CX1000K is made of copper, silver soldered and silver plated. The circular strap encircles the anode cooler of the 4CX1000K and supports one plate of tuning capacitor C_3 and two "ears" which attach to the dual plate blocking capacitors. The capacitor plate measures 2¼" × 4".

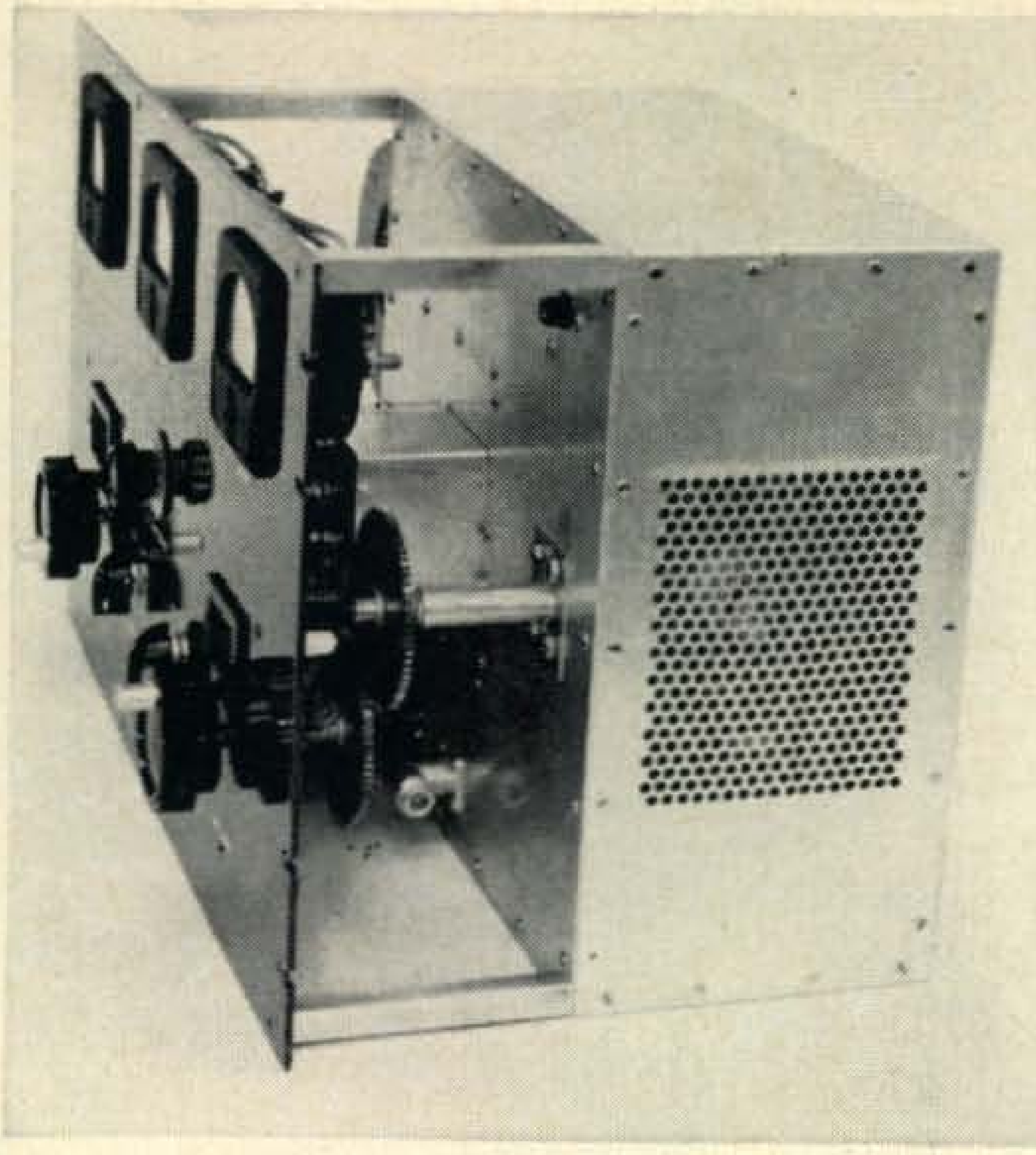


Fig. 14—Oblique view of the v.h.f. amplifier. The r.f. input fitting (J_1), plate circuit gears, and compartment for the power lead filters may be seen in this view. The B plus high voltage connector is located at the top of the enclosure. All meter leads are run in shielded wire, with the shields grounded at each end of the lead and the inner conductor bypassed to the shield with small disc ceramic capacitors at the meter terminals. The end of the plate compartment is perforated to allow exit of cooling air.

r.f. energy be permitted to leak into the grid enclosure. The air inlet at the base of the grid enclosure is covered with screening to reduce r.f. coupling through this opening. In addition, all power leads external to the enclosure are run in shielded braid which is grounded and bypassed at both ends of the lead.

Metering Circuits

Screen, grid and plate circuits are monitored separately by three panel meters. It is useful to observe the ratio of these currents during the tuning process and proper loading can readily be achieved when the operator has sufficient information to adjust the ratio of grid drive to plate impedance. Polarity reversing switches are incorporated in the grid and screen circuits in order to note negative currents often encountered when tetrodes are operated in the v.h.f. region. Meter circuits are returned to a common cathode point, as shown in fig. 7. The complete metering circuitry is shown in the general schematic, fig. 11.

Plate current is measured in the cathode return circuit to the high voltage power supply. It is necessary, therefore, that the negative terminal of the supply be isolated from ground. Both terminals of the bias supply are isolated from ground as is the negative terminal of the screen supply. The bias supply, in addition, is "hot" to ground.

Power Supplies

As is common with all power tetrodes the screen power supply of the 4CX1000K should be well regulated and the supply "bled" to 70 milliamperes or so. Dangerously high plate currents may flow if the screen power supply exhibits a rising voltage characteristic with negative values of screen current.

Voltage stabilization may be accomplished in several ways: a suitable bleeder resistor may be connected across the screen supply or an electronically regulated supply may be used. It is essential to use a bleeder if a *series* regulated supply is used, as such a supply exhibits a high input impedance to negative current. A well regulated, choke input supply capable of 150 milliamperes current capacity and bled to 70 ma is probably the best compromise solution.

The rated heater voltage for the 4CX1000K is 6.0 volts (*not* 6.3 volts). Tolerance is plus or minus 5%, but for longest tube life, the voltage should be held between 5.8 and 6.0 volts. The cathode and one side of the heater are internally connected. Heater voltage and blower should be turned on for three minutes before other operating voltages are applied.

Amplifier Tuning and Adjustment

For initial adjustment, a kilowatt dummy load is connected to the amplifier; bias voltage is applied first and set to approximately —60 volts.

[*Continued on page 92*]

Mode (Class)	Plate Volts	Plate Current (ma)	Plate Input (watts)	Peak Drive Pwr-watts	Power Output (watts)	Max. Grid Current	Max. Screen Current	Grid Bias* (Approx)
AB^1 (s.s.b.)	2000	883	1766	4.5	915	0	20	−53
AB^1 (s.s.b.)	2500	800	2000	4.4	1165	0	21	−55
AB^1 (s.s.b.)	3000	666	2000	6.3	1200	0	18	−56
AB^1 (a.m.)	2500	400	1000	1.2	250	−0.3	−29	−57
B (c.w.)	2500	400	1000	5.2	625	−2.5	21	−80

*Adjust bias for: Resting plate current of 250 ma for Class AB^1.
—Resting plate current of 1 ma for Class B.
—Resting plate current of 200 ma for a.m. linear service.

Fig. 15—Amplifier operating characteristics for the 4CX1000K.

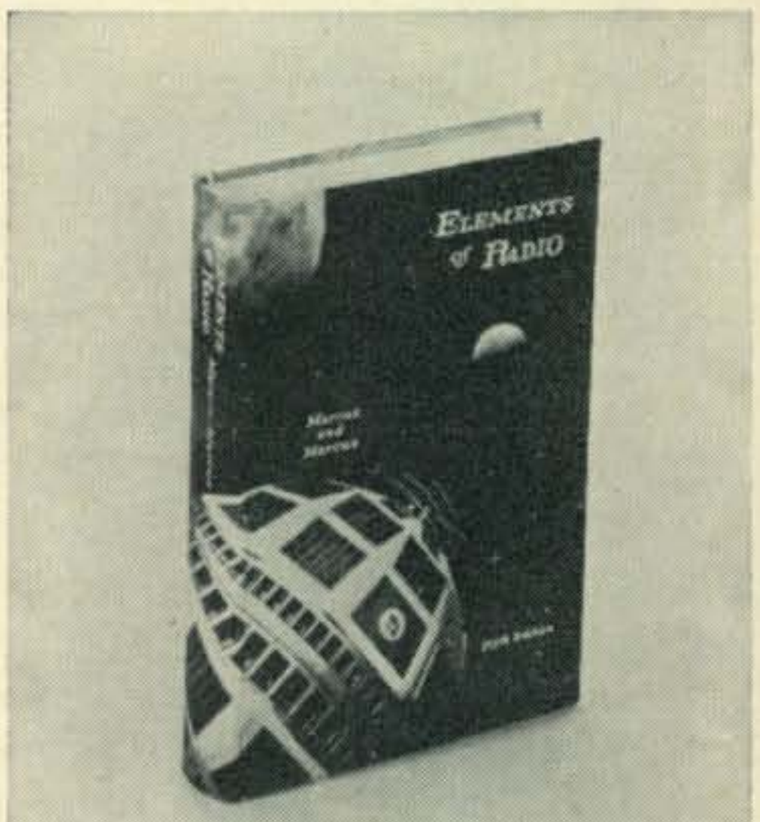
New Amateur Products

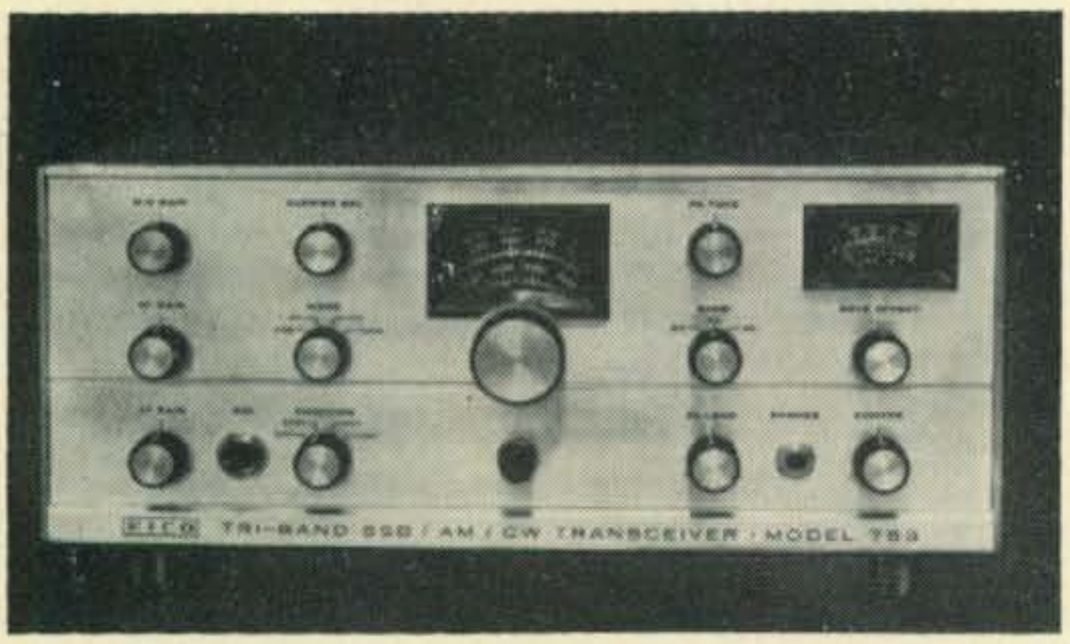
Heath SB-110

THE SB-110 is a 180 watt p.e.p. s.s.b. six meter transceiver. It features upper and lower s.s.b. and c.w. operation with p.t.t., v.o.x., and v.o.x. operated c.w. The SB-110 can be operated either v.f.o. transceive; crystal-control transmit, v.f.o. receive; or crystal-control transceive. Frequency stability is less than 100 cps drift per hour after 20 minute warmup. The SB-110 kit weighs 23 lbs. and sells for $320.00. Power supply not included. For complete specifications and details write to Heath Company, Benton Harbor, Michigan, 49023, or circle 69 on page 106.

"Elements of Radio"

PRENTICE-HALL, INC., New Jersey publishers have recently brought out the new fifth edition of "Elements of Radio" by Marcus and Marcus. Many will recall using this book when first starting out. Through 43 chapters and 672 well-illustrated pages the fundamentals of electronics are brought forth and made clear to both the beginner and more advanced student. It is a worthwhile Xmas gift and invaluable addition to any ham library. The price is $8.50 at most bookstores. For more information write Prentice-Hall, Inc., Englewood Cliffs, N.J. or circle 70 on page 106.



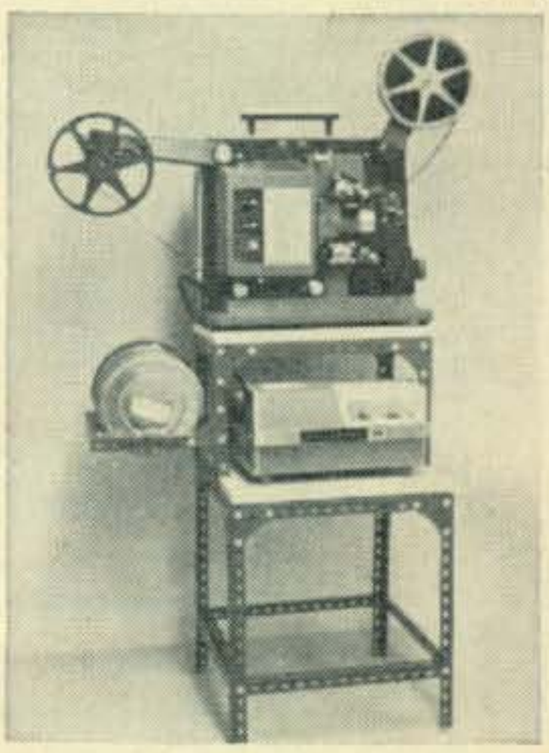


EICO 753 Tri-Band Transceiver

THE EICO 753 covers 20-40-80 meter s.s.b., a.m., and c.w. Input power is 200 watts on s.s.b. and a.m. and 180 watts on c.w. with 110 watts output. Claimed receiver sensitivity is better than one microvolt for 10 db signal to noise ratio. It comes in kit form for $179.95 and wired at $299.95, less power supplies and speaker. For more information write to Eico, 131-01 39th Ave., Flushing, New York, 11352, or circle 71 on page 106.

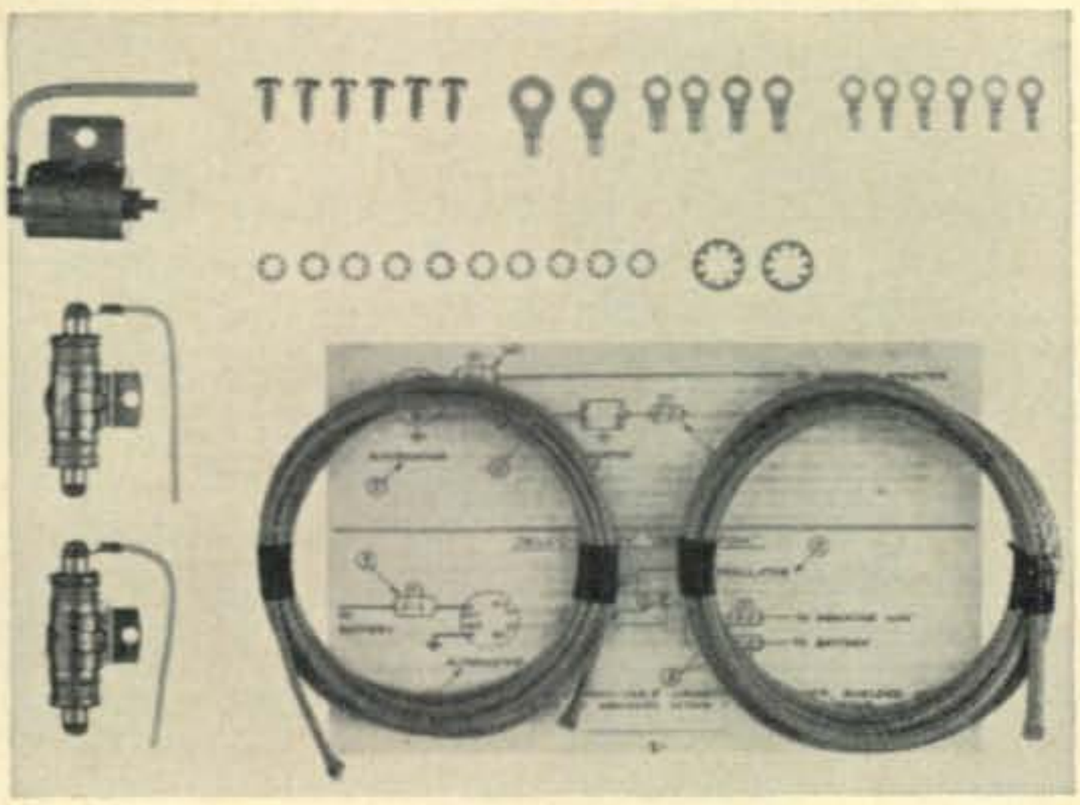
Dexion Do-It-Yourself Steel Angle

RESEMBLING a huge erector set, the Dexion slotted angle components are available from local hardware and lumber yards. With an ordinary wrench and hacksaw and using just nuts and bolts, numerous items can be made for the shack and workshop. Workbench frames, storage shelves, book shelves, operating tables, racks, and other useful things can be made. Dexion is available in two sizes. The standard angle, packaged in bundles of 50 ft., is priced at $10.50 per package. The heavy duty size is $12.75. Each package contains 75 nuts and bolts and 20 corner (support) plates. "Idea" pamphlets are offered free with other information by writing to Dexion, Inc. Retail Division, 39-27 59th St., Woodside, New York 11377, or circle 72 on page 106.



Hallicrafters SR-500 Transceiver

THE SR-500 is a three band (80, 40, and 20) 500 watt p.e.p., s.s.b. and c.w. transceiver. Called the "Tornado," the unit features amplified automatic level control (AALC) and receiver incremental tuning (RIT) which allows the operator to tune the receiver up to 3 kc to either side of the transmitter frequency. The SR-500 sells for $395.00. Optional equipment includes mobile mounting bracket, a.c. supply, d.c. supply, and v.o.x. adaptor. For further details write to Hallicrafters, 5 Kestner Ave., Chicago, Ill., or circle 73 on page 106.



Estes Engineering Company

INTRODUCTION of the Electro-Shield Alternator Kit is announced by Estes Engineering Company. The kit is designed to eliminate interference from alternator and d.c. generator circuits, permitting long range noise-free operation of all two-way radio systems. It can be used on both gasoline and diesel engines.

The Electro-Shield Alternator Kit includes shielded cables for radiated noise, and 50 amp filters for conducted noise. Circuit diagrams for all popular battery charging circuits are provided. For further details write to Estes Engineering Company, 1639 West 135th St., Gardena, California, 90249, or circle 74 on page 106.

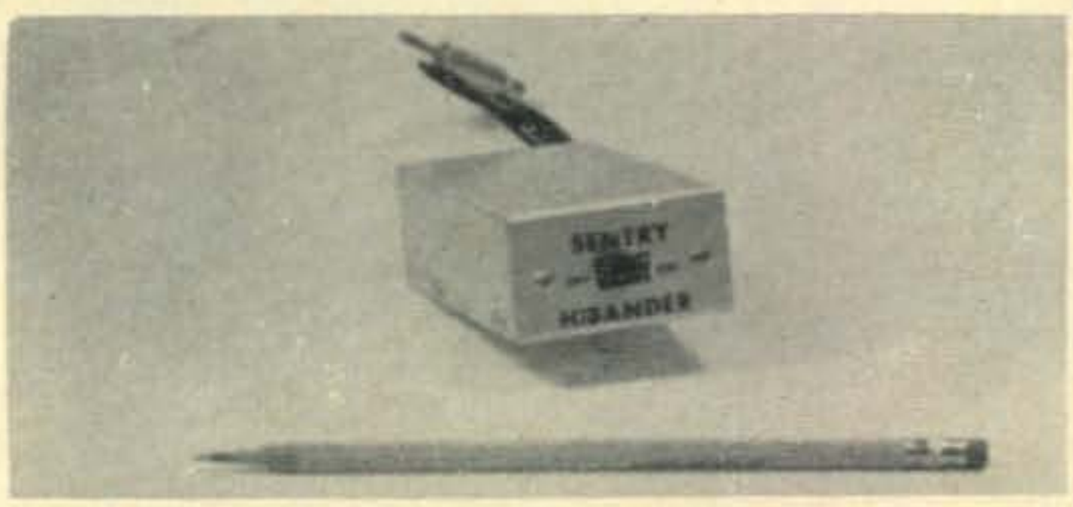
Lafayette HA-650 6 Meter Transceiver

THE model HA-650 is a solid state 6 meter transceiver with 2.5 watt input and 1.5 watt output. It has a push pull modulator, 6 crystal controlled transmit positions and uses standard 8 mc crystals. The receiver is tunable and has a claimed sensitivity of 1.2 uv. A built in mobile power supply (Zener diode), carrying case, shoulder strap, telescoping whip antenna, and batteries are supplied. Fixed station a.c. supply is optional. The price is $119.95. For more details write to Lafayette Radio, 111 Jericho Turnpike, Syosset, L.I., N.Y. or circle 75 on page 106.

Knight-Kit C-577

THE C-577 is a fully transistorized audio compressor/preamplifier (not a clipper) kit. It serves as a low level preamp for both low and high impedance mikes with minimum distortion and 26 db gain at 1 kc. It has full compression at 3 millivolts input, with an output of 50 millivolts. The kit is priced at $19.95 and is Allied catalog number 83U816MW. For complete specs, write to Allied Radio, 100 N. Western Ave., Chicago, Ill., or circle 76 on page 106.

Sentry Converters



THE Sentry converter permits the business man or enthusiast to monitor any single frequency between 25 mc and 180 mc, f.m. or a.m. Single switch operation changes normal tuning range and converter. Operated from self contained 9 volt battery. Price is $37.50. For further literature write to Sentry Manufacturing Co., P.O. Box 12322, Oklahoma City, Okla., or circle 77 on page 106.

אוסקר III*

"Bruno Puts Israel Into Space"

BY URI BERNEAH†, 4X4OC/W6

So reads the headline from the daily newspaper *Ma-Ariv* of Israel, announcing a reported record-breaking QSO between Asia and Europe via OSCAR III satellite. The 950 mile contact was made between 4X4DH, Bruno Bienefeld of Tel-Aviv and LZ1AG of Sofia, Bulgaria. The article reads, in part . . .

"Bruno Bienefeld an engineer from Tel Aviv operates an amateur satellite tracking station in his home and is in communication with other amateur stations around the world.

"While people around the world are wondering about the practical role of the satellites which will eventually bring man to the moon, another kind of satellite orbits the globe. These are the communication satellites used to relay radio, telephone and TV transmissions and in the next few years many "comsats" of this type will be placed in space forming a network which will cover the whole world. The space communication era has begun, but though many "comsats" orbit the globe, there has been no tracking station in the area between the Pacific and the Mediterranean. A pioneer in this field is Bruno Bienefeld, an electrical engineer from Tel Aviv. In his home he operates a private satellite tracking station. With his amateur station he has managed to contact other such tracking stations around the world, and that's how he "put Israel into space".

"How did the radio amateur satellites get into orbit? Even though there are many radio amateurs around the world, they can't build vehicles or boosters to put satellites into orbit. The OSCAR society got in touch with a U.S. missile agency and asked for permission to hitchhike a satellite on one of the boosters. The agency agreed, and three years ago OSCAR I was sent into space.

"The OSCAR satellite was orbited and sent a signal in morse code which meant laughter (HI). Probably the only man in the middle east who heard that "laughter" of OSCAR was Bruno, an enthusiastic radio amateur who looked for new means of communication through space. He managed to receive the OSCAR transmissions which contained telemetry information about the height, speed and many other details, and Bruno's tracking station proved itself.

"Since then, says Bruno, two more satellites were sent up and the telemetric information was received by me". OSCAR III was sent up in March of this year and through Bruno's station, contact was actually established with the European continent." The radio amateur and the satellite will have in the future a very important role in human communication. They are the bridge over all continents," Bruno explains.

"Bruno is a graduate electrical engineer from the *Technion* where he worked for 5 years in cosmic ray research. For 6 years he worked in the Weizman Institution in development of instruments for magnetic field detection. Later, he devoted himself to radio and when the first satellites circled the globe, he tracked and observed them. When Oscar III orbited the earth, he used his amateur station 4X4DH to communicate through OSCAR III to LZ1AG, a radio amateur in Bulgaria. His name was Stanislav, and he and Bruno met each other for the first time through space." ■


ברונו „הכניס את ישראל לחלל"

האינג'ינר תל־אביבי ביענפלד מפעיל בביתו תחנת־מעקב על לווינים וכונן קשר עם תחנות אחרות בעולם

Oscar makes front page news recently in the Israeli newspaper *Ma-Ariv*. The article reports the successful Oscar III QSO between 4X4DH and LZ1AG.

*OSCAR III (Hebrew).
†Project Oscar, Inc., Foothill College, Los Altos Hills, Calif.

The Transcom SBT-3, Three-band Transistorized s.s.b. Transceiver. The thumb-operated controls, described in the text, are the four horizontal elements on the dark panel near the lower center. The one for p.a. loading is between the upper and lower knobs at the right.

CQ Reviews:

The Transcom SBT-3 Transceiver

BY WILFRED M. SCHERER,* W2AEF

A PET peeve of ours is that most of the ham gear designed for mobile operation is just too large to make a neat installation without overcrowding the front quarters of the car or taking up too much leg space, while at the same time allowing accessibility for convenient handling. It was therefore pleasing to find the Transcom SBT-3 three-band s.s.b. transceiver a nicely styled package which takes up only a quarter cubic foot of space, with good performance and economical operation.

Although designed for mobile work, it is also a neat and handy unit for portable, field or fixed station use with many unusual design features included.

The SBT-3 operates at a power input of 165 watts p.e.p. to deliver a p.e.p. output of 90-100 watts; while the receiver has a sensitivity of 0.5 μv for 10 db S/N ratio. A crystal lattice filter is used in both the receiver and the transmitter for 3 kc selectivity.

Economical mobile operation is obtained by use of transistors throughout, except in the final amplifier where instant-heating type tubes are used (these are the *only* tubes used), the filaments of which are not energized until the mic p.t.t. button is pressed to transmit. Battery drain is thereby held down to a minimum during receiving periods (only 500 ma) and instant receiver/transmit operation is made possible.

Other features of the SBT-3 are: frequency coverage of 3.8-4.0 and 7.2-7.3 mc on lower sideband and 14.2-14.35 mc on upper sideband; frequency stability of 100 c.p.s. or better over any 10-minute period after warmup; fine vernier tuning with one knob revolution covering 5 kc or less; 5 kc dial calibrations; easily adjusted controls using knurled thumb-wheels; carrier and sideband suppression of 45 and 40 db below maximum output respectively; adjustable pi-network for 30-100 ohm output loads; r.f. compression on transmit; push-to-talk operation; receiver bandwidth of 3 kc at 6 db points; image rejection better than 60 db; 2 watts a.f. output; a.g.c.; a.f. response of 400-2500 c.p.s. ± 3 db in both receive and transmit. Size is 4⅜" × 11⅜" × 8¾" (H.W.D.) and weight is 10 pounds. Separate external power supplies are required for either 12 v.d.c. or 117 v.a.c. operation. A loudspeaker is built into the a.c. supply. Current drain with 12 v.d.c. is 500 ma on receive, 12-15 a. on transmit.

*Technical Director, *CQ*.

Circuitry

A number of interesting innovations are included in the SBT-3. The lineup is shown in the block diagram at fig. 1. Starting with the transmitter section, the basic concept is that of generating the s.s.b. signal at 5173.5 kc and heterodyning this with a variable frequency to produce output in the desired amateur band.

The b.f.o. carrier generator feeds a ring-type balanced modulator to which the a.f. from the speech amplifier is fed from a signal splitter, Q_3. See fig. 2. The s.s.b. output from the modulator then goes through a four-crystal lattice filter, the 2nd and 3rd i.f. stages and thence to the transmitter mixer where the heterodyning takes place with the v.f.o. signals.

For 80 and 20 meter use, the v.f.o. frequency is 4486.25-4586.25 kc. This is doubled to 8973.5-9173.5 kc in the multiplier, Q_{14}, before going to the transmitter mixer. A 13 mc trap eliminates the 3rd harmonic of the v.f.o. when the 20-meter band is in use. On 40 the v.f.o. functions on 4124.5-4158.5 kc which is tripled to 12373.5-12473.5 kc by the multiplier.

Unlike other solid-state gear we've seen so

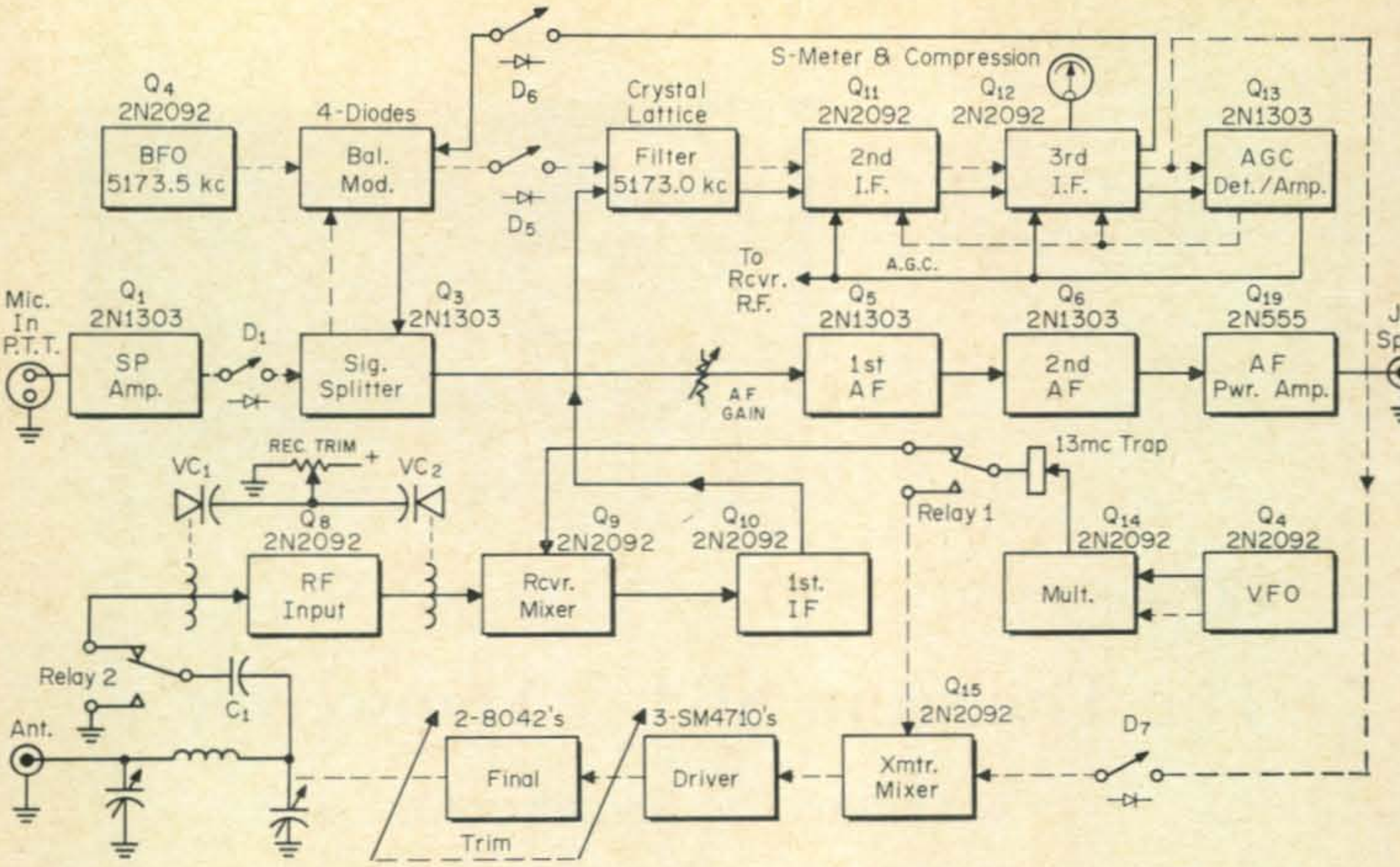


Fig. 1—Block diagram of the Transcom SBT-3 Transceiver.

far, the r.f. driver stage, which follows the mixer, also employs transistors instead of vacuum tubes. Three Motorola SM-4710's are used in a unique circuit wherein the transistors are connected in a cascaded arrangement to provide the required driving voltage for the final p.a. See fig. 3. Excellent stability is exhibited; so much so, that a novel space-saving and inexpensive system can be used that allows gang tuning of the input and output circuits of the driver using a butterfly-type capacitor with one of its stators connected to the input circuit, the other to the output.

The p.a. has two Amperex type 8042 instant-heating tetrode tubes connected in parallel with neutralization and a pi-network output circuit. A toroid-wound tank coil is employed which not only saves space and is highly efficient, but which also minimizes stray r.f. fields around the tank and thus further contributes to the overall stability of the unit.

Separate variable capacitors are used for p.a. tuning and loading in the pi-network. An unusual departure here is that the loading capacitor is a compression-type trimmer which is mounted at the rear of the panel with its adjusting screw in a vertical plane and parallel to the panel. The screw is connected to a metal thumb wheel that protrudes through a horizontal slot in the panel.

Receiver Section

In the receiver the frequency conversions work in reverse order; that is, the incoming signals beat with the v.f.o. signals to produce a 5173.5 kc i.f.

The r.f. stage has a 2N2092 operating as a ground-base amplifier with its collector fed to the base of a 2N2092 mixer through an impedance-matched transformer. The input signal is obtained from the plate side of the p.a. tank through a small capacitor coupled to a tuned circuit at the emitter of the r.f. transistor, Q_8. Thus there is a double-tuned input arrangement for improved r.f. selectivity.

Varicap diodes (voltage-controlled solid-state variable capacitors) are used instead of the conventional variable capacitors for tuning the input and output circuits of the r.f. stage. Both Varicaps are "gang tuned" with a potentiometer turned by a thumb-wheel on the panel.

The signal from the r.f. stage goes to the base of the mixer and the heterodyning signal from the v.f.o. is injected at the emitter. The resulting i.f. signal goes to the 1st i.f. amplifier, the 5173.5 kc filter, the 2nd and 3rd i.f.'s and then to the balanced modulator which now functions

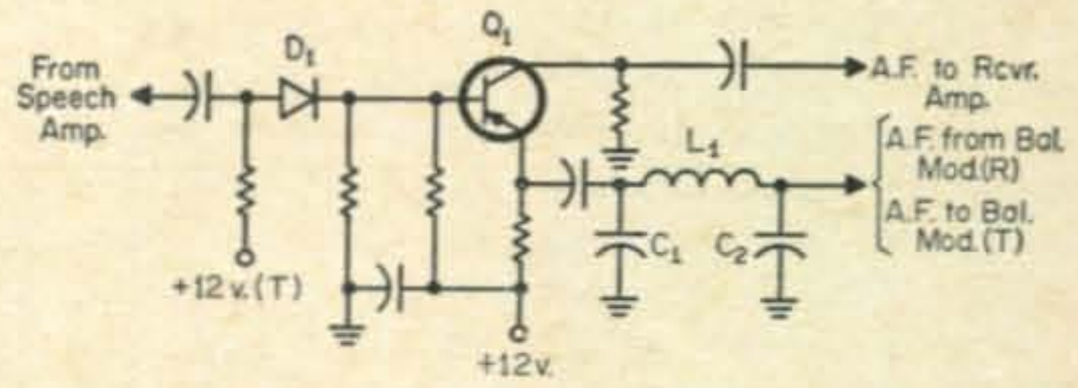


Fig. 2—Signal-splitter circuit used in the SBT-3. It is a bilateral affair through which the a.f. circuits in and out of the balanced modulator are routed and impedance matched. On receive, the a.f. output from the balanced modulator goes to the emitter of Q_1, the collector of which feeds the receiver a.f. amplifier. On transmit, a.f. from the speech amplifier goes to the base of Q_1 via diode switch D_1 and is applied to the modulator from Q_1's emitter. The emitter impedance matches that of the modulator. L_1, C_1 and C_2 constitute an r.f. filter.

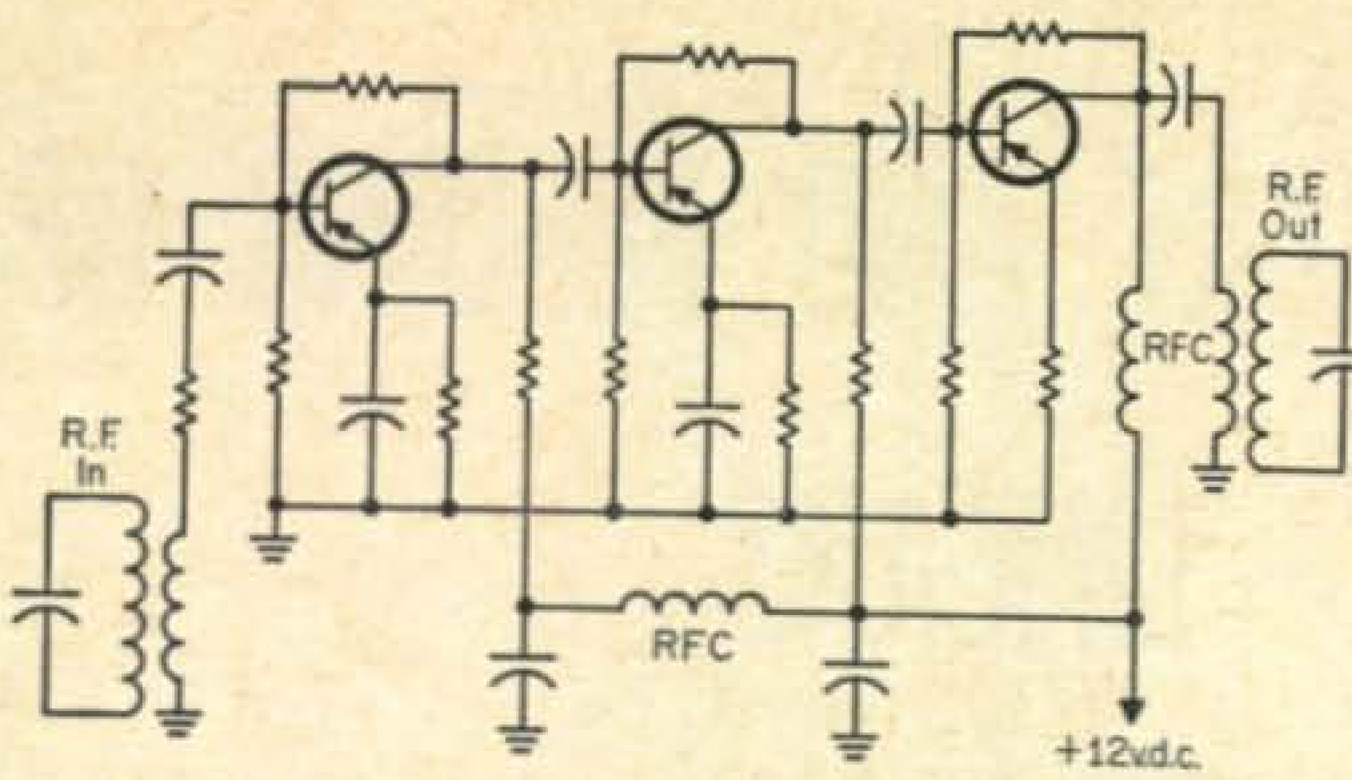


Fig. 3—Circuitry for the driver in the SBT-3. Three transistors are connected in cascade with a configuration which, except for the r.f. chokes and the tuned input and output circuits, is like that of a conventional a.f. amplifier.

as the product detector. See fig. 4.

We were particularly impressed to see this arrangement used, since for many years we've found it a superior method of product detection in our homebuilt gear; and especially since we've run across quite a lot of manufactured gear where the so-called product detector was not acting solely as such, but which at the same time exhibited a considerable degree of envelope detection, resulting in undesirable distortion products.

The a.f. output from the balanced modulator goes to the signal splitter and then to the a.f. amplifier chain consisting of two stages followed by an a.f. power-output amplifier.

A.g.c. is obtained from the a.g.c. detector/amplifier, Q_{13}, which is coupled to the last i.f. A.g.c. voltage is applied to the base of the r.f. stage and the last two i.f.'s. The a.g.c. also acts on the i.f.'s during transmit to provide low-level r.f. compression, a system that does not depend on *any* final p.a. grid current to produce an a.l.c. voltage.

The S-meter responds to variations in the voltage drop across the emitter resistor of Q_{12}. It also serves as a compression indicator on transmit. When the tuneup position of the SBT-3 is used, the meter is automatically switched to read the plate and screen currents of the p.a. tubes.

Switching

Diode switches are used to transfer the low-level signal circuits from receive to transmit.[1] Two conventional relays are used elsewhere. One switches the v.f.o. multiplier output to the receiver or to the transmitter mixer. It also switches

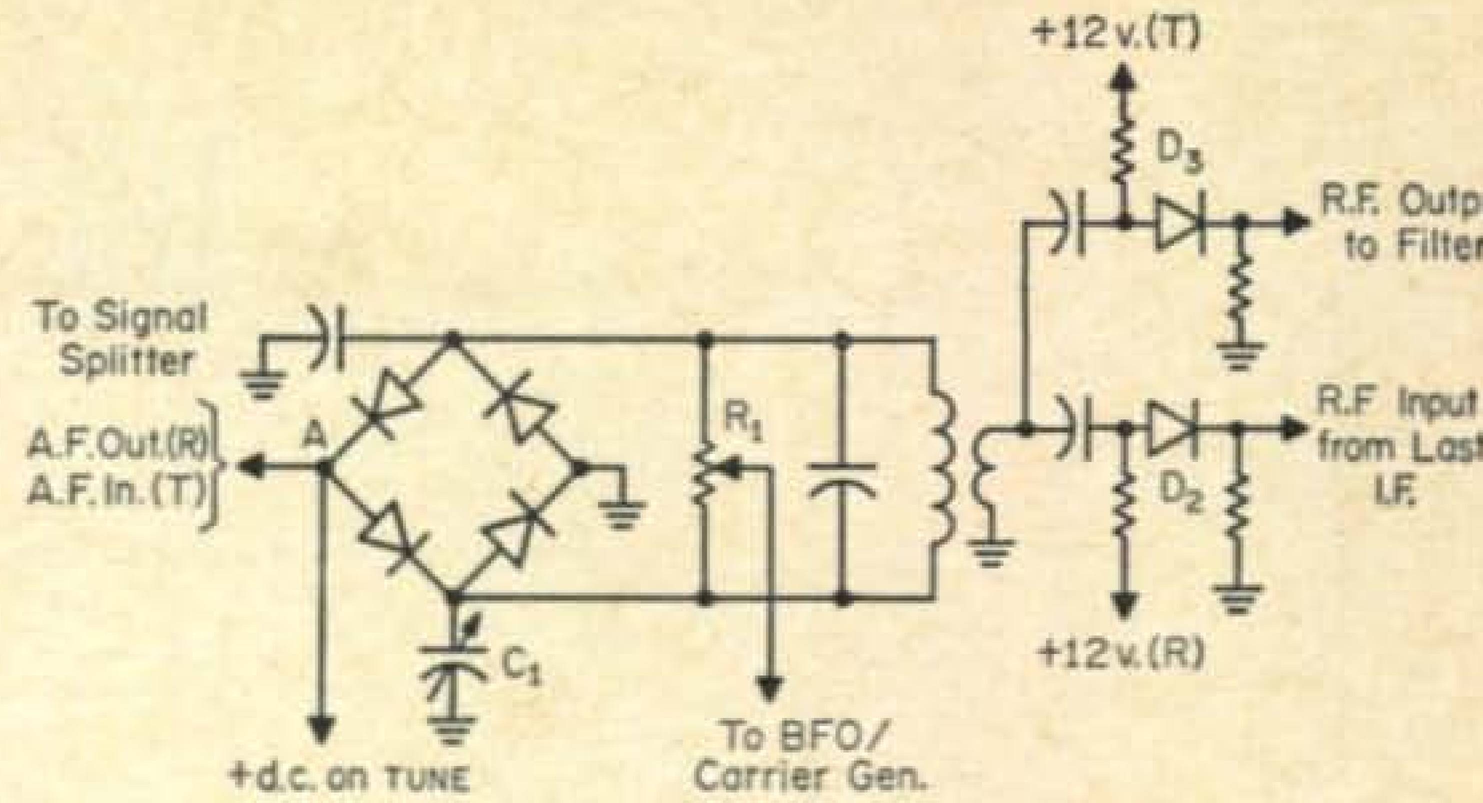


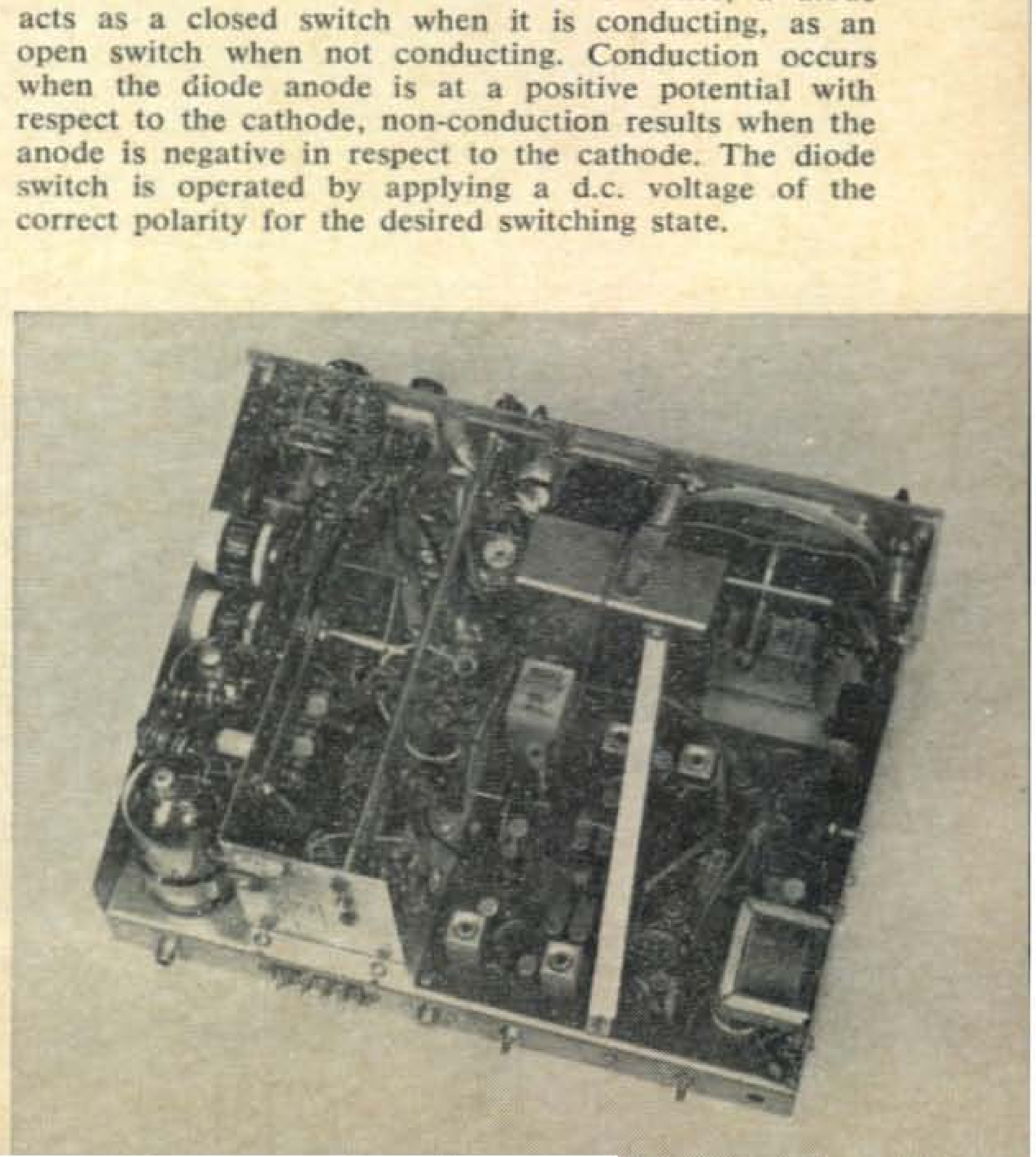
Fig. 4—Balanced modulator/product detector circuitry for the SBT-3. The carrier generator/b.f.o. signal is fed at all times to a ring type modulator using 4 diodes. On receive, r.f. output from the last i.f. goes to the modulator through diode switch D_2. The demodulated a.f. output from the modulator is obtained at point *A*. On transmit, the a.f. speech is applied to the modulator at *A* and the modulated r.f. goes to the lattice filter via diode switch D_3. The carrier signal is balanced out with R_1 and C_1. During tuneup, a d.c. voltage is applied at point *A* to unbalance the modulator and thus supply a carrier.

the supply voltages for the required receiver and transmitter functions. The other relay, during receive, connects C_1 to the r.f. input stage. During transmit, it disconnects C_1 and grounds it. By so doing, any high-power r.f. leakage from the transmitter, that otherwise might take place due to stray capacitance between open relay contacts, is bypassed to ground, and the r.f. transistor is thereby protected against damage.

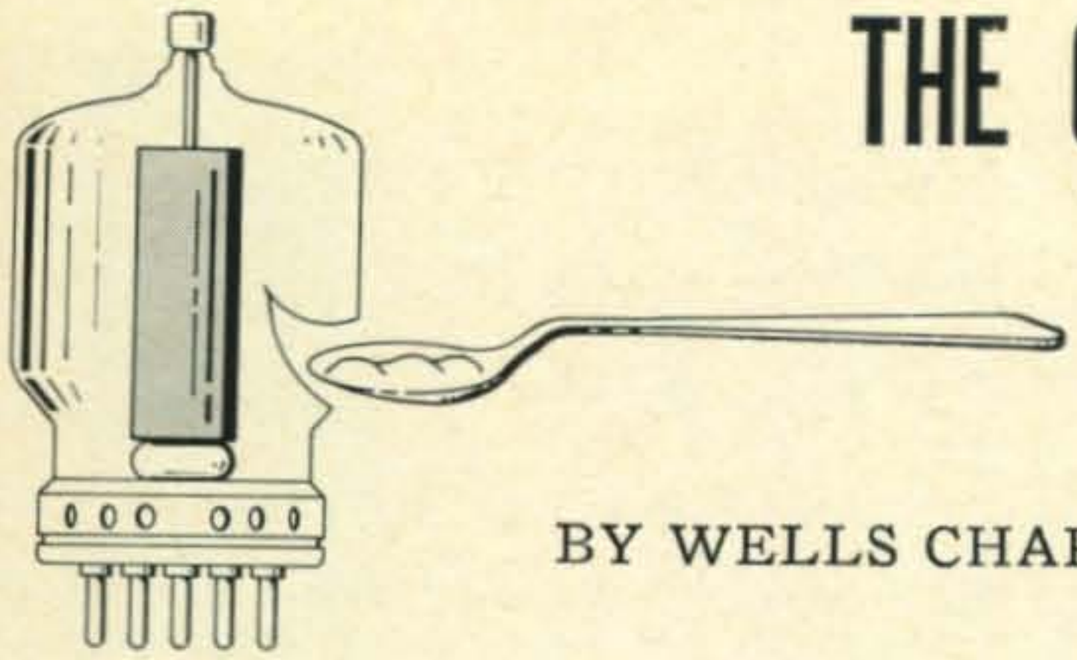
Due to the physical location of the relay, this method was probably devised to avoid r.f. pickup from r.f. ground currents through the chassis that could occur if the relay were rigged in the conventional manner to ground the input coil instead.

[*Continued on page 94*]

[1]For those not familiar with diode switches, a diode acts as a closed switch when it is conducting, as an open switch when not conducting. Conduction occurs when the diode anode is at a positive potential with respect to the cathode, non-conduction results when the anode is negative in respect to the cathode. The diode switch is operated by applying a d.c. voltage of the correct polarity for the desired switching state.



Top View of the SBT-3. A perforated cage has been removed from the final amplifier in order that the toroid tank coils may be seen at left center. The r.f. driver amplifier is on a circuit board on the right side of the shield next to the p.a. tubes. The bandswitch and the r.f. coils are above the chassis. The b.f.o. is built on a printed-circuit board that is mounted on a baffle (top center) which is firmly supported by a channel bracket. The low-level stages are contained on the board in the right foreground.



THE CARE AND FEEDING OF LINEARS

BY WELLS CHAPIN,* W2DUD/8

Covered below are several obscure facts about driving and tuning linear amplifiers. Following these simple procedures can improve the quality of your signal on the air.

EVERYONE knows that all you do to get higher power in an economical manner is to hang on an amplifier. However, it is not that simple as some of the problems can be quite sticky. The adjustment, power measurement and calculation, excitation and matching to the exciter can be difficult. In addition, the type of amplifier selected can be important.

Perhaps you do not realize it, you have been using linear amplifiers for some time. The r.f. and a.f. amplifiers in superheterodyne receivers are typical low power linear amplifiers. The IRE dictionary defines a linear amplifier as an amplifier in which the signal output voltage is directly proportional to the signal input voltage. The same source says: a Class B linear amplifier is an amplifier in which the grid bias is approximately equal to the cutoff value so that the plate current is approximately zero when no exciting grid voltage is applied and so the plate current in a specific tube flows for approximately one half of each cycle when an alternating grid voltage is applied. Thus, it is obvious that the input and output signals are very inter-dependent on each other.

There are many advantages besides the power gain when using a high power linear amplifier. The driving power required is lower thus enabling you to use a smaller exciter and its inherent lower harmonic radiation problem. Linears, when used in s.s.b. can approach efficiencies of 70 to 75 per cent. C.w. signals are cleaner and key clicks are eliminated as the keying and shaping are done a lower level.

The type of linear you buy or build is important. The screen grid type of tube requires less excitation and maybe the best if you have a low power exciter in the 10 watt area. However, screen grid amplifiers could give you unstability and neutralizing problems. If you have an exciter in the 70 to 100 watt class and you have a linear that uses low excitation you have a "swamping problem" where you must stabilize and dissipate some of the exciter's energy. Don't be lulled into the trap of buying a 100 watt exciter and plan to back down the audio gain to reduce power as this presents an entirely new set of problems. For example, your carrier suppression and noise level rise and in addition are more difficult to keep in adjustment.

Whether you use a type AB or AB1 amplifier is not really important. However, if you select zero bias tubes your bias problems are simplified. The problem of having a "stiff" bias supply (a well regulated supply) is eliminated. The grounded grid amplifier should be seriously considered as they are simple, easy to build, most stable and just about fit the average 70 to 100 watt exciter perfectly.

Your experience with Class C amplifiers will have to be forgotten when adjusting and discussing linear amplifiers. Linears are easy to tame but you must remember the driving power, grid current, and plate current dip are quite different than when working with the Class C amplifier.

Power calculation, which can be quite tricky, is not complicated, just a little confusing. You hear the term p.e.p. used on the air and in transmitter specifications. Just what is p.e.p. (peak envelope power)? It is simply the d.c. power input at the peak of the modulation envelope and is limited by the tube plate efficiency. This factor is based on the assumption that the average voice inflection does not exceed the dissipation of the tube. When you read the FCC regulations it doesn't mention the term p.e.p.

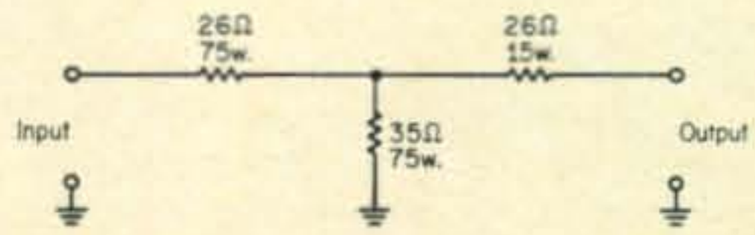


Fig. 1—The T pad circuit can be used to drop the exciter output of 100 watts to 10 watts for a linear and still maintain a proper impedance match.

*2775 Seminole Road, Ann Arbor, Michigan, 48104.

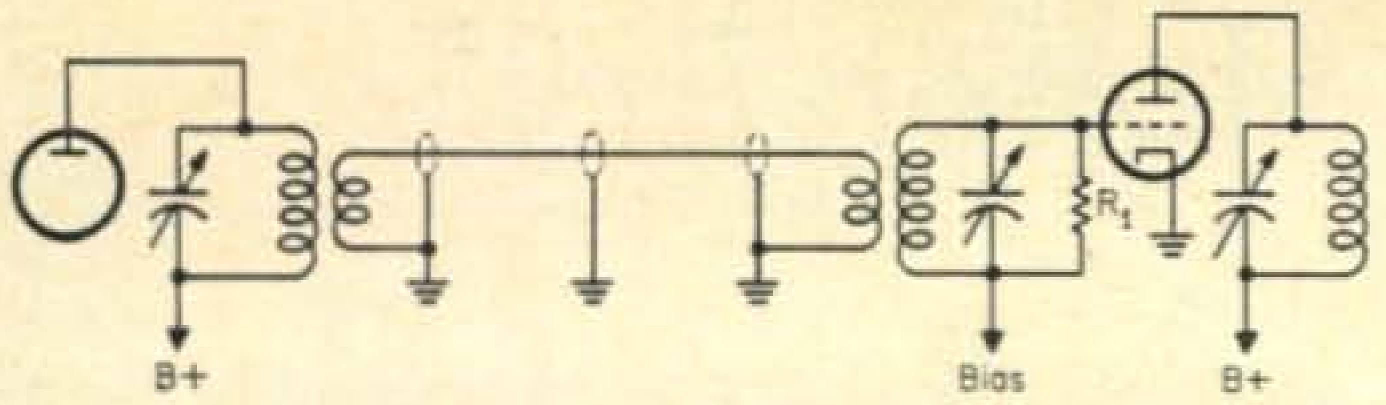


Fig. 2—The exciter output can be swamped by the use of R_1 as explained in the text.

Instead, the FCC regulations say: the legal power input shall be 1 KW d.c. input to the stage or stages delivering power to the antenna. The regulations go on to say: the plate meter used to measure the final plate current shall have a time constant not exceeding 0.25. This time constant is specified because meters are bothered by mechanical inertia. The meter needle just cannot physically follow the rapid excursions of the voice inflections and only shows average. Thus, when you talk up the current on the final amplifier to the point where the peaks don't exceed 500 mils at 2000 volts you are meeting the FCC regulations. (That is if you are not flat topping or creating some other type of distortion.) Even though your d.c. input is not exceeding 1000 watts by meter calculation, your peak envelope power (p.e.p.) is now approximately 2 KW. This p.e.p. is your effective radiated power.

The amount of excitation a linear receives is important. In most exciters you have more power than is necessary to drive the linear and, thus you must find a means to reduce it. To take advantage of the specified carrier suppression (approximately 50 db, average) of your 100 watt exciter you must run the exciter at 100 watts. Anything less will result in poorer carrier suppression. You cannot simply cut back the audio gain control to reduce power. Thus, the only means you have is to use power reducing networks. Naturally, you match the impedance of the power reducing network to the exciter and the final. Most of the equipment today is in the 50 ohm category and has a power output of 100 watts. Those linears that require lower power generally need around 10 watts or so. Therefore, let's consider a T pad

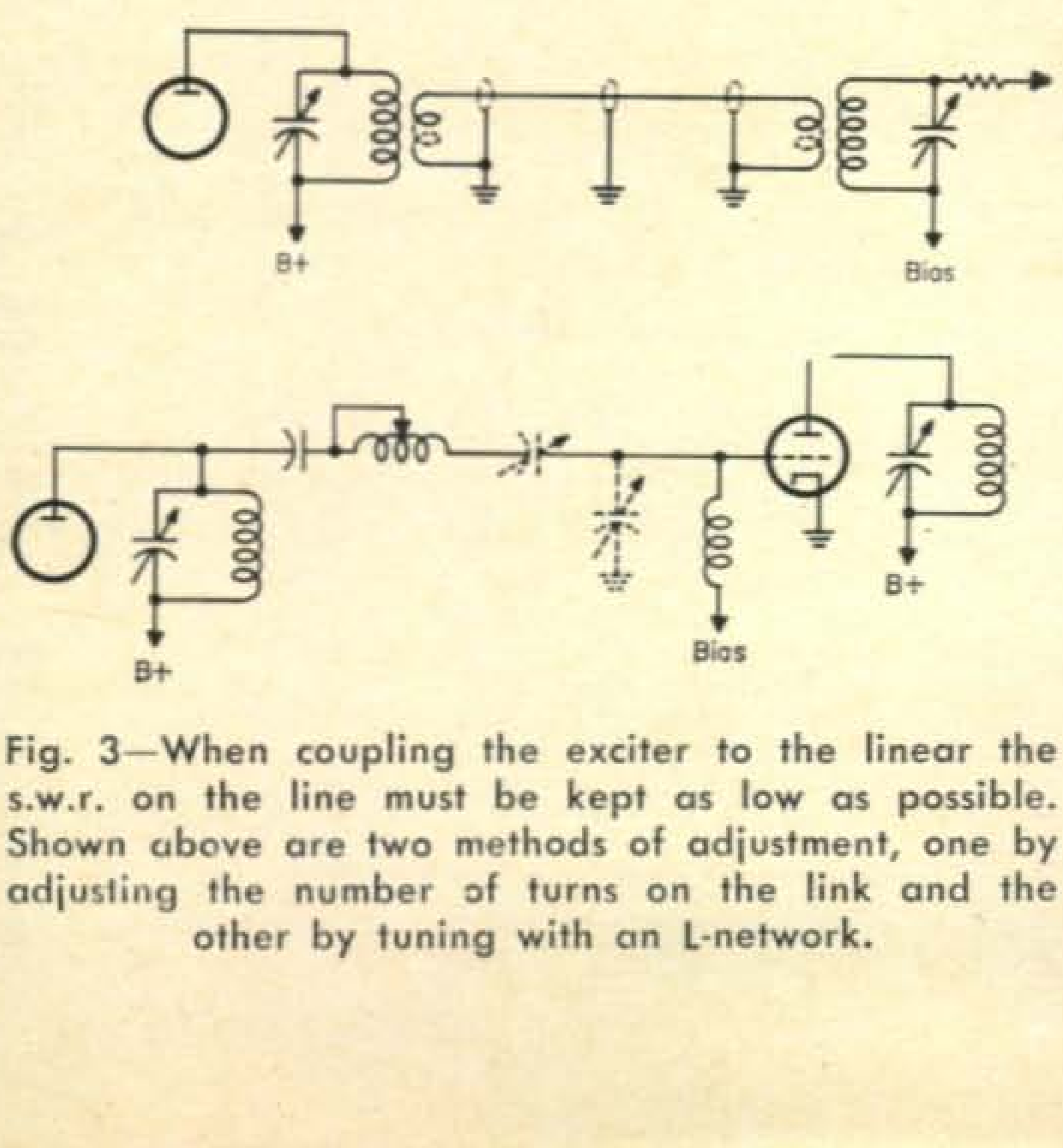


Fig. 3—When coupling the exciter to the linear the s.w.r. on the line must be kept as low as possible. Shown above are two methods of adjustment, one by adjusting the number of turns on the link and the other by tuning with an L-network.

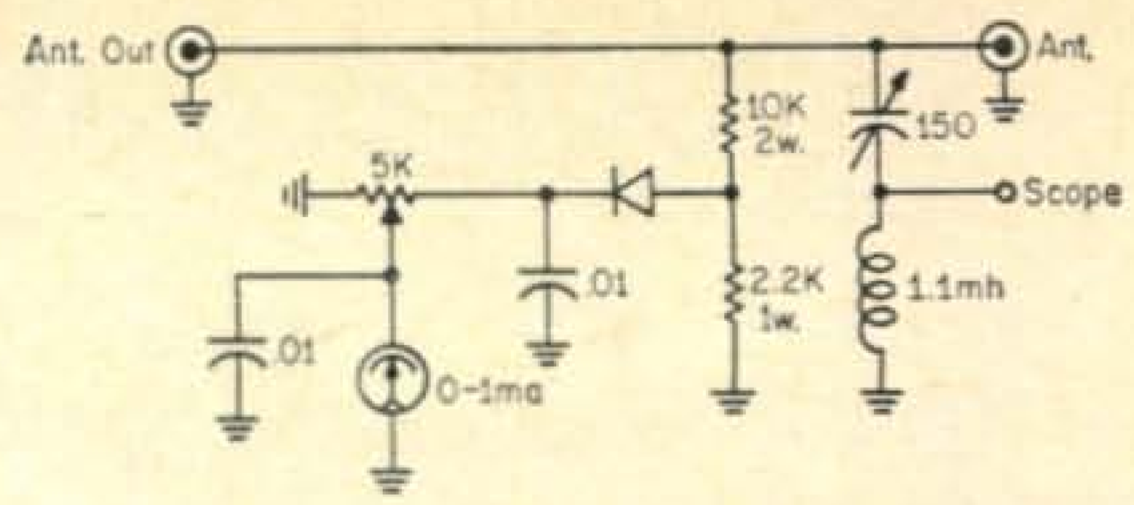


Fig. 4—This output indicator can be connected to the antenna line and it will show relative r.f. output on the 0-1 ma meter. It also provides an attenuated take-off for a scope. This type of tuning aid is almost a must for adjusting linears.

reducing network of about 50 ohms input and output with 100 watts in and 10 watts out. See fig. 1. These figures are not exact but near enough to match and close enough for a cut and try approach. The wattages shown are larger than necessary for safety factors. The resistances should be non-inductive.[1]

Another method of varying the load and excitation is "swamping". This is a highly controversial means of obtaining results. Six men will give you six different answers—but all basically will agree that the method works, but all will disagree as to the value of the resistor. This is shown in fig. 2. This resistor, R_1, should be about 5000 ohms, non-inductive and match the power of your exciter. The best way to approach this method is to cut and try with different sizes of resistors until you achieve the desired results. Use as much swamping as the exciter will stand. This will give you a more nearly constant load.

The object of matching a driver to the amplifier is to load the driver plate circuit so that you obtain the desired excitation without exceeding the plate input of the driver tube. Most drivers have 50 ohms output and generally are connected to the final with 50 ohm coax. Your objective is to make the line between your exciter and final have as low an s.w.r. as possible over as wide a band of frequencies as possible. To keep yourself out of trouble, if you are band switching use as short a line as possible. Several feet can be tolerated at 80 meters but on 10 meters even a short length can cause trouble.

[*Continued on page 90*]

[1]Glanzer, K., "T Pads for R.F. Circuits," *CQ*, July, 1964, P. 31.

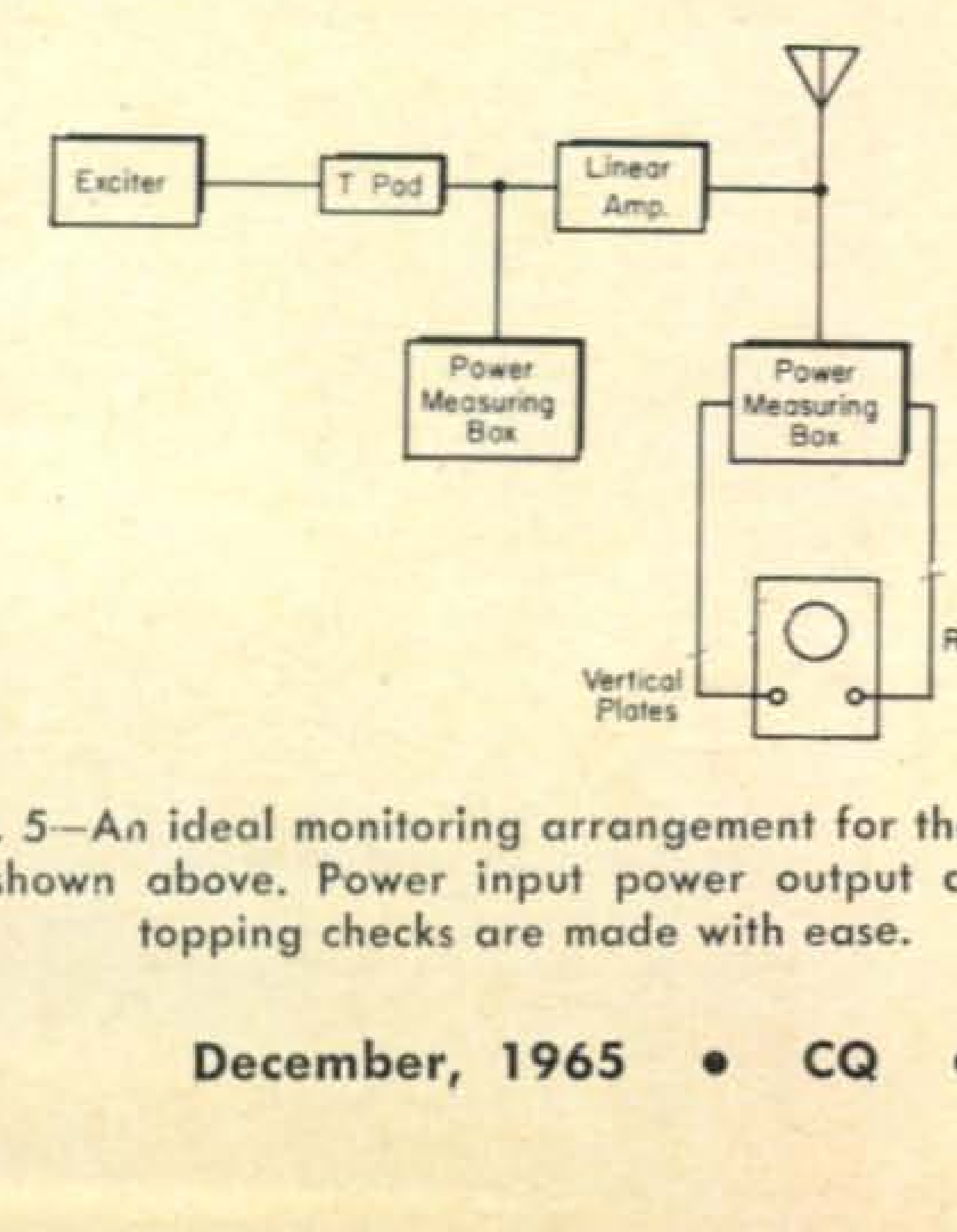


Fig. 5—An ideal monitoring arrangement for the linear is shown above. Power input power output and flat topping checks are made with ease.

CQ Awards Honor Roll

Worked All Zones. **The following is a list of the call-letters of top DXers throughout the world who have qualified for the Worked All Zones Award as of October 1, 1965. Calls are listed in alphabetical order by call area and country.**

RADIOTELEGRAPH

W1AB	W2BHU	W2OGE	W3EPV	W4CKB	W4TFI/1	W5QK	W6DUB	W6KTE	W6RAN	W7AEA	W8AMZ	W8TJM	W9MZP
W1ACB	W2BMK	W2OKM	W3EVW	K4CLT	W4TM	W5QKZ	W6DUC	W6KUT	W6RBQ	W7AHX	W8ARH	W8TLL	W9NDA
W1AJG	W2BOK	K2OLS	W3EYF	W4COC	K4TWK	W5QN	WA6DUG	W6KYG	W6RDR	W7AIB	W8BHW	W8TMA	W9NLJ
W1AZY	W2BRR	W2OTC	W3FYS	K4CTU	W4UXI	W5QVZ	W6DVB	W6KYT	W6REH	W7AJS	W8BOJ	W8TTN	W9NRB
W1BFT	W2BRV	W2PCJ	W3GAU	W4CXA	W4VMS	W5RS	W6DZZ	W6KZL	W6RKP	W7AMX	W8BRA	W8TTS	W9NZZ
W1BGA	K2BU	W2PDB	W3GEN	WA4CXR	W4VPD	W5RU	W6EAK	K6LAE	W6RLN	W7AQB	W8BSH	W8UAS	W9OD
W1BGW	W2BVN	W2PEO	W3GHD	W4CYR	W4VYP	K5STL	K6EC	WA6LCK	W6RLP	W7ASG	W8CDT	W8UMR	W9OTS
W1BIH	W2BXA	K2PFC	W3GJY	W4CYU	W4WDI	W5TIZ	K6EDE	W6LDA	W6RLQ	W7AUS	W8CED	W8UPN	W9OVF
W1BIL	W2BYP	K2PIC	W3GRS	W4CYY	W4YGZ	W5TPC	W6EFM	W6LDD	W6RM	W7BD	W8CLR	K8VDV	W9PIO
W1BLO	K2BZT	K2PKT	W3HHK	W4DHZ	W4YWX	W5URU	W6EFR	W6LEE	K6RTK	W7BE	W8CRI	W8VLK	K9PJN
W1BPW	K2CD	W2PTD	K3HQJ	W4DKP	W4ZYS	W5UX	W6EGB	W6LER	W6RW	W7BGH	W8CQ	W8WBV	W9PQA
W1CKA	W2CNT	W2PTI	W3IMV	W4DLG		K5UYF	W6EHV	W6LGD	K6RWO	W7BPS	W8CUT	W8WT	W9PVA
W1CKU	K2CPR	W2PZI	W3IPO	W4DQH	K5AAP	W5VA	K6EIV	K6LGF	W6RZS	W7BTH	K8CVQ	W8WZ	W9QGR
W1CTW	W2CWK	W2QDY	W3IXN	W4DQS	K5ABW	W5VIR	W6EKZ	W6LGZ	W6SA	W7CAB	W8CWY	W8YCP	K9QIE
W1CUX	W2CZF	W2QHH	W3IYE	W4EEE	W5ABY	W5WZQ	K6ENL	W6LN	W6SAI	K7CHT	W8DAW	W8YIN	W9QLD
W1CV	W2CZO	K2QHL	W3JKO	W4EJN	K5ADQ		W6ENV	W6LRU	WA6SBO	W7CKY/	W8DEN		W9QIY
W1DGJ	K2DCA	W2QJM	W3JNN	W4EO	W5ADZ	W6AAO	K6ENX	W6LS	W6SC	KL7	W8DFQ	W9ABA	W9QLH
W1DGT	W2DEC	K2QXG	W3JTC	W4EPA	W5AFX	W6ABA	W6EOZ	W6LTX	K6SHJ	W7CMO	W8DHC	W9ABB	W9QNO
W1DHO	W2DEO	W2RA	W3JTK	W4FFV	W5AI	W6ADP	W6EPZ	W6LW	W6SIA	W7CNM	W8DLZ	K9AGB	W9QQN
K1DMG	W2DGW	W2RDD	W3JW	W4FUI	W5ARJ	W6AFI	W6ERS	K6LZI	W6SN	W7CSW	W8DMD	K9ALP	W9QYW
W1DQH	WA2DIG	W2REF	W3JZY	W4FZO	W5AWT	K6AHV	W6ETJ	W6MDK	W6SQP	W7CWE	W8DSZ	K9AVQ	W9RBI
W1EIO	W2DOD	W2RGV	W3KA	W4GD	K5BGB	W6ALQ	K6EVR	W6MEK	W6SR	W7DAA	W8DX	W9BPW	W9RDI
W1EOB	W2DS	W2SAW	W3KBC	W4GRP	K5BGT	W6AM	K6EWL	W6MHB	W6SRF	W7DET	K8DYX	K9BVR	W9RH
W1EQ	W2DSU	WA2SFP	W3KDF	K4GSS	W5BOS	W6AMA	W6EYC	W6MJB	W6SRU	W7DIS	W8ELL	W9BZB	W9RKP
W1FFO	K2DSW	W2SHC	W3KDP	K4GSU	W5BRR	WA6AMZ	WA6EYP	M6MJY	W6SUQ	W7DJY	W8EVZ	K9CAZ	W9ROU
W1FH	W2EHN	W2SHZ	W3KFQ	W4GXB	W5BUK	W6ANN	W6EYR	W6MLS	K6SXA	W7DL	W8EWS	K9CJK	W9RQM
W1FQA	WA2ELS	W2SSC	W3KPI	W4HA	W5BZT	W6AOA	K6FET	W6MLY	W6SYG	W7DLR	W8EYE	K9CLO	W9SFR
W1FZ	W2EQS	W2SUC	W3KT	K4HFS	WA5CBL	W6AOD	W6FHE	W6MUC	W6TEU	W7DXZ	W8FKY	K9CUY	W9SWR
W1GKJ	W2ESO	WA2TAG	W3KVQ	K4HJJ	W5CE	W6AQP	W6FHW	W6MUF	WA6TGY	W7DZ	W8FRW	K9DNR	W9TKD
W1GKK	W2EXH	W2TP	W3KZQ	W4HUE	W5CEW	W6ATO	W6FLT	W6MUM	W6TI	W7EJD	W8GB	W9DUY	W9TPA
W1GVZ	W2FBS	W2TQC	W3LE	K4HYL	W5CK	W6AUT	W6FOZ	W6MVQ	W6TKX	W7ENW	W8GLK	W9DWQ	W9TQL
W1GYE	K2FC	W2TQR	W3LMA	K4ICK	W5CKY	W6AVM	W6FSJ	WA6MWG	W6TPJ	W7ETK	W8HGW	W9DYG	K9TZH
W1HGT	W2FCQ	W2TVR	W3LMM	W4IFN	W5CYE	K6AYA	WA6FTM	W6MX	K6TQR	W7FB	W8HMI	K9EAB	W9UX
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W1HX	W2FSN	W2TXB	W3LOE	W4IMI	K5DGI	W6BAF	W6FWQ	W6NHA	K6TSY	W7FUL	W8IBX	W9EHW	W9UXS
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W2BXA W2TP W4AZD W5PQA W6RCD W7BTH W8KIA KØCTL DL1IN F8DC G6TA I1RIF LU1DAB PY2CK
W2CZF W2TVR W4DQH W5PSB W6RKP W7CMO W8KML WØJYW DL1KB F8SK G8GP I1SM LU4DMG PY2JU
K2DCA W2UTH W4EEE K6RWO W7DLR W8MPW WØLBB DL3DW FA8RJ G8IG I1UA LU6AJ PY4CB
W2DEC W2UZF K4HYL W6AM K6TSY W7DQM W8PQQ WØLIL DL3EA G8KS PZ1AX
WA2ELS W2VCZ W4JGO W6BAF W6TXL K7GCM W8WT WØMAF DL3LL G2BOZ GI3CDF JA1ACB MP4BBW
W2EXH K2VQQ W4MS W6CHV W6TZD W7LBP W8ZET WØMLY DL3RK G3AAE GI3IVJ JA1BK MP4BCC SM3AZI

SM3BIZ SM5RY SP9KJ UR2BU VE4OX VE6NX VE7CE VE7PU VK2JZ VQ4ERR YV5AB ZL1ACI ZL2UW ZS6VX
SM3EP SM5TR VE4XO VE6SF VE7GI VE7SB VK4FJ YV5AIP ZL1AIX ZL4BO ZS6YQ
SH5AZU SM5WJ UB5UN VE1WL VE5JV VE6TF VE7HJ VE7ZM VK4RQ XE1AE YV5AXQ ZL1HY ZS5PG
SM5CO SP7HX UC2AA VE2WY VE5RU VE6TP VE7IT VE8RG VK5QR XE1CV YV5BBU ZL1KG ZS6LW 4X4DK
SM5LL SP8CK UQ2AN VE2YU VE6BY VE6VK VE7MD VK2AAK VK6RU XZ2SY YV5BQF ZL2GX ZS6Q 9K2AZ

ALL SINGLE SIDEBAND

W1AOL W2EXH W2WZ W4MS W5PQA K6TSY W7UZA W9ILW DL1AU G2BVN JA1DM OK1MP UA3CR VK6RU
W1BAN WB2FSW W2ZTV W4NJF W5PSB W6USG W7ZAS W9JJF DL1IFK G3AIZ JA2JW ON4DM UA3DR VQ2AT
W1BHP W2FXN W2ZX W4OM W5QVE W6VUW W9JYJ DL1IN G3AWZ JA3UI ON4QX UA3FG VQ4ERR
W1BIH W2GNQ W4OPM K6VVA WA8AJI W9QQN DL1JV G3DO JT1CA OY7ML UB5KAB
W1DCE WA2HOK W3CGS W4PAA W6BAF W6WWQ W8ARH W9SFR DL1UX G3FKM OZ7FG UR2AR XE1AE
W1GOX WA2IZS W3DJZ K4PUS K6CYG W6YMV W8BF W9UZC DL1VR G3FPK KG6AJB XE1IL
W1ICV K2JFV K3COW W4QCW W6EKZ K6YRA W8BKO KØBJK DL3DW G3HDA KH6DLF PAØHBO VE3BQP XE2WH
K1IDW K2JGG W3GHD W4RBZ K6ERV WA6ZIQ K8GLH WØBMQ DL3IR G3NMR KP4CK PZ1AX VE4XO XW8AS
K1IXG W2JXH W3JTC W4SHP K6EXO W6ZJY W8HBI KØCTL DL3RK G3NUG KP4CL VE6BY
K1JMV W2LV W3KT W4SSU WA6EYP K6ZXW W8IJZ WØCVU DL5AO G6LX KR6HL SM2BCS VE6NX
W1LLF W2MES W3LMA K4TJL W6GT W8JIN WØKFA DL6EN G8KS LA5HE SM3BIZ VE6TF YO3GK
W1OOS W2PTM W3MAC W4VCB/ WA6HOH W7AQB W8MPW WØLBB DL7HU G13CDF SM5IC VE6TP
W1ORV W2QNE W3NKM KL7 W6HYG W7BPS K8NZD WØMLY DL9OH GI3IVJ LA5LG SM5LL VE6VK ZL1AIX
W1UOP WA2RAU K3TPL W4WDI W6KTE W7BTH W8PQQ WØNFA DL9OV GI6TK LA8LF SM5MC VE7CE ZL2GX
W1YDO W2RGV W3WGH K4WHD W6LDA W7CMO K8CFU WØQLX GM3CIX LU1DAB SM5UF VE7GI ZL3AB
W1ZW WA2SFP W3YZI K6LGF W7DLR W8EAP WØQVZ EI4Q GM3JDR SM6SA VE7IT ZL3IA
WA2TAG K4AJ W5AFX WA6MAZ W7DQM W8EWS KØRAL EP2AG MP4BBW SP9FR VE7MD ZS5DW
WA2AEI W2TP W4ANE WA5EFL K6MLS K7GCM K8RTW KØRDP HB9TL VE7PU ZS5JM
W2BXA W2TVR K4HEF W5IYU W6NWZ K7HJN W8TMA WØTJ HB9ZY OD5CT VE7ZM ZS6BBP
W2CZF W2UTH W4HKJ K5JEA W6REH W7LBP W8YBZ KØUKN F8DC TI2HP OE1ME VE8RG ZS6LW
K2DCA W2UZF K4HYL W5KFT W6RKP W7PHO WØUUV F8SK I1AMU OE1RZ ZS6YQ
W2DGW W2VCZ W4INL W5KGX K6RWO W7QPK K9EAB I1RB OH2HN UA1CK VK3AHO
WA2ELS W2MWG W4LZT W5MMD K6SOK W7UPF W9EXY DJ3KR G2BOZ I1UA OH2NB UA3CG VK4FJ 4X4DK

USA-CA

The United States of America Counties Certificate is awarded in six levels for working different numbers of United States counties beginning at the 500 county level. The following list, in alphabetical order, indicates those who have received the USA-CA Certificate and additional endorsements. Complete rules for the Program will be found on page 75, January, 1965 *CQ*.

3079
K9EAB

3000
K8CIR
K9EAB
WØMCX

2500
K4VOF
K5SGJ
K5SGK
K8CIR
K8IWI
K8KOM
WA9AJF
K9EAB
WØJWD
WØMCX
VE3-9301

2000
K4VOF
W5EHY
W5NXF
K5SGJ
K5SGK
K8CIR
WA8EZW
K8IWI
K8KOM
W8UPH
K8VSL
K8YGU
WA9AJF
W9CMC
K9EAB
K9UTI
WØJWD
WØKZZ
WØMCX
WØVFE
VE3-9301

1500
W1GF
W2JWK
K3LXN
K4BAI
K4ISE
WA4MGC

K4VOF K3LXN W9HUF K1NWE WA2WEE K4GLA W5BUK WB6IUH W8APN W8WT K9QBV WØMCX LA6CF
K4VRI K4BAI W9KA K1OOJ WA2WGS K4GMR W5CME W6JNX K8BHG W8WUT K9QGR KØMLM LU1DAB
W5EHY WA4CLR W9LKB W1PLJ WA2WKU W4GYP W5CRF WA6KHK WA8BIC K8YBU W9QGR WØMLY OK2QR
W5NXF K4ISE K9LLX K1QZV W2YVQ W4HKJ K5DGI WA6KNE K8BIT K8YGU K9QJT KØORB/ OK3EA
K5SGJ W4KA W9QWM W1RWP K2ZKU W4HOS W5DJB WA6MIE WA8CGZ K8ZCG W9QWM KØVRB PAØVB
K5SGK WA4MGC K9UTI W1SXX W3AIZ K4IEX W5DQK WA6MWG/K8CIR K8ZNI K9RFU WØPLN PJ3AO/
W6KG W4UF W9UX K1TNB W3AYS K4IKF WA5DUL KH6FLC WA8CNN W9ACU W9SZR KØQIX VE2LP
K8CIR K4VOF K9WSL W1UOP K3BNS K4ISE W5EHY W6NAT W8CSK WA9AIB K9UCG KØQJG PZ1AX
W8CYB/2 K4VRI KØDEQ W1UOT W3BNU W4IZR W5EJT W6NUQ W8CXS WA9AJF K9UTI WØQWS SM5CCE
K8EUX W4VWW KØEJW W1VBR WA3BQX K4JIG W5EMZ WA6OET W8CYB/2K9AMD W9UX KØRGU SM5WI
WA8EZW W5EHY WØGYM W1VKZ K3BTT W4JUJ W5FPN W6OJW W8DCD K9AZX W9UZC KØRRO SM7ID
K8IWI W5NXF KØHUU K1VTM W3BVL W4KA WA5FRN W6PCA W8DCH W9BJH W9UZS KØRTH SP7HX
K8KOM K5SBN KØIDV W1WHQ W3BWU WA4KUM/K5FTH K6PQY K8DCR K9BLX K9VYL KØSPH TG9AD
W8NAN K5SGJ KØIIK W1YPH W3CDG W1AFA WA5HDA W6QIL WA8EOH W9CHD K9WSL WØTFQ TG9SC
W8NXN K5SGK WØJWD W1ZLX W3DKT W4KZF K5IKL WA6RXM WA8EOZ W9CLH W9WUQ KØTKQ VE1AE
W8UPH K5UYF WØKZZ K1ZND W3EFY WN4LSU W5KKL WA6RZX WA8EUC W9CMC K9YND WØVFE VE3BKL
K8VSL K6BX WØMCX K2BFU K3FFJ W4LYV W5LDH/ K6SXA K8EUX WA9CNN W9YT KØWEM VE3CBY
K8YGU W6KG KØRTH K2CJN K3GEO WA4MGC W5LXX W6UBP WA8EZW K9CSL K9ZXG KØWEN VE3CWE
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W9CMC W6YC VE3BKL W3BXE W3IMN K4MSS K5LWL WA6UQS WA8HSB W9DGA WAØAQN CO8JK VE3EVZ
K9EAB K6YMZ VE3-9301 W2EAF K3JHG K4MYO K5MID K6UTO/ W8HWX K9DWG WØARO CR6CA VE3LZ
W9HAS/ W7KOI VE3-11367W2EBW K3JYZ W4NOK K5MOF K7UXN W8IBX K9EAB WØBBS CR7IZ VE3RN
K4KWQ K7NHG WPE3EBF W2EMW W3KDP WA4PFQ K5MWV W6YC W8IEC K9EGQ WØCUC CT1PK VE6ABP
W9HUF K7SQD WPE9ETT K2ETC K3LXN K4PXY W5NXF K6YMZ K8IQB WA9FXJ KØDEQ DL1IB VE6ABV
W9LKB K8CIR W2ETS K3PSU K4RNS K5OCX K6YVV K8IWI K9GDF KØDEW DL1QT VE6AGE
K9UTI W8CYB/2 **500** W2EWZ K3QVV W4SKI W5ONK K7AGJ W8JAQ W9GFF WAØDGW DL9PF VE6UP
K9WSL W8DCD K1BOM W2FLD K3SLP K4TVE K5OPT W7BNV/ K8JIC W9GML KØDJC F9BB VE7CE
KØEJW K8EUX K1CXP/ W2FXA K3SVI W4UF/ W5PQA K7JRE W8JXY K9GOE WØEGC FG7XL VE7HJ
WØGYM WA8EZW W1BHV WA2HGL W3TKQ W4ZKD W5PSB K7CPC K8KOM W9HAS/ KØEJW G2FFO VK3AHO
KØHUU K8IQB W1DMD WB2HKZ K3VSV K4VFY K5RBN K7CRL W8KPL K4KWQKØEQF G3DO VK3AXK
KØIDV K8IWI W1DPJ WA2IMT W3YRN K4VGL W5RIT W7GAO/6 K8KPM W9HAT KØEQY G4CP VK3RJ
WØJWD K8KOM W1DWA W2JMF K4ADU K4VOF K5SBN W7GBL W8LAU W9HGP WØEXD/5 G6VQ VK3XB
WØKZZ W8NAN W1EIO W2JWK WA4AEB K4VQP K5SGJ K7GTK K8MQB W9HUF KØFIK G8PL VK7SM
WØMCX W8NXN W1EQ K2KBI K4AUL K4VRI K5SGK W7JZB W8NAN K9IHU WAØFPU GB2SM VP9AK
WØVFE W8RCJ/ W1FAB W2KIR K4BAI W4VWW K5SHQ K7KHA W8NXN K9IIQ KØGIC GI6TK XE1AE
VE3-9301 W1BUS W1FPS W2KXL W4BCB W4WLM W5WZQ W7KOI K8ODY W9ILR WØGNX HK1QQ XE1VT
W8RQ W1GF WB2LZF/ WA4BMC W4WSF K5YWX/ØK7KPM K8OHS W9IRH KØGSV HK3LX XE2DS/
1000 K8TNE W1GKJ W9OIJ K4BVD K4WVX/ W5ZBC K7MPQ W8OQV W9IXF KØGVA HK3RQ XE2DPS
K1CXP/ W8UMR W1HGT WB2MFX W4BWR HR3JP WA6AJF K7NHG K8PFX W9JCV WØGWT HK3VV YV5ACP
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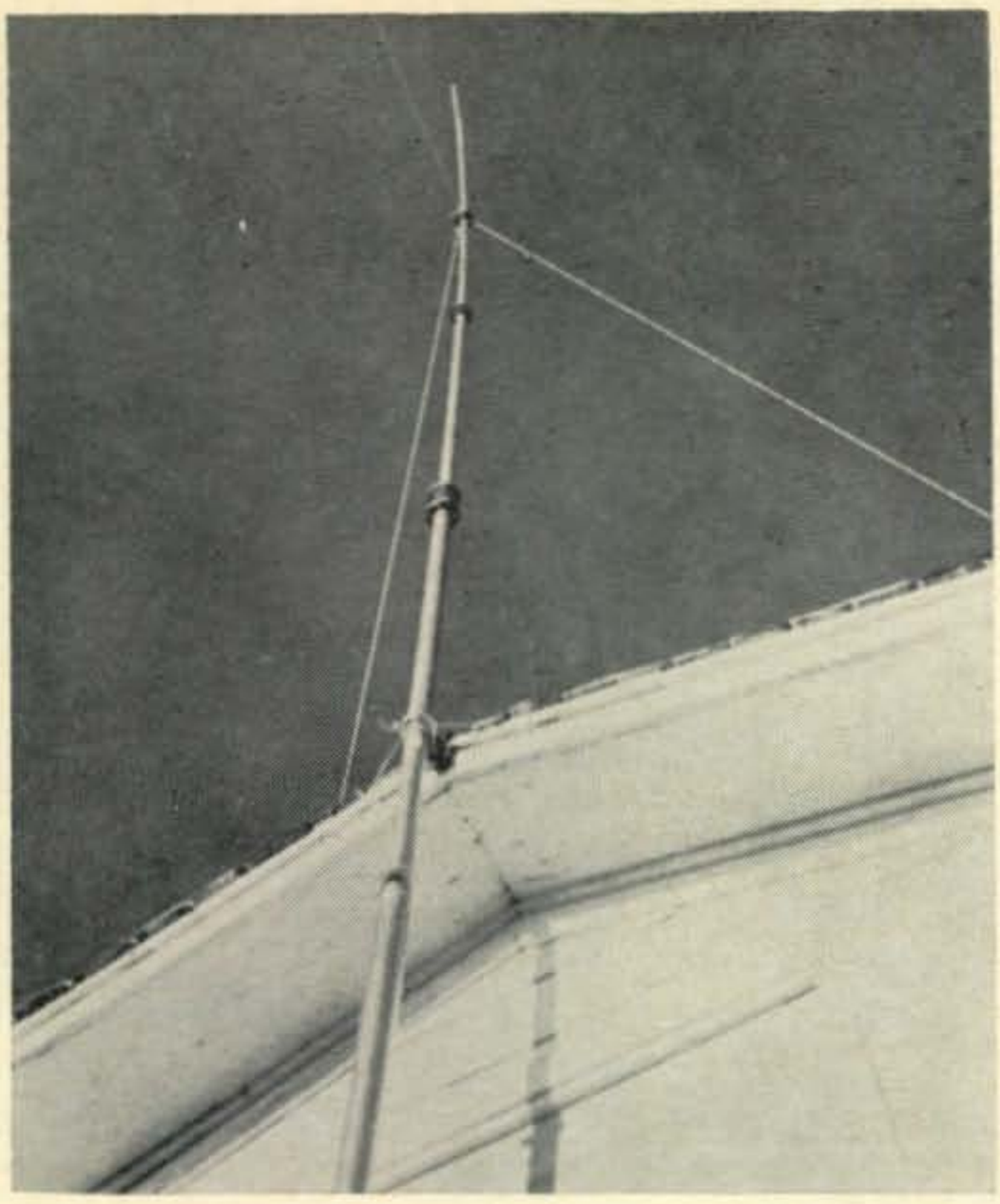
W1GF K8VZW K1IIK K2PFC WA4CLR K4ZCP K6BX W7OEB W1BUS W9KA WØHSC I1ER SWL
W1GKJ W8WT K1IJU WA2PMW W4CZ/ K4ZNK K6CJF K7QXG W8RQ K9KCQ KØHUU IT1AGA VE2-8679
WA2IMT W8WUT K1INO WA2PWI W1CV K5ABE WA6CRN W7RZY W8RSW WA9KHW WØIDM KH6BIH VE3-7554
W2JWK K8YGU K1KCN WA2QMF W4DPN W5AKR W6DIX K7SQD W8SH W9KSE KØIDV KH6BLX VE3-9301
1500 WB2LZF/ WA9AJF K1KPS WA2RMF WN4EBE WA5ALB WA6DWH W7TDK K8TBR W9LKB KØIIK KH6DKA VE3-11367
W1GF W9OIJ K9AZX W1KVA WA2RUB W4EEE W5ANE WA6ECF W7ULC K8TNE K9LLX WØIJN KL7MF W2-6893
W2JWK K2PBU W9CMC K1LBH WA2SAZ W4EJP W5AWT K6EIE W7VJI W8UMR W9LXW KØIOZ KP4CC WPE2HEA
K3LXN K2PFC K9EAB K1MBM W2SCP W4EJQ K5BQS/ W6ETR W7WLL W8UPH K9MAU WØIUB KZ5BX/ WPE3EBF
K4BAI WA2PWI W9HAS/ W1MRQ/ W2SNI K4FF W5KPO W6FGJ W7ZKL W8VII K9MMA KØJPL WØBXMW5-10353
K4ISE WA2QMF K4KWQ W1MX K2UKQ WA4FJF WA5BSV WA6GWM WA8AJZ K8VSL W9NZS WØJWD KZ5JW WPE9ETT
WA4MGC K3HNP W9HGP K1NJE K2UPD WA4GAY K5BTM K6HOR W8AL K8VZW K9PZD WØKZZ LA2MA WØ-10646



View of the half wave 40 meter vertical antenna. A standoff insulator on the edge of the roof and three nylon ropes provide adequate support.

A HALF WAVELENGTH VERTICAL

BY W. E. LA FARRA,* W5ZCC

This simple vertical is a half wavelength on forty meters and a quarter wavelength on 75 meters. Its construction is simple and inexpensive.

WITH the sunspot cycle past the minimum and on the upswing, we can all look forward to the high bands opening again, but this time is yet several years away. In the meantime we will have to settle for the bands we have. Of course every ham has his own pet band and pet antenna. We have tried most of the antennas: beer can, ground planes, loaded whips, and we're looking for something different. Since we are lazy, live in a small town, and have a limited budget, we had to give up some of our wilder dreams.

What we had in mind was an antenna that would be inexpensive, easy to construct from locally available material, and would perform when it was finished. For some time now we had been dreaming of a half wave vertical antenna especially for forty meter operation, and without the matching network this antenna would then serve as a quarter wave for seventy-five meters. These two bands have good DX openings at this stage of the sunspot cycle. After thinking about the ½ wave vertical for forty, we just had to give it a try.

*P.O.B. 43, McGehee, Arkansas.

Construction

Technically the antenna has several good advantages, low angle radiation, easy matching, *etc*. Construction wise we decided on a fifty foot telescoping TV mast, utilizing TV mast extension to complete the necessary 64 feet.

First the mast was placed on the ground and the 64 feet measured correctly. Each section was then marked so that the same measurements would hold true once we stood the assembly in the air. All top sections were pulled completely out, and the bottom two sections were used for adjusting to frequency. Since each section clamps together, we decided to solder a piece of braided wire at each joint to give a good electrical contact.

With the ½ wave vertical antenna, a matching coil and capacitor is needed as the impedance

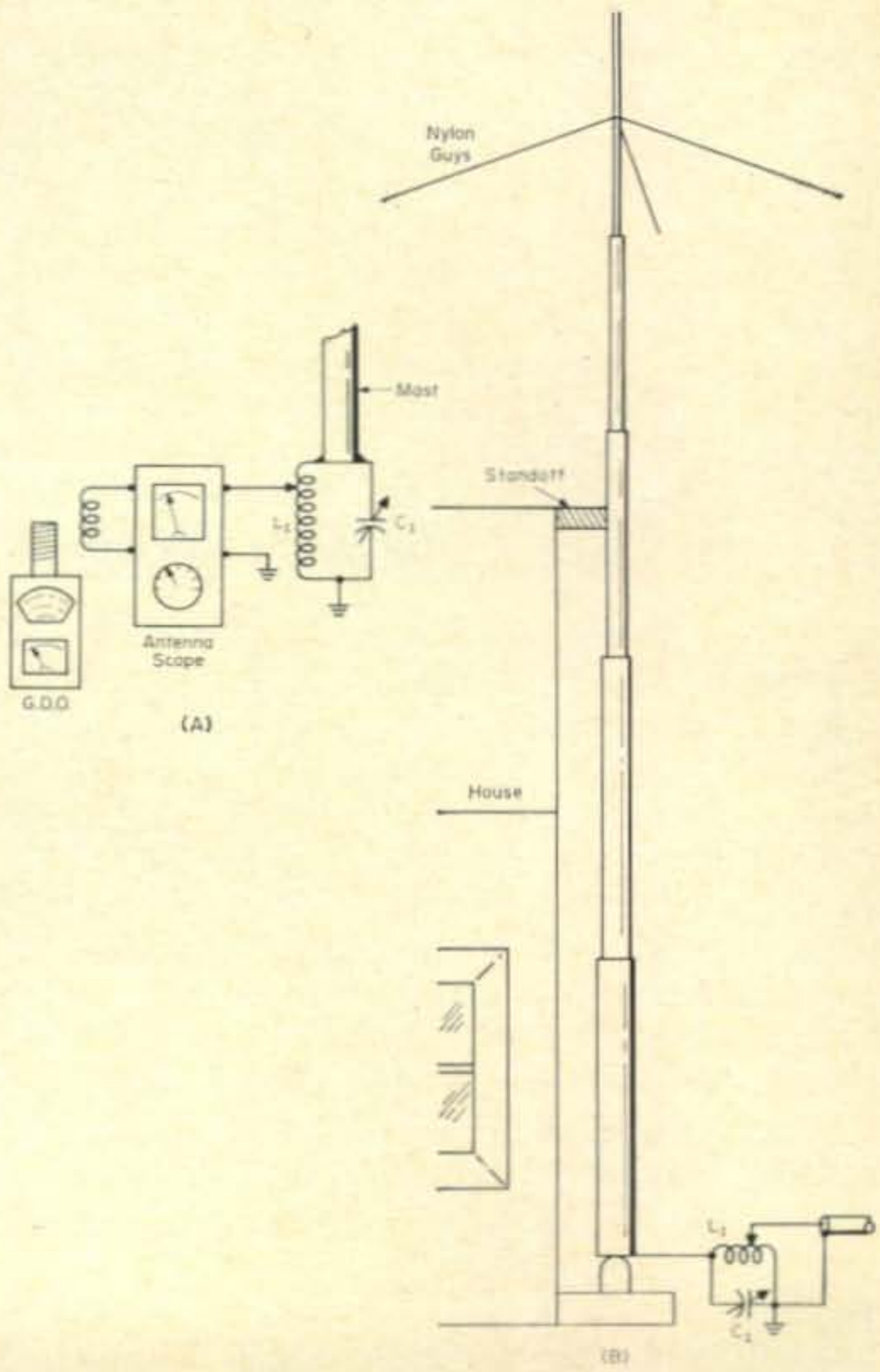
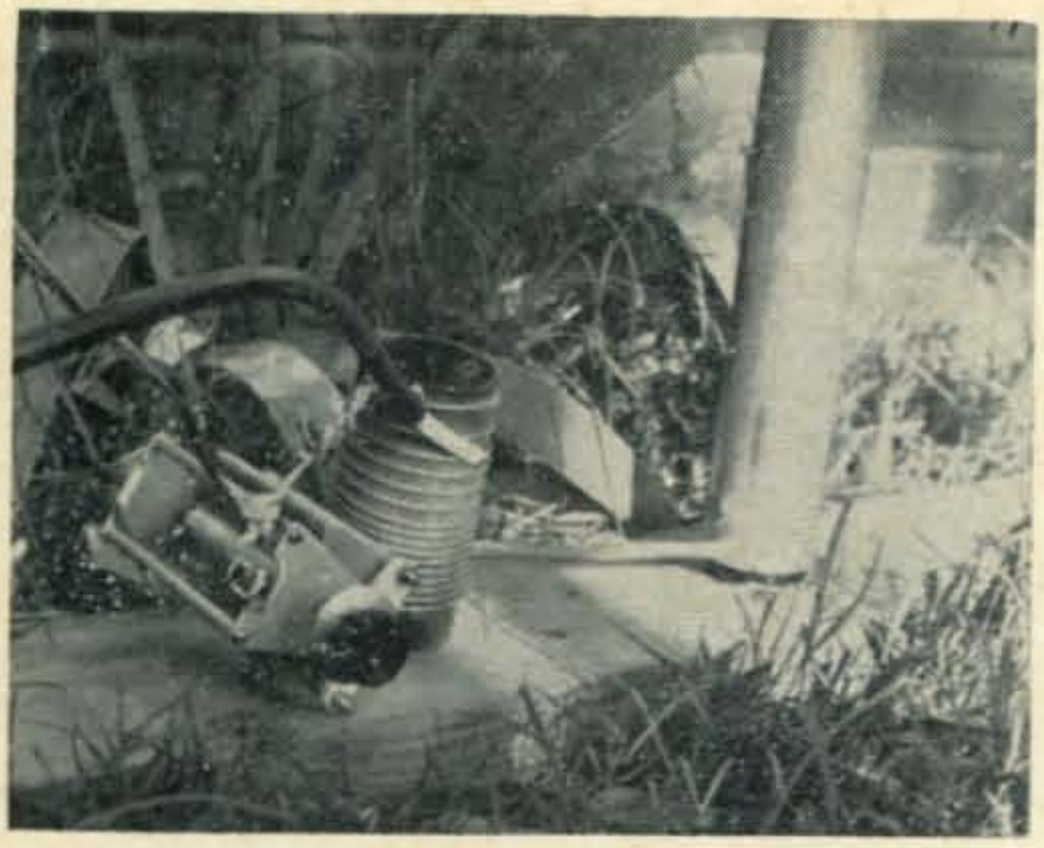


Fig. 1(A)—Test set-up used to select the proper tap position on the coil for 52 ohm coax. (B)—Basic construction of a 40 meter half wave vertical antenna. For 7.2 mc the length is 64' 2" ($\lambda/2 = 462/f_{mc}$).



View of the temporary lashup used to match the 40 meter vertical to a 52 ohm coaxial line. The assembly was rebuilt in a plastic refrigerator container for waterproofing. For 75 meter operation the antenna can be fed directly by coax.

at the end of a ½ wave antenna is approximately 2500 ohms. The parallel tuned circuit meets this requirement and allowed us to tap up on the coil to find a 52 ohm matching point for a low v.s.w.r. For 75 meters no tuned circuit is used but a ground system will be needed. Better still, use quarter wave radials extending out from the base. This can be fed directly by 52 ohm coaxial cable. The quarter wave radials for 75 meter operation will also improve the half wave forty meter antenna as it offers an established ground.

Guy wire became a problem. We felt that few were needed since the antenna was supported at the house and didn't offer, in itself, much of a wind catcher nor was it supporting anything. Wire guides are OK if you break them up with insulators every few feet. We decided on using rather heavy nylon fishing net cord. This was not too expensive, 500 feet for $2.00, and would eliminate the insulating problem.

For the matching coil about anything that will hit the frequency, 7.2 mc, and handle the power will do. We used a 250 mmf variable capacitor from the junk box and an old coil form. A 250 mmf variable and a 3" length of Air Dux #2004 (2½" dia., 4 t.p.i., 5 microhenries) will do very nicely. You can use a neon bulb to resonant this tank if a grid dip meter is not available. This assembly was later placed in a plastic refrigerator box to seal it from moisture.

Tune-up

For test purposes and to allow us to try our set-up we stood the antenna on a board, insulating the bottom with a power company standoff. This standoff had a hole in it, and the mast has a hole in it too. By placing a bolt or nail through the mast hole, with it down over the insulator, you have a nice seat for the antenna. Using a step ladder and adjusting the last two sections, we were able to set the mast to our selected frequency of 7.25 mc.

Utilizing an antenna scope and grid dip meter[1] (fig. 1(A)) we started up from the bottom of the coil until a 52 ohm point was found. If the grid dip meter and antenna scope are not obtainable, these measurements can be made with a standing wave meter which most hams have or can borow for the short time needed. The idea here is to feed 7.2 mc at low power, into the antenna. Then find the lowest v.s.w.r. by tapping the coil and adjusting the vertical section. Repeat the procedure until the v.s.w.r. is brought down to 1:1.

Results

On the air tests with the antenna has generated lots of excitement. First off, everyone just doesn't have a half wave job, and the result proved that the antenna was performing. On seventy five the antenna does a terrific job of working mobiles in the vicinity. Our cost was less than 20 dollars for our antenna and even if every part has to be purchased, the price shouldn't run over $25.00. ■

[1]Novice, *CQ* March 1960, p. 70.
Geiser, D. T. "The Instrument Deluxe," *CQ*, October 1962, p. 47.

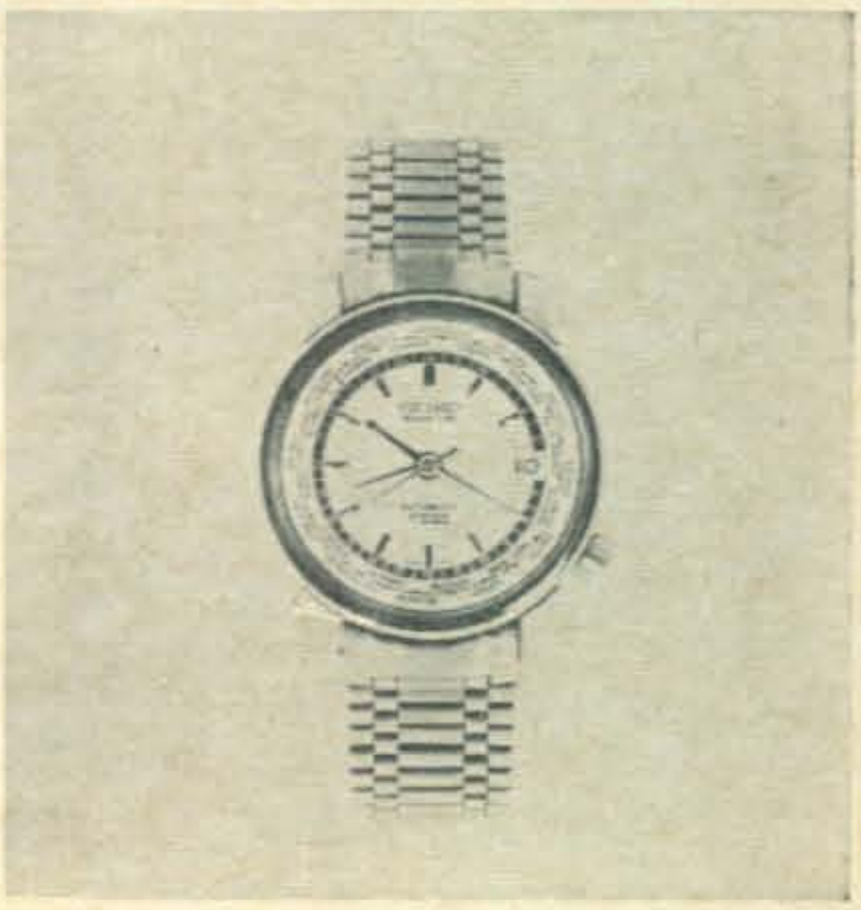
New Amateur Product

Seiko Time Corporation

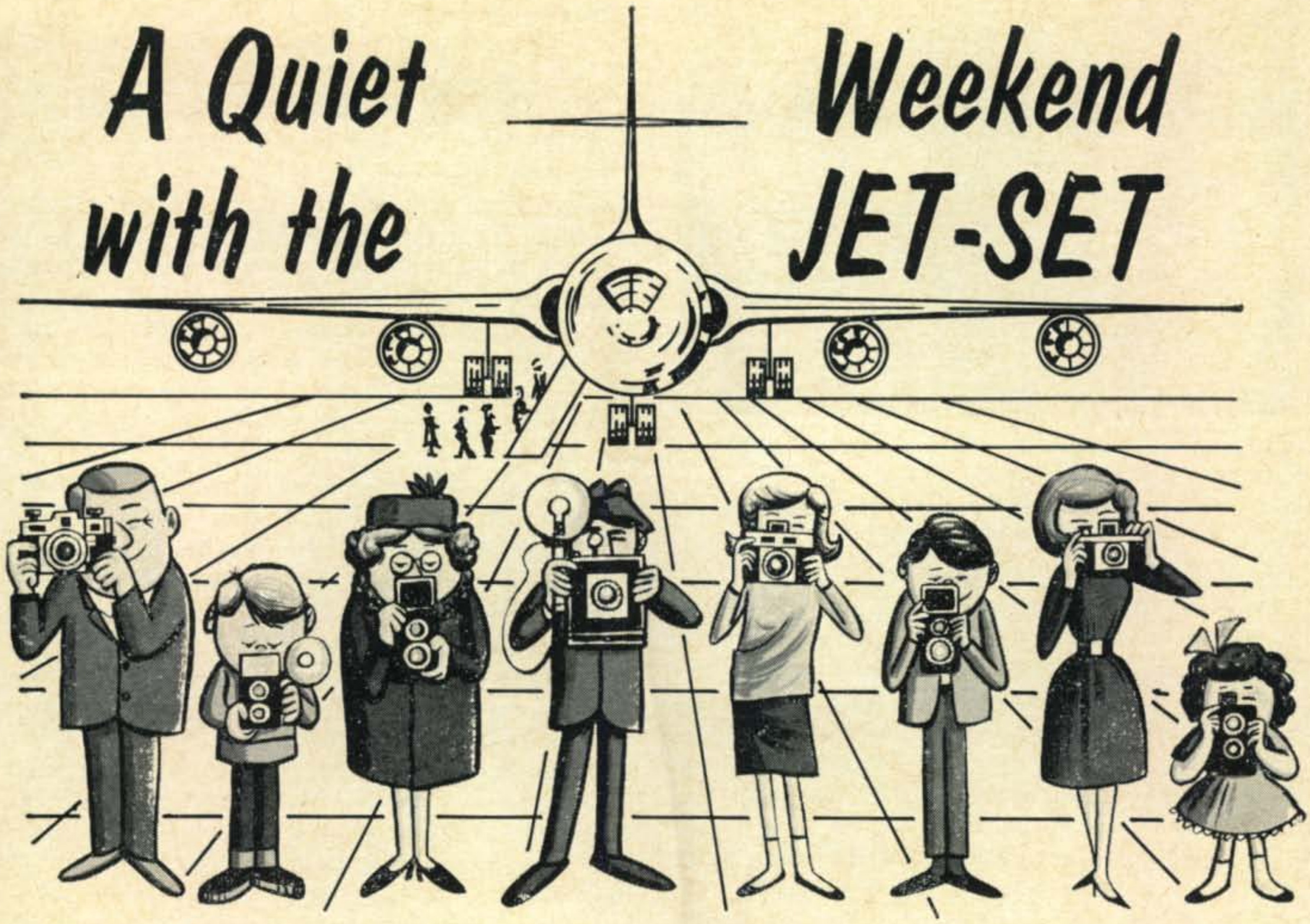
THIS new, 17-jewel, self-winding, automatic calendar watch from Seiko, Official Timer of the 1964 World Olympics for all events, tells the time instantly on five continents simultaneously at just a glance, requires no mental arithmetic or reference to charts. It gives the time in the world's major cities with the same ease as local time, including automatic color indication of whether time is night (black) or day (blue).

The automatic date-calendar has Seiko's patented Instant Reset, allowing the date to be moved instantly back or forward with just a click of the crown, without turning through 24-hour cycles.

Waterproof and shock-resistant, price $55.00. For further information write to Seiko Time Corporation, 9 Rockefeller Plaza, New York, New York 10020, or circle 65 on page 106.



A Quiet Weekend with the JET-SET



BY SYLVIA MARGOLIS*

So what's a gorgeous doll like you doing in a crummy joint like this?"

Thus graciously did John Gayer, HB9AEQ, Honorary President of the International Amateur Radio Club, greet me when we first met at the Communications Exhibition in London last October.

He had come to pay respects from one to another international amateur radio organization. Ours is the Amateur Radio Mobile Society, whose monthly publication, *Mobile News*, my husband and I edit, and at whose Exhibition booth I was noisily flogging myself to death.

For four, twelve-hour days a deranged few volunteers staff the ARMS booth. Using the entirely new approach that *radio amateurs are human, too*, we sell membership in our unique Society, sell specialist supplies, exchange gossip and information on mobile operation and generally embellish the occasion. Come to the Exhibition, find the noisiest booth and you can buy Me and My Girls a drink!

"If you like doing this kind of thing," said John, "and will pay your own expenses and work for nothing—such a nut we can use. Come to Geneva for our Third Convention in September."

I said yes because it was easier and John is a hell of a nice guy.

It was to be a real, restful vacation, away from the thunder of tiny feet and an ever-loving husband, that break in routine that every doctor would prescribe for every woman, particularly if she is the wife of G3NMR, the mother of G3UML and of a 10-year-old avid short-wave-listener, too. So there's not much else happens in our home except amateur radio.

Geneva is a fine city, with splendid historical buildings, statues, parks, magnificent shopping, an enchanted lake, the highest fountain in Europe and, invisible most of the time, Europe's highest mountain, Mont Blanc.

Or so they tell me. I saw two buildings in Geneva, both circa 1960. The one with the flags outside is the I.T.U. Building. The one with the Cadillacs and Rolls Royces outside is the Intercontinental Hotel.

From London I travelled night-flight, because it's 50% cheaper and a girl doesn't make much money writing for *CQ*. My husband said he would pay the fare if I brought home one of

Eric, G3IIR, and Bill, W6SAI, explain amateur radio to African delegates.

*95 Collinwood Gardens, Clayhall, Excid, Essex, Eng.

Plenipotentiary delegates are introduced to Harold Megibow, K2HLB, host at the reception given in their honor in Geneva's Intercontinental Hotel on the evening of the first day of the Convention.

the top raffle prizes. Wise guy!

Night-flight brings you in at 3:30 A.M. Yet at 12 noon, bleary but eager, I reported for duty at the I.T.U. Building. I was greeted with joyous cries that should have warned me. John and his staff were still busy with their own I.T.U. work but, goody-goody, here was the first of their voluntary workers walking right into the trap.

To arrange a Convention as ambitious as this involves not only imagination and verve and genius. It means hundreds of hours of sheer, administrative slog. I saw and did enough to convince me of what must already have been done.

They found me some clerical work to keep me occupied and out of the way. When, at 6 P.M., I staggered up off my knees, Vera Jackson, John's super-efficient *British* secretary, the administrative genius behind the Convention, said we must go home early, have a quiet dinner and an early night. Tomorrow would be rather a difficult day. To hell with British understatement. Tomorrow was murder.

We started at 9. For ten hours we handled "Registration." Each arrival had to be welcomed and identified and his documents produced. We explained that he would receive one free raffle ticket, that more were available at 25¢ each, which was a good buy, because the manufacturers had presented an SR-500 and an HX-50A as just two of the prizes. Then he must be docketed, ticketed, indexed, cross-indexed, cossetted, labelled, tabulated, soothed and charmed. All this in four languages and five currencies.

Besides, we had to be able to inform and advise on hotel bookings, bus routes, exchange rates, excise restrictions, licensing regulations (the Swiss P.T.T. issued temporary HBØ licences on the spot), where to buy a sweater, a watch or a camera, which hairdresser would still take bookings, was there a doctor in the house and what would be the local time in Milwaukee. There must be an easier way of spending a Friday.

The first of the Convention's three lavish Receptions, at the Intercontinental Hotel, was attended by a large group of delegates from the I.T.U. Plenipotentiary Conference. They were transported from Montreux to Geneva in buses loaned by the Swiss P.T.T. The host was K2HLB, Dr. Harold Megibow.

The delegates mingled with the radio amateurs, a splendid token for amateur-professional-diplomatic relations. I wore a "little black" and the gorgeous perfume that dear George Jacobs, W3ASK, had brought me when he visited us in London in March. This was a plushy set-up, all diamonds and mink and Diorama and mohair suits and Corona-Coronas and hand-kissing and Chivas Regal. The women had really gone to town. Nothing flatters an occasion more, nor makes it zing, than women who have taken the trouble to look glamorous.

The place glittered with personalities—John Huntoon, W1LVQ; Stu Meyer, W2GHK; Neal Latorraca, WB2NAD; Emil Savundra, G3SDN; George Pearson, G3AWZ; Dick Van Breen, PAØFX; and the Presidents of several National Societies. As Mr. Gayer's Young Ladies, we were expected to act as hostesses, keep things running smoothly, interpret, circulate, introduce. Afterwards we were taken to dinner by some of the delegates. Any gentleman foolish enough to offer food to the Staff was on a bad deal, for we needed endless calories. I only stopped eating that night because by then, I needed sleep more than food.

Now I had to make a momentous decision. Two cars were available to ferry us home. One was a superb 1935 Bentley, owned by Bill Boyle, VK9WB; the other was John's Mercedes 220SE. Such problems every girl should have.

At 8 A.M. next morning we opened shop at the Intercontinental. The routine was the same, but twice as frantic—the decor more luxurious. Whilst the opening ceremonial was performed by Gerald Gross, W3GG, Secretary-General of the I.T.U., Vera and I watched from the back of the hall, impressed despite ourselves at this complex project which she had designed and I had helped to execute.

Now the first copies arrived from the printer of the IARC's 1965 glossy publication, *Interadio*. Vera gave us the firmest orders.

"Supplies are strictly limited. One each *only*. Tick off the callsign on the list as they take their copy."

Perhaps the most popular section of the reception area —Heinz Oswald, (HB9ZO), a Swiss PTT official from Berne, issues on-the-spot temporary mobile licenses.

At noon they poured all over us and began to snatch the books. No time to check, count or tick—chaos threatened. Then I remembered what we did in England during the War when a shop got a supply of fresh oranges. But how would this extrovert, suave, masculine horde react? I gambled.

"PUT THOSE BOOKS BACK IN THE PILE AT ONCE. PLEASE FORM AN ORDERLY QUEUE!"

I have a very loud and clear voice and the reputation for being a bitch-on-wheels. There was silence. Then quietly, meekly, they shuffled into a beautiful, straight, obedient, patient British queue. Choking with laughter, we issued the books like army boots—callsign, check, tick, hand over the book, next please!

At the Convention Banquet, that night at the Intercontinental, we ate exquisite fresh salmon, roast beef and ice cream. I sat with the Megibow's and Harold ordered a magnum of champagne for his party. It made us feel pampered and immensely witty and also bland enough not to mind about winning nothing in the raffle. The winning tickets were drawn by the youngest child of Emil Savundra, the diminutive Jacquie, in a frothy, pink dress, hopping from one foot to another in her excitement.

The elaborate Convention Program included lectures and seminars on radio frequency allocation, s.s.b., antennas, Moonbounce, OSCAR, operating techniques, DX-peditions, equipment and mobile operation. I had heard from several satisfied customers that the presentations had been playing to standing room only, despite the glorious weather. On Sunday, Dorothy Megibow and I strolled in to the discussion on reciprocal licensing. The number of wives in the audience who were completely engrossed by the program proves what a delicate balance of technology and general interest was attained at Geneva.

Now, if anything were required to justify the very existence of the I.A.R.C. Conventions, it was this extraordinary debate. With over 80 countries present, this was the very first time there had been such an authoritative and open discussion of a most important problem. Bob Booth, W3PS, was Chairman and the way the procedure jell-ed was dramatic and enormously constructive. Representatives of each country reported, under Bob's masterly direction, on the situation in their country—what to do to obtain a temporary licence—or how far negotiations with officialdom had progressed. John Gayer pleaded with holders of temporary licences to abide scrupulously by the regulations of the host country and Bob Booth summed up by saying that we have the momentum at last and we must not let it drop; it is up to the individual to seek out his own authorities and to carry on the good work.

Theatrical people speak of the magic something that can spark a performance, no matter how humble or amateur, when the fourth wall between audience and players dissolves and, in the most unlikely circumstances, you know you

A view of the Council Chamber in the ITU building, scene of the Convention technical panels.

are seeing pure Theater. This happened in Geneva on September 19. It was the most significant episode in the whole happy weekend.

But, after tea—these British customs penetrate everywhere—I had a terrifying experience. John Gayer had asked if I would speak on one of the Panels, about mobile operation. "Don't be ridiculous!" I said, "What do I know about anything —except how to run a better club and magazine than you?"

Onto the rostrum of the august, solemn Council Chamber filed Stu Meyer; Gus Browning, W4BPD; top Dx-er George Pearson, G3AWZ; Past-President of the RSGB Geoff Stone, G3FZL. All important, famous, informed people, who knew what they were talking about. Then John yelled SYLVIA. "You'll be sorry!" I hissed. I missed his instep with my stiletto heel. I'll get him some time, though.

Very smoothly, Stu Meyer shuffled us into a cabaret act. Petrified, I waited my turn. They'd know me for a phony and walk out. I don't know an 813 from a teapot. To me a crystal lattice filter is costume jewelry and a VR6 a new detergent. I don't *believe* Ohm's Law. Bleak with misery, I stared out of the window opposite. Then a miracle happened. Later John said he had it all arranged specially for the Convention, all part of the IARC service.

Mont Blanc emerged from the surrounding clouds, which it does about three days a year if you are lucky. There it soared, unbelievably high and lovely and aloof. I looked at the mountain and the mountain looked at me and I thought, "Hell! You were there a million years before us and you'll be there a million years after we've gone! All the little things we fight and worry about—reciprocity, QRM, frequency allocations, commercial intruders—it will all be the same in a million years!"

They tell me I spoke very well. ■

PLEASE include your ZIP code number on all correspondence.

A group photo taken at a luncheon given by General Francisco Miliani, YV5GA, at the headquarters of the Venezuelan Air Force during the Awards presentation weekend by the Radio Club de Venezolano. From left to right: Cap. Pablo Miliani A. YV5GU; Armando Diaz, YV5AQO; Carlos Julio Martinez, YV5FI; Napoleon Centeno, YV5BNR; Mayor Francisco R. Marin S., YV4BH/5; General of BGDA, Francisco Miliani A. YV5GA; Frank Anzolone, W1WY; Stuart Meyer, W2GHK; Ricardo Sierra, CX2CO; Eduardo Cabrera, YV5AXU; Enrique Berrizbetia, YV5AGA; Rafael Domingo Moros, YV5AVW; Oscar Oyarzabal, YV5ANF; Arturo Rosales, YV5BNV; Miguel Angel Delgado, YV5AIP. The pictures on the wall show the founders of Venezuelan aviation.

PEOPLE AND PLACES

James J. Lawlor (right), waits for Lance Corporal John A. Palcer (center), of Marine Corps Schools, Quantico, Va., amateur radio station W4PFC to complete his transmission before talking shop. Looking on (left) is Corporal Doug Rundel, noncommissioned officer in charge of the station. Mr. Lawlor, executive secretary of the International Eye Bank, Washington, D.C. Division, visited with the station operators, September 2. It was his first meeting with the two Marines since the station's hook-up with the Eye Bank network. (Official Marine Corps Photo by Sgt. Eugene Bender)

The Wilkinsburg Emergency Radio Net helped 3000 Boy Scouts open an historical hiking trail this summer. The Forbes trail, named after General Forbes, was used in 1758 to march an army to what is now Pittsburgh. John Wright, K3AZP, is shown checking a problem of a patrol of Boy Scouts as they hike the Forbes Trail. The Radio Net was used to relay instructions to the hiking column, which at times was 13 miles long.

These are before and after photos of Dick Buckly's, K1ZBT, antenna and tower. The after photo was taken last Dec. after a storm. The ice was three inches thick on the elements and the tower was frozen solid making it impossible to lower for six days. The drooping elements are forty feet long. This is just a reminder for this Dec., to check weather reports and to winterize antenna installations where possible.

DX

BY URB LE JEUNE,* W2DEC

SSB Honor Roll Notes

The return of Singapore to the list added one country to the standings of the following: K1IXG, W1LLF, W2BXA, W2FXN, K2MGE, W2PTM, W2TP, W2VCZ, W2ZX, W3KT, W3MAC, K4HYL, W4OPM, W4RLS, W4SSU, K4TJL, W5KC, K6CYG, K6LGF, W6RKP, W6UOU, W6USG, W6NWE, W6YMV, W6ZJY, W7BTH, W7DLR, K8ONV, W8PQQ, K8RTW, K9EAB, WØQLX, WØQVZ, DL1IN, G2BVN, G2PL, G3AWZ, G3DO, G3HDA, G3NUG, G8KS, GM3JDR, HB9TL, I1AMU, OZ7FG, PZ1AX, SM5UF, VK4FJ, VK5QR, XE1AE, YV5AFF, and 5Z4ERR. CEØXA moves TI2HP back into first place at 305. Musty, W2TP, stands at 304, thanks to LA5CI, Jan Mayen. G3AWZ added PY2BZD/PYØ Trinidade for 303. I1AMU reached 282 with CR4, FY7, VP8HF, VP8GQ, VQ8BFC and 8Z4. CEØAG, CR4, OHØ, TU2, VP2D, YU, 7B1 and 8Z4 pushed Vin, W5KC, onto the Honor Roll.

Guest Editorial by K6TZX

The day of the Extra and First Class license is almost upon us. Certainly incentive licensing will do its part in improving our bands and the quality of the signals contained therein. However, let us not lose sight of the fact that the purpose behind the incentive licensing proposals is to improve the radio amateur and his "image" before the world in general and other users of the radio spectrum in particular. This is of primary importance if we are to retain our bands.

But will merely passing a 20 w.p.m. code test and a "tough" written exam save our bands? I think not—to think that it would, will lead to disaster. It will help, but operation in the public interest is the key. And how do we, as DXers, serve the public interest? Not very well I'm afraid. Here we have the tremendous potential, with our huge beams and our kilowatts, to spread the word to the world that we really are "good guys" not "bad guys". And what do we do? We exchange RST's rather than ideas.

I worked a 16-year-old VE7 on 15 meters several weeks ago and had a nice long chat with him, with a few words of advice on how he could improve the note on his DX-60. His card came the other day with this note, "Our QSO certainly raised my opinion of W6s." The price of this goodwill was only half an hour of my time.

I'm not advocating a long rag chew with every DX station worked but when the band is "dead", work a JA, VK, ZL, UAØ and find out what he does for a living, and let him know what you do (besides work DX, hi). I've worked a JA who's very interested in sports car racing, a UAØ who was surprised to learn that not every W6 runs a KW and that not every house in California has a swimming pool, and a VK school teacher who was surprised to learn that few of our high schools teach calculus.

It only takes an hour or two a week. Your country total may not go up as rapidly but at least it will help to assure that those "countries" will be there a while longer.

When was the last time you had a QSO instead of a qso? *(Thanks NCDXC).*

Here and There

FR7 Reunion Island: Guy, FR7ZD, can be found at 1230 GMT on Saturdays on 20 meter s.s.b. *(Tnx LIDXA).*

GC Guernsey: GC8HT, Dick, looking for W/K from 1400 GMT on Wednesdays on 14,242 kc and on Sundays between 1400 and 1500 GMT on or near 14,285 kc. If you want QSLs direct send something to help defray expense, otherwise via bureau. *(Tnx WGDXC).*

KG6I Marcus: Chuck, KG6IF, on 14,270, at 0200 GMT. Also heard on 14,200 and 14,245. The new quad is putting out fair to good signals to the East Coast and Chuck promises to be on as much as possible. He will be there for about six more months. QSL W6ANB. *(Tnx LIDXA).*

VK9 Papua Territory: VK9WE 14,035-40 kc 0530-0800 GMT daily and 1200-1300 GMT week-

Jack, 9G1FK, looks like he has the conveniences of home in his Accra, Ghana shack. *(Tnx K2DGI).*

*Box 35, Hazlet, New Jersey 07730.

SSB HONOR ROLL

TI2HP	305	W1LLF	282	G2BVN	264	OZ7FG	234
WØQVZ	304	W6UOU	282	G3DO	260	W4HUE	231
W2BXA	304	W3KT	282	W4RLS	260	W3DJZ	231
K4TJL	304	I1AMU	282	W6WNE	260	W2PTM	231
W2TP	304	G8KS	280	PJ2AA	258	WA2EOQ	229
G3AWZ	303	W2RGV	279	KP4CL	256	W6ZJY	228
W2ZX	302	K4HYL	277	K6LGF	251	W3FWD	226
5Z4ERR	301	DL1IN	276	W1AOL	250	K1SHN	224
W8PQQ	300	HB9TL	276	W4OM	249	K2JFV	223
K2MGE	297	PZ1AX	275	W4PAA	249	K4JEY	221
W3NKM	296	W4SSU	274	W4NJF	248	W2MJ	215
W2FXN	294	W6RKP	274	GM3JDR	247	SM5UF	209
W4OPM	291	K9EAB	274	XE1AE	247	WØQLX	206
W2VCZ	291	W2LV	271	W7CMO	246	W5KC	206
K1IXG	289	G3NUG	270	YV5AFF	240	K6CYG	204
K8RTW	288	K8ONV	270	W7DLR	239	W6USG	204
WA2IZS	285	G2PL	266	K1JMV	236	KØUKN	202
W3MAC	282	W6YMV	265	W3VSU	235	G3HDA	200

The following certificates were issued between the period from September 6th, 1965 to and including October 5th, 1965:

CW-PHONE WAZ

2207	K2ZKU	Edward Gaudet
2208	OK1DJ	Stanislav Novak
2209	K1IGO	Robert F. Herrick
2210	VE6ABP	Margaret Tettelaar

ALL PHONE WAZ

316	OE1NY	Helmuth Nikischer

TWO-WAY SSB WAZ

342	VE6ABP	Margaret Tettelaar
343	W4DLG	Rudolph B. Spivey
344	OE1SF	Frank Friedl
345	K9LUI	Verna D. Franz
346	OA4PD	Vitaly Franco

CW WPX

680	K3GKF	M. F. Nelson
681	SP6ALL	Seweryn Wojtusiak
682	SM3CJD	Carl Otto Ragne
683	SM4CHM	Torbjorn Landstrom
684	VE3CWE	Walter C. Kimball
685	W5JKJ	Stan Kuhl
686	SM6CMU	Ingemar Olsson

PHONE WPX

123	W5NXF	Norman L. Maguire
124	G3MCN	Harry James

SSB WPX

218	W5LEF	Willie E. Petty

100 TWO-WAY SSB

470	GW3NWV	Robert C. Holt
471	W7CMO	Norman S. Moberg

200 TWO-WAY SSB

131	G3WW	R. F. G. Thurlow

ends when band open. All W/K QSLs go via WA6GLD (Jerry Hagan, 5031 Arroway Avenue, Covina, Calif. 91723) whose QTH is not correct in the *Callbook*. *(Tnx WGDXC)*.

VP5 Grand Turk Island: VP5AR, Tony, will be active for 18 months at present using temporary rig with mobile whip antenna but is awaiting his "S-line" and TA-33 beam. *(Tnx WGDXC)*.

VR6 Pitcairn Island: Tom, VR6TC, active most Mondays on 15 meters at 2200 GMT on 21,250 (a.m.) working W's on 21,300 then 21,255. Also 21,065 c.w. QSL W4TAJ.

4W1 Yemen: 4W1G and 4W1I QSLs are now being handled by Harry Charvat, K9BPO, 207 Mandel Lane, Prospect Heights, Illinois, who has the logs from both these stations and is now having cards printed. Harry requests s.a.s.e. and GMT. He will probably be handling QSLs for other 4W1 stations as they are activated. *(Tnx K2MGW)*.

ET Ethiopia: The following letter is from Jim, the new president of ET3USA. "I am very happy to announce that Kagnew Station Amateur Radio Club, ET3USA, will be using a special call sign 9F3USA for the entire month of December. I would like to take time out now to give my thanks to K7UCH, W7TDK and K1QHP/FL8-AK as our QSL managers. They have done a job which mere words cannot describe.

"I am very sorry to say that one of our best members has left our club, Albert L. Kemmesies, K1QHP/FL8AK. When he arrived here over a year ago, our club was barely making a go of things. After his arrival, he took over as President and has made the club what it is today—a well-organized, world wide known club which can now hold its head up with pride of a job well done, knowing when Al leaves here that he has left something better behind and a part of himself.

"Now that I have taken over the job as President, I will continue to carry out along in his footsteps. If I can do just half the job Al has done, this club will remain among the top in the world, with a QSL program which is hard to beat.

"Now to change the subject a little bit. I have had many people ask how come they don't hear ET3USA on 80, 75 and 10 meters. Well, I guess one of the reasons is the lack of antennas. The other being very poor band conditions here. I for one would like to see these bands being used because I know there are many hams looking for rare DX stations on these bands and I will do my best to see that ET3USA will be among these DX stations on 80, 75 and 10 meters.

"Also, at this time I would like to say that if there are any hams who would like a special schedule with ET3USA to feel free to write me or any of the other operators at any time on this matter or any other matter. All the members of the club are willing and able to set up any kind of QSO with you. I would like to mention that we do not have any equipment for 6 and 2 meters. The address for the club is ET3USA, OP: Jim, APO, New York 09843.

"Another thing I would like to bring up is the discourtesy which some hams have shown us in the past. Any ham who causes us needless QRM, for example, calling on frequency during a QSO, or anything along that line will have his call taken and posted next to the equipment, and at no time in the future will a QSO be made with that operator. This may sound mean or harsh, but the way I look at it, that one LID has caused us to lose five or more QSOs with other hams who had the courtesy to wait.

"In closing I would like to say that I will try my best to be the ideal ham by bringing good DX from Ethiopia and that the WPX hunters will not be disappointed with our new prefixes of 9E3 and 9F3."

160 Meter DX Tests

The annual trans-Atlantic and World-Wide DX Tests on 160 meters will be held as follows: Dec. 5 and 19; Jan. 2 and 16; Feb. 6 and 20.

Radio Club Venezolano Award

A special series of 160 meter tests will be held also, for "First Timers" as follows:

Europe and Africa—Dec. 19 and Feb. 6.

W/VE/North America—Jan. 9 and Mar. 7.

All those in these areas who have previously worked 160 meter DX will please QRT and let the boys who have never worked real DX on 160 enjoy a clear field, without QRM from the "big boys" and regulars. See last month's column for full details.

DX Awards

Korean Amateur Radio League

The Korean Amateur Radio League has established the HM Award (HMA) and All Seoul Award (ASA), available to any licensed amateur. The HMA is issued in five classes for Korean contacts as follows: HMA-K—Five HM's; HMA-O—Ten HM's; HMA-R—Twenty HM's; HMA-E—Thirty HM's; HMA-A—50 HM's.

The ASA requires 9 confirmed QSO's with HM stations in all 9 districts of Seoul, the capital city of South Korea. The 9 districts and their Korea Districts Number (KDN) appear on HM QSL's issued after May 1, 1965 and are as follows:

A-11	Chongrokoo	A-16	Seodaemoonkoo
A-12	Choongkoo	A-17	Mapokoo
A-13	Seongdongkoo	A-18	Yongsankoo
A-14	Dongdaemoonkoo	A-19	Yongdungpokoo
A-15	Seongbookkoo		

All contacts must have been made after July 1, 1959 with any HM station with the following exceptions: 1—Ex-HL9TA (now HMØHQ) in 1959 and 1960 counts

The presentation of the winner's trophy during the first "Foxhunt" ever held in Hong Kong. Left to right VS6BJ and VS6FF winning team, VS6FO and VS6FJ winners up and VS6DS chairman.

Joe, LU9DM, is very active on all bands from this neat station.

as HMØHQ. 2—HMØHL operated by HL9 in 1964 is not effective.

Any single band and/or single mode operation will be noted on the certificate on request. A minimum report of R3 T8 is required. QSL's or GCR and full log data with 10 IRC's should be sent to: KARL, Central Box 162, Seoul, Korea.

Radio Club Venezuelano

Two new awards are available to amateurs working 200 countries (DX-200 Award) or 300 countries (DX-300 Award). Endorsements are available for the DX-200 for 225, 250 and 275 countries. ARRL Countries list is used, and the certificates are issued in three classes: 1. General (mixed); 2. All Phone; and 3. 2 Way SSB Only.

Submit ARRL form "CD-11" indicating your country total or indicate issue and page in QST showing your country total. This only applies for classes 1 and 2 above.

For class 3, 2 Way SSB, submit the equivalent form (or photocopy) issued by CQ or indicate issue and page in CQ showing your 2 X SSB total.

In the absence of either of the above, *all* QSL's must be sent accompanied by list in order of prefix giving full log data. Include sufficient postage for Registered Mail return of cards.

Fee for DX-200 and DX-300 is $1.00 or 10 IRC's. Compliance with all license restrictions and rules of good sportsmanship are mandatory. Applications should be sent to: Radio Club Venezuelano, Comision de DX, P.O. Box 2285, Caracas, Venezuela, S.A.

QTHs and QSL Managers

BY4SK	via W4ECI.
CR7BJ	Box 1, Milange, Mozambique.
DJØAA	via G2DHV.
DJØLJ	via G2DHV.
DL5AC	via K8UZA.
EA3OT	via WB6BSJ 1597 Minerva Ave., Anaheim, Calif.
HC6GM	Box 374. Latacunga, Ecuador.
HL9KT	via K8UZA.
HM9AP	via K6ZDL.
KA2AC	via K8UZA.
KG4AA	via W4ORT.
KG6IF	via W6ANB.
KW6EJ	via W2CTN.
M1AC	via K8UZA.
ON5ZQ	via G2DHV.
ON8IR	via G2DHV.
PA9DHV	via G2DHV.
PY2BZD/PYØ	W/VE via K2HLB. Others via Box 19094, Sao Paulo, Brazil.
PZ1BK	Box 160, Paramaribo, Surinam.
VP2MN	via W6FET.
VP2SJ	via VE4OX.
VP3MU	via W2FKQ.
VP5AR	via WA8GUA.
VR4CR	Box 619, Honiara, Solomon Islands.
W9WNV/8F3	via W4ECI.
ZC4MO	Club Station, RAF, Troodos, Cyprus.
3A2CK	via G2DHV.
5VZ8CM	via W1YDO.
9A1AC	via K8UZA.

73, Urb

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

November	**27-28**	**CQ WW DX C.W.**
December	4-5	OK DX C.W.
December	4-5	New England Party
January	8-9	ARRL VHF SS
January	8-10	Arkansas Party
January	15-16	ARRL CD C.W.
January	22-23	ARRL CD Phone
January	29-30	Louisiana Party
January	**29-30**	**CQ WW 160 DX**

OK DX C.W.

Starts: 0000 GMT Sunday, December 5
Ends: 2400 GMT Sunday, December 5

This is a world wide type contest, each contact counts 1 point, but 3 points if it's with a Czech station. The multiplier is determined by the number of prefixes worked. (*CQ* WPX list)

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

Complete rules in last month's CALENDAR.

Logs go to: Central Radio Club, Post Box 69, Prague 1, Czechoslovakia. Mailing deadline is January 15, 1966.

New England QSO Party

Three operating periods. (EST)
7:00 to 11:00 p.m. Saturday, December 4
7:00 to 11:00 a.m. Sunday, December 5
7:00 to 11:00 p.m. Sunday, December 5

This announcement was received too late to give complete details but rules are same as last year and can be found in the December 1964 issue.

Operation is restricted to stations in New England only.

Logs go to: Connecticut Wireless Ass'n. c/o Pete Chamalian, W1BGD, 111 Buena Vista Road, West Hartford, Conn. 06107. Mailing deadline is January 11, 1966.

Arkansas QSO Party

Starts: 2200 GMT Saturday, January 8
Ends: 0400 GMT Monday, January 10

Complete rules and operating frequencies in next month's CALENDAR.

CQ WW 160 DX

Starts: 0200 GMT Saturday, January 29.
9 p.m. EST Friday, January 28.
Ends: 1400 GMT Sunday, January 30.
9 a.m. EST Sunday, January 30.

It doesn't seem 7 years ago that yours truly got together with Charlie O'Brien, W2EQS and got this "Little Gem" going on 160. But here we are going into our 7th year and the participation is steadily going up, 1,374 by actual count last year, with 270 logs from 26 countries. Charlie our Contest Chairman has done a wonderful job in making this the "biggest little contest in the world." (See the August issue for a full report on the last one.)

Since the top scores were pretty evenly divided as to U.S. areas and countries, we are leaving the rules alone.

1. This is a c.w. contest *only*. (No c.w. to phone or cross band contacts allowed.)

2. For W/VE/VO stations: Contacts with other W/VE/VO stations, 2 points per QSO. Contacts with all other countries, 10 points per QSO.

3. For all other countries: 2 points per QSO with stations in the same country, 5 points per QSO with stations in other countries; except for contacts with W/VE/VO stations, which will count 10 points.

4. For all stations: A multiplier of one (1) for each state, Canadian province or foreign country worked.

5. Final score: Total QSO points multiplied by the total multiplier.

6. Exchange: RST report plus a progressive contact number starting with 001 for the first contact, followed by your state or province. (It will not be necessary for DX stations to send their country, that's quite obvious.) (i.e.: W1BB/1 579001 Mass.)

7. Disqualifications: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of this contest, or unsportsmanship conduct, or taking credit for duplicate contacts in excess of 3 percent of the total number of contacts made, will be deemed sufficient cause for disqualification.

You can thank Barbara Plomitallo for your 1964 certificate. "Bobbie" typed over 700 odd certificates for our last World Wide DX Contest.

*14 Sherwood Road, Stamford, Conn. 06905.

CALENDAR OF EVENTS – SPRING 1966

Established Dates[1]			*Suggested Dates* *International*[2]	*Domestic*[3]
January	8-9	ARRL VHF SS	—	—
January	8-9	*Arkansas Party		
January	15-16	ARRL CD C.W.	—	—
January	22-23	ARRL CD Phone	—	VE 1 Contest
January	**29-30**	**CQ WW 160 DX**	—	*Louisiana Party
February	5-6	—	REF C.W.	Tennessee Party
February	12-13	ARRL DX Phone	—	—
February	12-13	*N.Y.C.-L.I. Party		
February	19-20	QCWA Party	—	*Vermont Party
February	19-20	YL/OM Phone	—	—
February	26-27	ARRL DX C.W.	—	—
March	5-6	YL/OM C.W.	REF Phone	—
March	12-13	ARRL DX Phone	—	—
March	19-20	RSGB BERU	—	—
March	26-27	ARRL DX C.W.	—	—
April	2-3	—	SP DX C.W.	Florida Party
April	9-10	(EASTER)	—	—
April	**16-17**	**CQWW DX SSB**	—	Connecticut Party
April	16-17	ARRL CD C.W.	—	—
April	23-24	ARRL CD Phone	PACC CW/Phone	Missouri Party
April 30-May	**1**	**CQ Spring VHF**	*Helvetia 22	—
May	7-8	—	USSR DX	—
May	14-15	—	OZ CCA C.W.	Georgia Party
May	21-22	—	Bermuda Party	—
May	21-22	—	*YL Int. SSB	—
May	28-29	—	OZ CCA Phone	—
June	4-5	CHC/FHC/HTH Party	—	—
June	4-5	National Field Day	—	—
June	11-12	ARRL VHF Party	Bermuda Party	—
June	18-19	—	—	—
June	25-26	ARRL Field Day	—	—
July	2-3	Venezuelan Contest	—	—

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

Certificates to the Top station in each State, Canadian province and foreign country. If participation warrants 2nd and 3rd place awards may be made.

Log sheets and United States Operating Regulations for 160 may be obtained from *CQ* upon request. A large s.a.s.e. please.

Mailing deadline for your logs is Feb. 28th and they go to: *CQ*, Att: 160 Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y.

Louisiana QSO Party

Starts: 1400 GMT Saturday, January 29.
Ends: 2200 GMT Sunday, January 30.

This is the first annual Louisiana QSO Party sponsored by the Lafayette Amateur Radio Club.

Use all bands and modes, c.w. and phone, a.m. and s.s.b. being classified as phone.

Exchange: QSO number, RS/RST and QTH. Parishes for Louisiana stations, state, provinces and country for all others.

Scoring: Each contact counts 1 point. The same station can be worked and counted for QSO points on each band and each mode. Louisiana stations can also work in-state stations for QSO points.

[1]The established dates above are those that have already been officially announced or established by previous activity in past years.
[2]The International suggested dates are based on previous years and with some slight changes to avoid past conflicts.
[3]Most of the State Parties also follow previous dates. Trying to avoid other activities is a rather difficult problem.
*Activities that have already been announced.

Final Score: Total QSO points multiplied by number of different Louisiana parishes worked. Louisiana stations will use states, Canadian provinces and countries as their multiplier.

Frequencies: Suggested spots are: 3600, 3910, 7100, 7230, 14100, 14300, 21100, 21400, 28100 and 28700 kc.

Log Data: Date/time in GMT, station worked exchange sent and received, band, mode and score.

Awards: Certificates to the Top score in each State, call area in Canada and each country. In Louisiana certificates will be issued to the 1st, 2nd and 3rd place winners. (Note: A minimum score of 50 points is required to be eligible for an award.)

Logs must be postmarked no later than February 28th and they go to: Louisiana QSO Party, c/o Bill Allen, W5NQR, 155 Karen Drive, Lafayette, Louisiana, 70503.

Editor's Notes

At this writing we are anticipating the coming World Wide DX Contest. And by the time you read this they will probably be all over and once again we on the committee will have months of hard work ahead of us. By the way requests for log forms have been rolling in this one promises to be the biggest year yet. Anticipating this mountainous task we are adding two additional members to our working committee, Fred Capossela, W2IWC and Andrew Bodony, WB2CKS. Freddie is an avid contest man with years of experience behind him, Andy not only has years of experience but is also an authority on European contest procedures. Both should be of great assistance to us and perhaps lighten the load a bit this year.

[*Continued on page 96*]

Propagation

BY GEORGE JACOBS,* W3ASK

SOME 10 meter DX openings are forecast for December, generally to southern and tropical areas, during the daylight hours. Good 15 meter DX openings are expected to most areas of the world during the daylight hours, with signals often exceptionally strong. Twenty meters is expected to open for DX shortly after sunrise, and remain open to one area of the world or another through the daylight hours and into the early evening. When propagation conditions are better than normal, 20 meters is likely to remain open to southern and tropical areas during the hours of darkness as well.

With static levels at seasonally low values in the northern hemisphere, and the hours of darkness at a maximum, a considerable improvement in DX propagation conditions is predicted for 40, 80 and 160 meters during December. Forty meters is expected to open for DX during the early afternoon hours, and remain open to one area of the world or another during the hours of darkness and the early daylight hours. Frequent 80 meter openings are forecast to many areas of the world during the hours of darkness. Some DX openings are also expected on 160 meters during the hours of darkness, with signals peaking when it is dark at one end of a path, and sunset or sunrise at the other.

160 Meter Tests

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

"Again, reminiscent and symbolic of the first pioneering trans-Atlantic radio crossings by Marconi, Deloy, Schnell, Reinartz and Godley between 1901 and 1924, and continuing a yearly operating activity on 160 meters established in 1932 and held every year since (except during World War II), the Annual Trans-Atlantic and Worldwide "Top-Band" DX Tests will be held between 0500-0730 GMT on the following Sundays: December 5 and 19, January 2 and 15, and February 6 and 20. During these Test periods, special efforts will be made to establish new records on 160 meters. W/VE stations should call "CQ DX Test" the first five minutes of the hour, and alternate periods thereafter, listening between periods. DX stations should call "CQ DX Test" during the 2nd, 4th, 6th, etc. five minute period, listening between periods.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for December

	Forecast Rating & Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **3, 13-14, 28-29**	A	A-B	B-C	C
Normal: **1-2, 4-6, 11-12, 15, 17-18, 21, 25-27, 30-31**	A-B	B-C	C-D	D-E
Below Normal: **7, 9-10, 16, 19-20, 22, 24**	C	C-D	D	E
Disturbed: **8, 23**	D	D-E	E	E

How To Use These Charts

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

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

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

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

4—This month's DX Propagation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 1000 watts d.s.b. into a dipole antenna a quarter-wave above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

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

6—The Eastern USA chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through Dec. 31, 1965, and are prepared from basic propaganda data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

As far as possible, stations participating in the Test transmissions should use the following frequency plan; Eastern W and VE stations, 1800-1825 kc; western W and VE stations, 1975-2000 kc; European stations, 1825-1830 kc; VK and ZL stations, 1800-1860 kc; Japanese stations, 1880 kc; African stations 1800-1825 kc. These Trans-Atlantic Tests are exciting, and all radio amateurs are reminded to be alert for unusual DX openings *anywhere* over paths that are in total darkness, or when it is dark on one end of the path, and sunset or sunrise at the other. Remember, these Tests are not contests! They are conducted for pleasure in an unusual operating

activity, without competition, and to develop some propagation information, which may make a worthwhile contribution to the art of radio. W/VE stations should send their Test reports directly to W1BB after *each* Test period. W1BB's QTH is Stewart S. Perry, 36 Pleasant Street, Winthrop, Mass. British stations should send their reports to G6QB, "Tommy" Thomas, DX Editor *SWM*, 49 Winchelsea Lane, Hastings, Sussex, England. Other DX stations can send their reports to either W1BB or G6QB."

V.h.f. Ionospheric Openings

There is a tendency for sporadic-E propagation to reach a minor seasonal peak during December (the major peak occurs during the early summer months). This may result in some short-skip openings on 10 and 6 meters, between distances of approximately 800 and 1400 miles. An interesting letter has been received from Pat Dyer, WA5IYX, who, as a senior in High School, is conducting a sporadic-E research program. Pat would like to hear from other radio amateurs who may be interested in participating in this program. His QTH is 279 Lark Avenue, San Antonio, Texas 78228.

A major meteor shower, the Geminids, should take place during the second week of December. Short-skip v.h.f. openings may be possible for distances up to approximately 1000 miles during this period as a result of ionization produced by the meteors as they enter the earth's atmosphere.

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

Sunspot Cycle

The Zurich Observatory reports a monthly average sunspot number of 16.3 for September, 1965. This results in a smoothed running number of 12.7, centered on March, 1965. The sunspot cycle is rising very slowly from the minimum value of 9.7, which occurred during October, 1964. A smoothed sunspot number of 25 is predicted for December, 1965.

This month's column contains DX *Propagation Charts* for December, 1965 and January, 1966. Short-Skip *Charts* for December appeared in last month's column.

The Editor of this column would like to take this opportunity to extend the warmest of wishes to readers of this column for a Merry Christmas and a very Happy New Year.

73, George, W3ASK

CQ DX Propagation Charts

DECEMBER 1965 & JANUARY 1966

Time Zone: EST (24-hour Time)

Eastern USA To:

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

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

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

Mc-Murdo Sound, Antarctica	08-11 (1)* 07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 15-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-03 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

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

CENTRAL USA TO:

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

Time Zone: PST (24-hour Time)

WESTERN USA TO:

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

*Predicted 10 meter openings, all others in column are 15 meter openings.
†Predicted 160 meter openings, all others in column are 80 meter openings.

[*Continued on page 96*]

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

SEPTEMBER 25, 1965 was a big day for the amateurs of the San Francisco Bay area of California and v.h.f. in general. Not only were the 432 mc moonbounce tests of WA6LET at Stanford University a success, but two members of the Bay Area U.H.F. Society broke the 5650 mc distance record on the same day! Here is how they reported it:

"At about 1435 GMT the moon peeked over the horizon at Menlo Park, California, and WA6LET heard its first echoes. The initial station heard was K2MWA/2 at 1439 GMT, but a successful two-way contact was not established until WA6LET worked W3SDZ at 1501 GMT. In all, a total of eleven stations were worked two-way."

"WA6LET left the air at 1945 GMT to make the dish available for a radio astronomy project." (This was earlier than expected and reduced their chances of working VK2ATN with a moonrise time of 2054 to zero.) "All contacts were A-1."

"The moonbounce equipment was the combined effort of the Stanford Research Institute Amateur Radio Society, WA6LET and the Bay Area U.H.F. Society, W6GD.

"The electronic equipment consisted of a c.w.-s.s.b. exciter system consisting of an HX-30 (with 50 mc output), into a 5894 mixer with 432 mc output, driving a 4X150 linear amplifier (K6HCP). The final was borrowed from Willie Sayer, WA6BAN, and consisted of a pair of Eimac 4CPX250K tetrodes in a linear that measured 600 to 700 watts output. The receiver system started with a 1.2 db-noise-figure paramp, WB6FSC and K6IMZ. The converter was a Parks Electronics 432 mc transistor job with a 4 db noise figure which was loaned to us by W7UHF/6. Three h.f. receivers were used as i.f.'s from the same 432 mc converter: a Collins 75A3 (K6HCP), a Drake R4 (WB6FSC) and a Collins 51J4 (WA6LET).

"The use of the three h.f. receivers for i.f.'s turned out to be a great asset, as three operators can be searching around for signals. Also, each receiver can have a different bandwidth for different search rates."

"We were able to use Stanford Research Institute's 150 foot dish.

"Later on the same day WB6JZY and WA6KKK positioned themselves on Copernicus Peak (Mt. Hamilton) and Sentinel Dome (Yosemite) respectively to easily break the 5900 mc record. Jack Trollman, WB6JZY and Glen Tomlin, WA6KKK made the 120 mile

*c/o Allen Katz, K2UYH, 48 Cumberland Avenue, Verona, New Jersey, 07462.

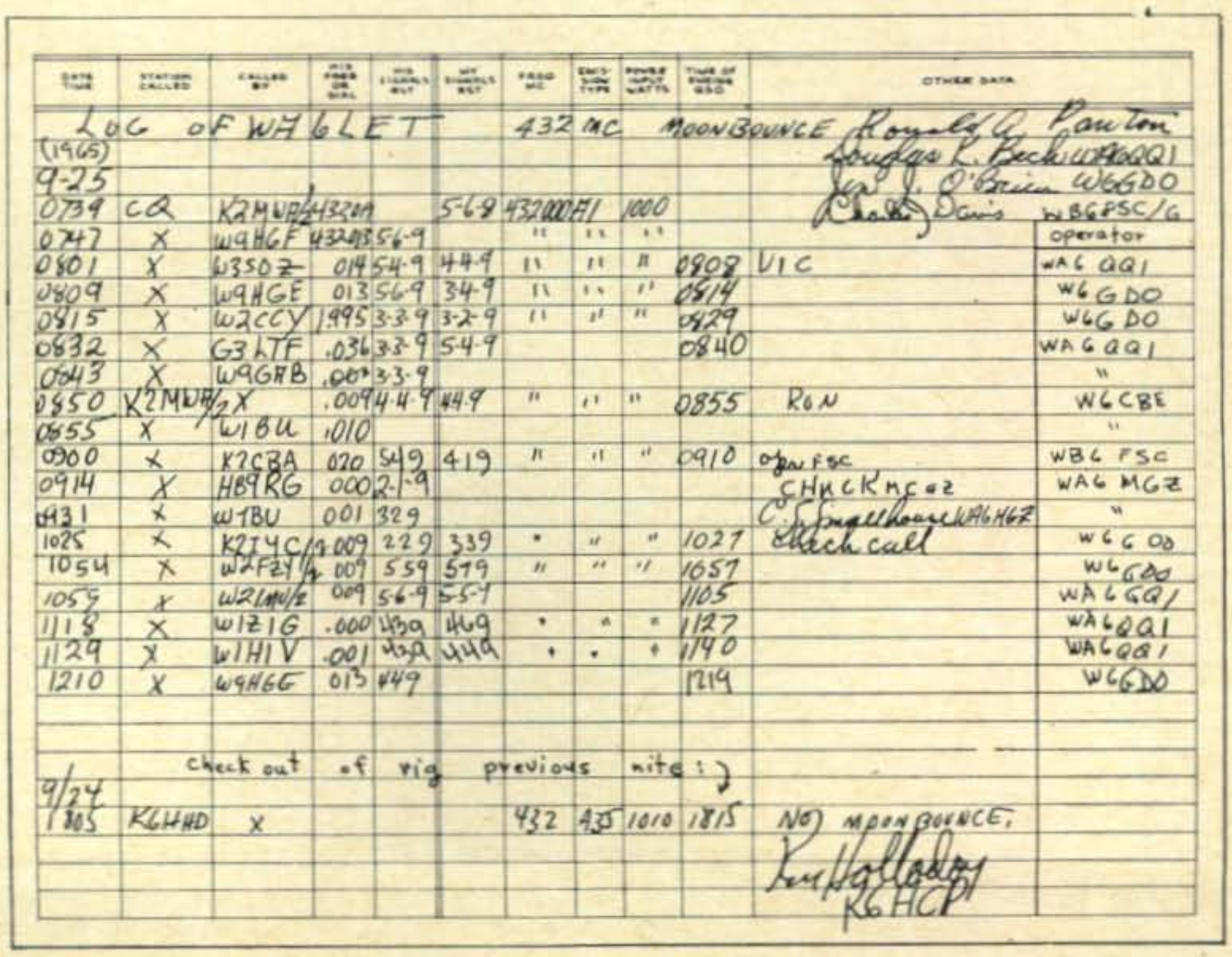
New VHF Century Club Members

Six Meters

WA8BGU 315
WA8BGU 316
WA8BGU 317
WA5AUA 318
WA4WQK 319
WA8BGU 320
WA4WQC 321
K1ZGH 322
WA8BGU 323
K7HBO 324
K3CYD 325
WA9DGZ 326
WB6LBS 327
WA4BMC 328

Two Meters

WA2ZPD 224
WA8LLY 225
WB2PEY 226
HG5KDQ 227
JA3FRC 228
K2MPT 229
DJ8PK 230
DJ5OI 231
WA9NGB 232



LOG OF WA6LET — 432 MC MOONBOUNCE — Ronald G. Paulton, Douglas L. Beck WA6QQ1, Jay J. O'Brien W6GDO, Charles Davis WB6FSC/6

DATE TIME	STATION CALLED	CALLED BY	HOW POWER OR SIGNAL	HOW COPIED OUT	HOW SIGNALS OUT	FREQ MC	EMIS SION TYPE	POWER INPUT WATTS	TIME OF FINISH GMT	OTHER DATA	
(1965)											operator
9-25											
0739	CQ	K2MWA/2 432 MC			5-6-9	432.000	FM	1000			
0747	X	W9HGF	432	03	5-6-9	"	"	"			WA6QQ1
0801	X	W3SDZ	014	54-9	44-9	"	"	"	0808	VIC	W6GDO
0809	X	W9HGE	013	56-9	34-9	"	"	"	0814		W6GDO
0815	X	W2CCY	1.995	3-3-9	3-2-9	"	"	"	0829		WA6QQ1
0832	X	G3LTF	.036	33-9	54-9				0840		"
0843	X	W9GFB	.00?	33-9							WB6CBE
0850	K2MWA/2 X		.009	44-9	44-9	"	"	"	0855	R6N	"
0855	X	W1BU	.010								WB6FSC
0900	X	K2CBA	020	54-9	419	"	"	"	0910	ops FSC & HUCK MC 62	WA6MGZ
0914	X	HB9RG	000	2-1-9						C. Engelhaupt WA6HGZ	"
0931	X	W1BU	001	329						check call	W6GDO
1025	X	K2IYC/3	.009	229	339	"	"	"	1027		W6GDO
1054	X	W2FZY/2	009	559	579	"	"	"	1057		WA6QQ1
1059	X	W2LMN/2	009	56-9	55-9				1105		WA6QQ1
1118	X	W1ZIG	.000	439	469	"	"	"	1127		WA6QQ1
1129	X	W1HIV	.001	439	449	"	"	"	1140		WA6QQ1
1210	X	W9HGG	013	449					1219		W6GDO
		check out of rig previous nite :)									
9/27 1305	KG4HD	X				432	A3	1010	1815	NO MOONBOUNCE. Ken Holladay K6HCP	

The record-breaking log at WA6LET for Sept. 25, 1965. Group used Stanford Research Institute's 150' parabolic for these successful tests. Although signals were not as spectacular as KP4BPZ's at Arecibo, two group members broke the 5650 mc DX record plus establishing moonbounce hamming as a practical reality—if you have a research institute handy.

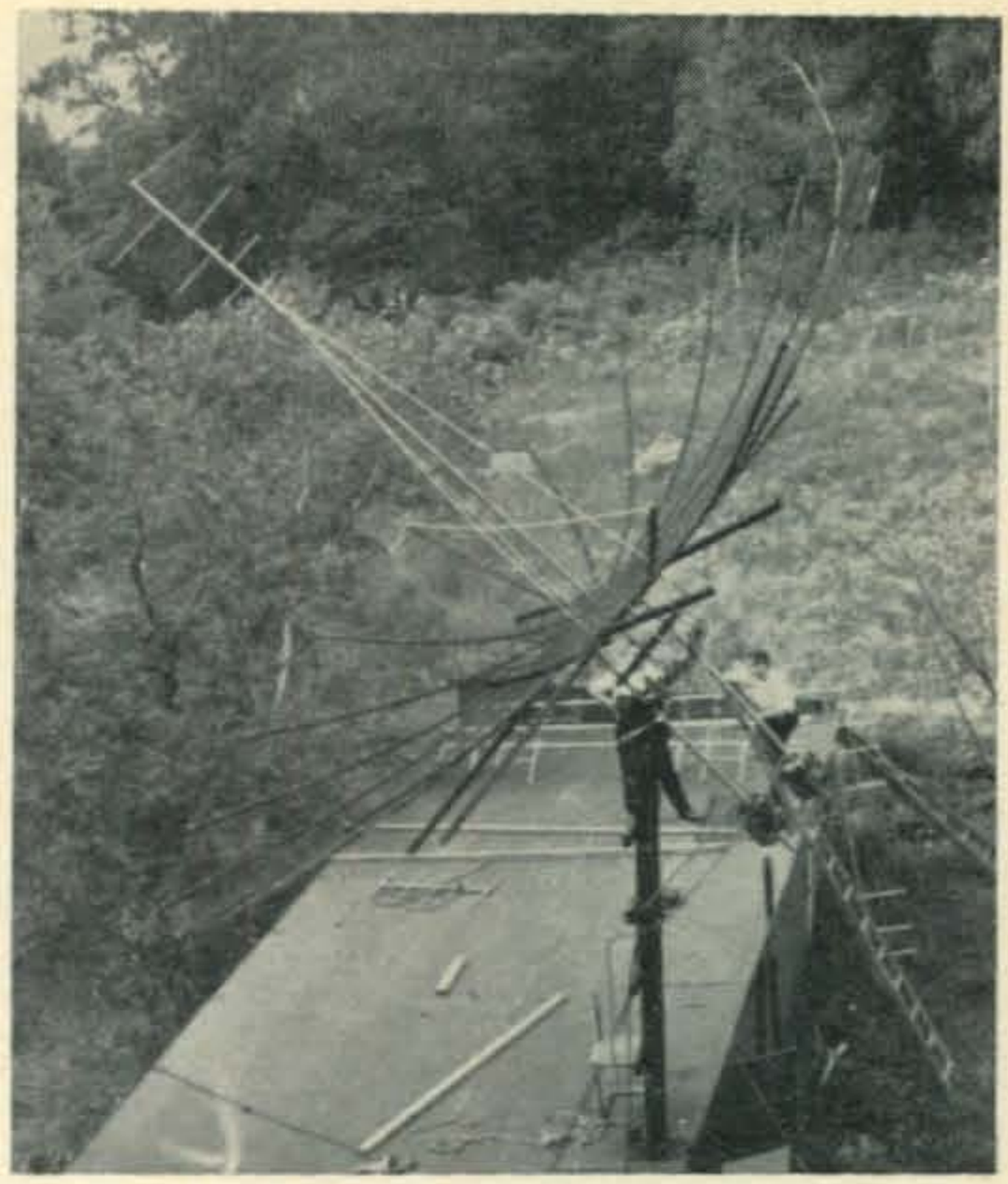
two-way contact about 15 minutes after setup of the 5900 mc gear on F2, and then changed modes to rebreak the record on F3. Will Jensby, WA6BQO, assisted at the Copernicus peak end." *In all, quite a day for v.h.f.!*

Syracuse Report

Things looked dark for a time, but we (K2UYH) did finally make it to the Syracuse V.H.F. Roundup! Fred, WA2FSQ, our co-driver, came down with a cold at the last moment. Due to the resultant last-minute confusion we did not leave until 6:00 a.m. the next day (Saturday), which meant a 5-hour trip up and a 5-hour trip back—all on the same day. Sunday had already been reserved for work. The Roundup, however, we can assure you, was well worth the effort.

Shortly after receiving local directions from W1OOP (who was also mobile enroute to the gathering) we arrived at our destination, the Three Rivers Inn. Immediately we began trading ideas with the fellows there. In my opinion these talk sessions are the most rewarding aspect of any v.h.f. conclave. The chance to talk face-to-face and hear other amateur's plans and ideas is invaluable.

Syracuse attracts the "tops in v.h.f. radio." Practically every moonbounce enthusiast on the east side of the Mississippi was present. We spent a considerable amount of time talking with Tom Sly, K2QRX. Tom is one of the few stations in this country seriously working with two meter moonbounce. Using an array consisting of 4 ten-element yagis, Tom has received his own echoes, and has just recently started maintaining skeds with W6DNG. Though moonbounce is marginal on two meters, we expect that Tom will succeed due both to the precision and practicability of the way he is approaching the project. We tried to persuade him to use the weak-signal detection system we have been experimenting, with which supplies gain by integration and applies a modified Dicke system (used in radio astronomy) for gain stability. Use of such a system should take two meter moonbounce out of the realm of the "marginal."



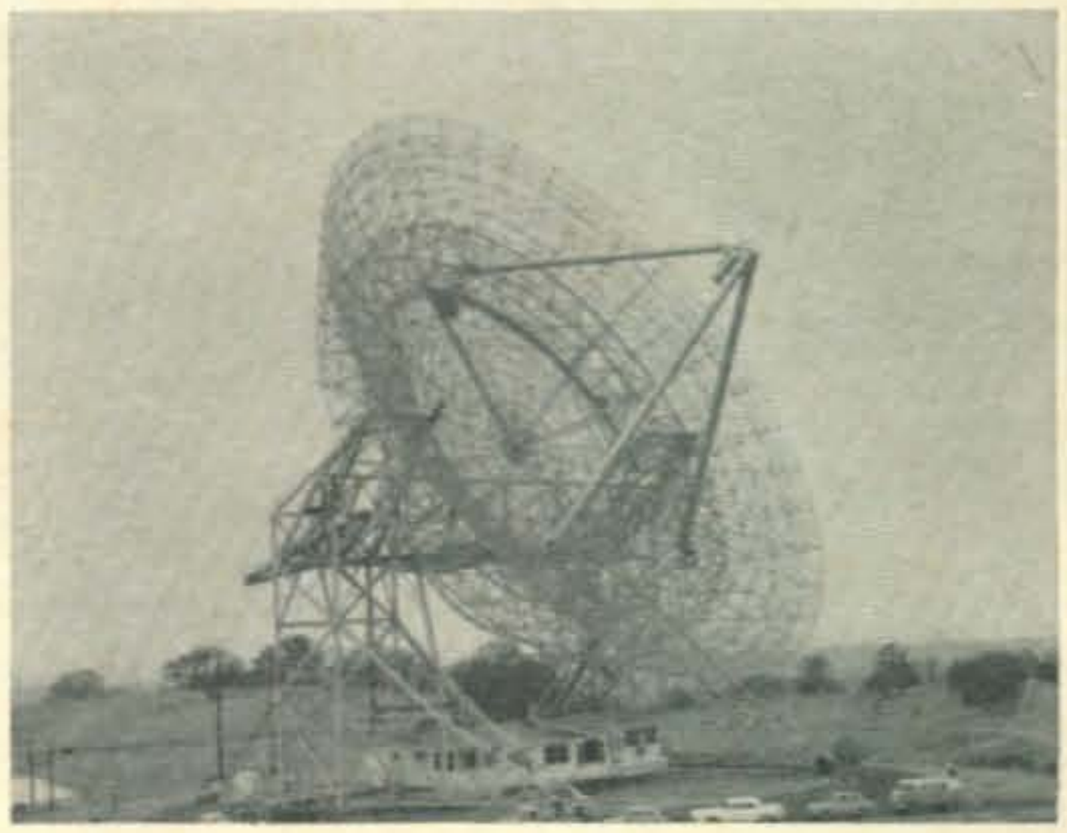
Visitor inspects K2UYH's new moonbounce dish at Oak Ridge, N.J.

Technical Program

The first speaker, whom we nearly missed by being engrossed in our conversation with K2QRX, was Fred Collins, W1FRR. Fred spoke about the fantastic advances being made by solid-state devices on the v.h.f.-u.h.f. scene. Much of his talk was concerned with varactor multipliers—a device with which Fred is intimately connected by his work for Microwave Associates, Inc. Of particular interest was a 432-to-1296 mc varactor tripler using lumped components (no cavities). We obtained a schematic of the unit and Fred promised to send pictures. So you can expect construction information on this device next month. Fred also mentioned that Microwave Associates is still supplying varactors "for hams only" at a price of 10 dollars.

The next speaker on the roster was Henry Cross, W1OOP, a close friend of both W1FZJ and KP4BPZ and a moonbounce expert in his

You'd be excited too if you were hearing HB9RG & G3LTF on 432. Bottom to top, behold WA6MGZ, W6CBE, K6HCP and an interested observer operating WA6LET on Sept. 25.



Here's the monster responsible for the big 432 moonbouncing affair on Sept. 25. It is Stanford Research Institute's 150' tiltable parabolic, into which WA6LET rammed 1000 watts. Europe on ¾ meters?!

Here's Fred Collins, W1FRR, delivering his "Solid State & VHF" presentation at Syracuse on Oct. 2nd. (Photo by K2AVA).

own right. Henry described the 1000 foot dish at Arecibo and gave the inside story of its operation for amateur purposes. One point he mentioned which kind of jarred us was the fact that when the multi-megawatt transmitters at Arecibo are used on the moon, not only is it possible to hear one echo, but a second (the signal bounced off the moon, off the earth, and off the moon again) can also be received . . . *that* is what we call a signal! At the end of his talk, Henry played tapes made at Arecibo during the 432 mc moonbounce tests of July 3 and 24 of this year.

Project Oscar

The final speaker was Nick Marshall, W6OLO, who gave an excellent talk on the history of Project Oscar supplemented by color slides. It might interest you that the idea of Project Oscar was born on the pages of *CQ* in an article by Don Stoner, W6TNS, who for a time acted as v.h.f. columnist.

The Evening

Before the banquet we spent most of our time talking with Vic, W3SDZ, so much so that we were nearly late for the dinner. Vic had tapes of his 432 mc moonbounce contacts with KP4BPZ and WA6LET and supplied us with much information on his own moonbounce efforts. After the meal, awards were presented to the highest scoring multi-operator stations in the nation and Western New York section for the June ARRL V.H.F. Contest. (W1MHL and W2WEB won the awards respectively.) Next, the door prizes were awarded. (I believe that Fred, W1FRR, took First Prize—How is that for luck?) Finally came the floor show which was said to be first rate. However, considering the distance ahead of us and the rigours of the day, we decided to leave early. As it was, we did not arive home before the wee hours of the morning.

Hope to see more of you at Syracuse next year.

On The WA6LET Tests

Victor Michael, W3SDZ, Milton, Pa: "The WA6LET tests have proved that the 'honeymoon is over' or moonbounce is difficult with amateur techniques even if you have a 150 foot dish. A total of seven different stations made it although 11 calls were used for contacts. It seems that troubles were part of the problem at Stanford. I talked with the crew by telephone during and after the tests, and they are not sure they were tracking the moon accurately during the test. I know their signal improved a good bit from the time I worked them at 1500 GMT until the signal was strongest at about 1900 GMT to about 1945 GMT when they signed off.

"I think this again points up the fact that for celestial tracking an el-az type of mount is most difficult to use. It requires a computer to get even technical tracking. With my polar mounted antenna, I was able to run the dish ahead in our angle and check sun noise to be sure the antenna was aiming properly. For instance, the crew in California were concerned that they were having problems with refraction of the signal through the atmosphere. Whether or not this is a problem I don't know (I've been told it isn't) but having the sun to check on solves the problem.

"We had excellent tracking on Sat. In fact, we ran some tests (quick echo) and were pleasantly surprised to find our own echoes coming back. They are not loud, but I do have them on tape.

"The reason I didn't continue the echo tests on Sat. was that we blew a screen bypass in the final amplifier and shorted out one tube when we really tried to push the final amplifier up.

"Speaking of the new final, it works real well. We are developing 62% efficiency at 600 watts output. For the California tests we were running about 450 watts out to be sure everything would hold up. We have been able to measure as much as 1100 watts output from the amplifier with everything running wide open. It is using 8122's (RCA) in push-pull with half-wave lines.

"I'm not satisfied that I'm getting the maximum results I may eventually be able to get

[*Continued on page 98*]

VHF DX RECORDS

The following represent the greatest confirmed distance records established by amateurs for two-way communications.

50 Mc
12,000 m.· LU3EX–JA6FR, March 24, 1956.

144 Mc
5250 m.: OH1NL–W6DNG,* April 11, 1964.

220 Mc
2540 m.: W6NLZ–KH6UK, June 22, 1959.

420 Mc
5092 m.: KH6UK–W1BU,* July 31, 1964.

1215 Mc
5092 m.: KH6UK–W1BU*, Aug. 9, 1962.

2300 Mc
170 m.: W1EHF/1–W2BVU/1, July 1963.

3300 Mc
190 m.: W6IFE/6—W6VIX/6, June 9, 1956.

5650 Mc
120 m.: WB6JZY–WA6KKK, Sept. 25, 1965.

10,000 Mc
265 m.: W7JIP/7–W7LHL/7, July 31, 1960.

Above 30,000 Mc
500 feet: W6NSV/6–K6YYF/6, July 17, 1957.

*moonbounce communications.

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

THE task of trying to keep up with the state of the radio-electronics art is not an easy one today—even for those of us who make a lot of effort to do so. It seems that something new is always followed shortly by something newer. Today's grand technical achievement often turns out to be tomorrow's "old hat"—but modern day technical progress is frequently measured in very small "units" or "spurts." Some of the most spectacular breakthroughs are not always as widely publicized as they should be.

One of the most outstanding accomplishments during this century (as far as amateur radio is concerned) was the rocketing into orbit of the OSCAR series of communications satellites. OSCAR (*O*rbital *S*atellite *C*arrying *A*mateur *R*adio) was no "stunt." As more OSCAR shots follow, each will contribute still more to the stature of amateur radio and the wider use of the uncluttered v.h.f., u.h.f. and even s.h.f. bands.

As sure as the sun sets and rises, one of these days a ham *anywhere* will be able to talk to another ham *anywhere* via amateur repeater satellites.

The new OSCARS in "stationary" orbit will be sophisticated jobs and even employ the multiplex techniques which permit hundreds, lo, even thousands of channels to be made available for communication. Of course, the h.f. bands will continue to be used but most hams will use the v.h.f./u.h.f. satellites.

Can't you imagine a number of ultra-modern, long-lived OSCARS in orbit? I can!

You know, the day will surely come when it will be possible to service communications satellites via interplanetary spacecraft. Far-fetched? Not at all!

As time goes on, newer power supply systems will be available and so will v.h.f./u.h.f. high power transistors. There is really nothing to prevent the establishment of a complete system of amateur communications satellites except money. Actually, if you get right down to it, 99% of the world's active hams would no doubt contribute enough money to get up the first 3 or 4 satellites. Of course the job is a big one but not so big that it cannot be done.

What we actually need in the world today is an international amateur radio organization which will be accepted by all countries and even have a seat within the International Telecommunications Union! Amateur radio is important enough for this.

This organization would act for *all* national radio organizations on frequency allocations and other matters.

Let us hope we all see the day when we have satellites for amateur radio communications purposes in orbit and also an international organization to take care of the *world's* ham requirements.

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

More on s.w. Broadcasting

My piece in the August 1965 issue of *CQ* on shortwave broadcasting resulted in my receiving exactly 28 letters. All of these letters defended s.w. broadcasting, but many writers lost the point of my little essay. The point again is: we have too many s.w.b.c. stations! These stations *are not all* needed. Nations of the world should be limited (according to location, population and resources) to the number of stations to effectively give the world-wide coverage they seek. True, s.w. broadcasts are not all propaganda and have much news and cultural value. Also, the educational aspects of shortwave broadcasting should not be overlooked for as was pointed out to me by a reader from Venezuela, a large number of people do learn languages by listening to s.w. broadcasts, as well as many other subjects.

I wrote in my August piece that I felt that developing nations should develop their own internal communications requirements before spending a lot of money on s.w. broadcast stations which would be of doubtful value in the crowded s.w. bands as they are today.

I would hate to think that I was responsible for the installation of an expensive s.w. broadcast station when my country's overseas telephone services were either non-existent or were very inefficient.

The argument that more h.f. band space must be made available to make room for more s.w.b.c. stations is nonsense—especially when there may be some thought of chasing the hams off the few kilocycles they have. I feel that a country that encourages amateur radio operation has a great asset in technically trained people that they would not have otherwise. If amateur radio development is curtailed then a country suffers technically. The largest countries in the world encourage ham radio (especially the USA and the USSR) for they realize that the citizens who train themselves and practice the amateur radio art are more than just "hobbyists." No country in its "right mind" would prevent development of its own technical resources by curtailing a radio service (the amateur radio service) without doing harm to itself.

Show me a country with a lot of hams and I will show you a nation that has good internal as well as external communications!

I rest my case.

Questions

Integrated Circuits (IC)—"What role do you think integrated circuits (IC's) will play in the

future development of amateur and other radio equipment?"

Nice question. Well, if and when the radio ham ever gets involved in digital communication (remember our satellites!), I foresee wide usage of IC's, but for present modes of ham communication I see little need for them—unless we have some spectacular break-throughs in the high power r.f. and a.f. fields.

As everyone now knows, the IC can actually be described as a "circuit board" on which resistors, capacitors and even inductances are "cast" or "etched." Some of the IC's on the market today take a microscope to see the fine connecting wires," transistors, etc.

One of the biggest problems of course with IC's is coming up with required IC inductance for r.f. use. Most IC's are confined to computer applications now, but this does not mean that they cannot be used elsewhere.

By 1968 I predict that the progress in IC development will be so far along that devices undreamed of *today* will be available using them.

HW-32 Final Modification—Out of the hundreds of letters we receive, some kind ham sends us some good information that we can pass to others. This is the case with J. Barham (WA6-INM/KR6FR) who sends us some fine information for curing the instability of the final amplifier in Heath HW-32.

To cure the instability found in some HW-32's do the following: remove C_{63} and replace it with a miniature air variable of 25 mmf. There is plenty of room to drill a small hole on the printed circuit board. Next, remove C_{55}. Make a 2" × 5" shield out of aluminum or copper. Solder a stiff wire to the center of the shield for use as a support. Insert the wire into the *ground* side of the capacitor C_{55} position and solder to the printed circuit. The purpose of this is to shield the 12BY7 driver and the 6EA8 r.f. amplifier from the final. Then on the underneath side of the printed circuit board, solder a 680 mmf silver mica capacitor in the C_{55} position. The original C_{55} is 1300 mmf and is too much for effective neutralization. Next, remove the screen voltage from the 6GE5's by removing resistors R_{60} and R_{70} and proceed with normal neutralizing procedures. Caution: use a phenolic or plastic tuning wand to adjust the neutralizing capacitor. Thanks Jim!

Q Multiplier for the HW-32—Again from WA6-INM/KR6FR is another fine idea for the HW-32. He says: "the receiver side of the transceiver operated well within specs as published by the Heath Company, but I felt that being unable to peak the receiver r.f. amplifier was a disadvantage when digging for weak signals. In a recent article in *QST*, May 1965 ("The Miser's Dream") I was impressed with a Q-multiplier circuit and wondered how it would work with the HW-32. It was highly successful, increasing the receiver sensitivity many times. Details of the circuit appear in fig. 1. There is plenty of room to mount the components under the chassis just back of the front panel on the FUNCTION

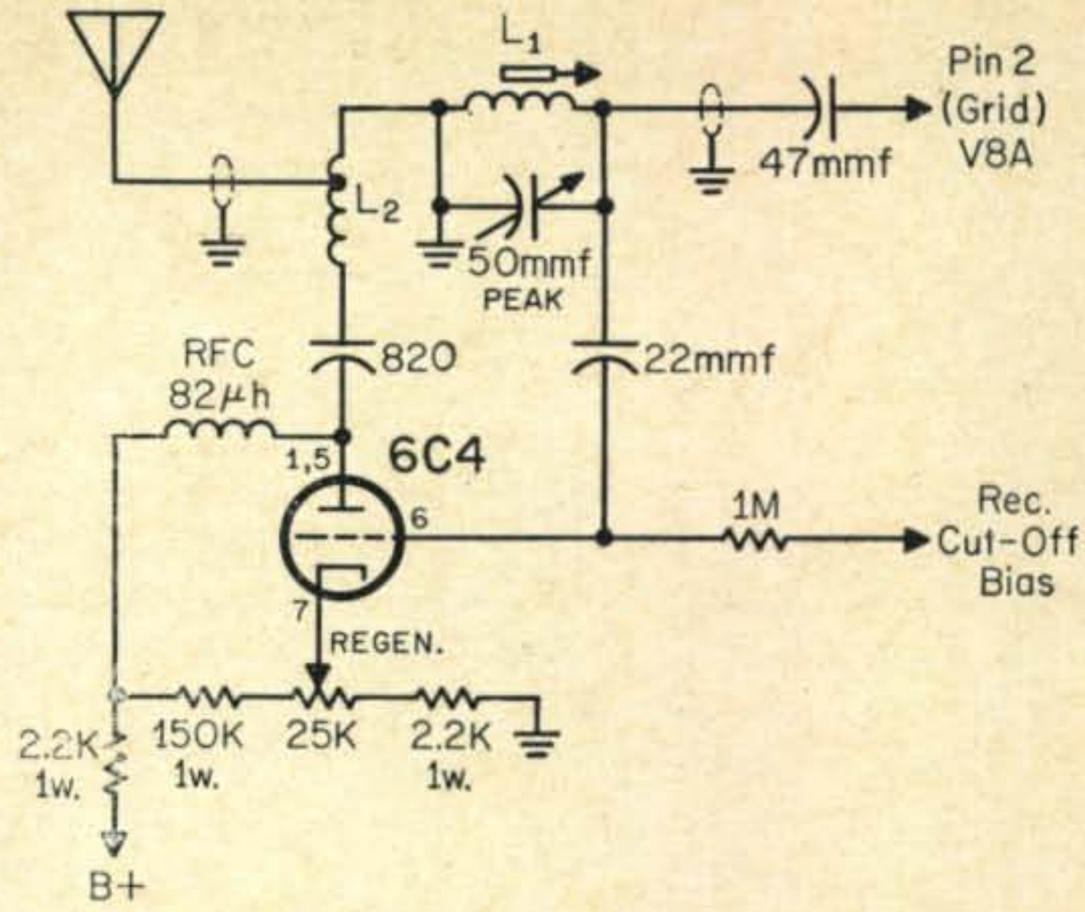


Fig. 1—Q multiplier for the Heath HW-32.

L_1—13t #22 e. spaced wire diameter on CTC coil form No. 1538 (½" diam.)
L_2—11t #28 e. close wound near L_1, tapped at 3 turns.

and R.F. GAIN side of the transceiver, with the exception of the regeneration control that is located on the opposite side. Once adjusted, there is little need to have screwdriver access to the S-meter-adjust and the vox delay controls, so these holes were enlarged to accept the peaking and regeneration controls." Thanks again Jim. I suggest that the 25K regeneration pot be a wirewound job. Also it may be wise to vary the capacitor size that is shown going to pin 2 of V_{8A}, for *your* specific installation to achieve desired results.

Fellows (and gals) do you have a couple of nice *ideas* like the two above? If you do, send them in to me so we can help out a lot of our fellow hams.

What's "75"?—"Pardon my ignorance but can you tell me what the '75' is that usually appears at the end of your column? I've heard it on the air a couple of times and I'm curious as all get-out."

After hearing a mother tell her son via phone patch "God bless you" or hearing close friends say, "well Jack, we send all of our love and God bless you all," I decided that the hams needed another signal abbreviation. So, for "may God Bless you and yours" I started using the number 75. I also started another (72) "peace and friendship in freedom." Both abbreviations save some time on c.w. and are as effective as "88's". I always use 72 when I QSO *any* foreign ham.

Joystick (Again!)—"I bought a Joystick antenna from Partridge Electronics Ltd. in England and believe you me, your recommendation wasn't far off. I live in an apartment complex in New York and I tried window verticals, an indoor doublet and a few other configurations. When I got the Joystick I was skeptical. But after hooking it up I was amazed. The other antennas I had tried in my particular location were *far* below the Joystick's performance. I was allowed to mount it on the top of the building (which I

did with a special bracket I made) and when I hooked it up to the matching network also supplied by Partridge, I was able with my KWM-2 to work Europe without the difficulty I had before. However, there is a question I'd like to ask and it is this: I am planning to buy a Henry 2K final, do you think this antenna will handle the power?

The Henry 2K final is a high efficiency linear amplifier and the reports I have received on it are absolutely excellent. It does put out the maximum power allowed by FCC regulations but the tests I have made here (in Switzerland with the help of HB9ACN) indicate that the antenna is *under-rated*—especially if it is used as an outdoor antenna. With the Joystick you have the advantage of the feeder radiating as well as the main "stick." If you are up high enough, the antenna will operate (especially on 15 and 20 meters) as well as a well-known 3 element beam with which we compared it. The tests were *operational* not "theoretical." We found that if we could hear 'em we could work 'em . . . and in most cases with 100 watts input! If you operate the Joystick as suggested by the manufacturer and have a good ground ("earthing" to the Englishman) it is hard to beat the Joystick as a simple, easily installed and non-complicated antenna, even if you have a suite in the Empire State building. I like it.

HB9XBC—"I understand that the Swiss PTT granted mobile licenses for three days to attendees to the IARC convention this year. As you were a panelist did you have a call and what was it? By the way, how was *the* convention?"

The convention was great! Thanks to the PTT I did operate mobile from HB9AEQ's mobile. My call was HB9XBC. The International Amateur Radio Club is a great organization! If you do not belong to the IARC, drop a letter to the Secretary, IARC Geneva 20, Switzerland for an application blank. Gosh, we had a lot of fun!

KWM-2 Power Supply Modification—Thanks to Doug Horner, WØHUF of Collins Radio Co. here is some information that will be of interest to KWM-2 owners. He says: "the KWM-2 will operate with the 516F-2, 516F-1, MP-1, 516E-1, 516E-2, and the PM-2 power supplies. It is only the latter power supply which underwent modification to increase the momentary supply voltage limits." The modification bulletin for the PM-2 is available by writing Collins and directing your inquiry to Doug. Ask for Bulletin No. 1 for PM-2.

Second Mixer Revision for 75A-4—A few of the earlier manufactured 75A-4's passed d.c. through the mechanical filter. This was not harmful, but should one of the pins or coils become grounded, the mechanical filter often was destroyed. There apparently are a few 75A-4's that have not been modified to prevent this. So if you have a 75A-4 and are interested in the modification, write Doug and ask him for the bulletin titled as is this paragraph. Thanks so much Doug! We know that those interested will write to you. Aside: you know, it is a *nice* thought to know that a large manufacturer of precision equipment is interested in keeping their customers posted.

1625 GG Amplifier—"I'd like to build a linear amplifier using 1625 tubes and be able to drive it with 20 watts or so. Any issues of *CQ* have information on this?"

Yes. Try the September 1960 issue for the article "A 1625 GG Linear Amplifier." Reprints of the article (as for any other available article) are obtainable from the Editor, *CQ* for $1.00. (Do *not* send your article reprint orders to HAM CLINIC!)

BC-779 Ultimate Conversion—"In what issue of *CQ* did an article on the BC-779 appear which covered a lot of modifications?"

Try the April 1961 issue of *CQ*. Other articles on the BC-779 appeared in the Sept. 1958, Oct. 1952, May 1948 issues.

Thirty

We extend our Christmas season's greetings to all of our readers, manufacture service managers who have assisted us to assist you in solving some of your knotty technical problems and to fellow hams all over the world. May 1966 be a year of peace and progression for amateur radio. 73 and 75 Chuck & Elfriede.

BY THE WAY...

Where else would this mobile amateur radio rally be held—but Wolfsburg, Germany, home of the Volkswagen. Seen entering the town is a caravan of mobile stations from all over Germany. In the distance (upper left side of photo) can be seen the Volkswagen plant.

NOVICE

WALTER G. BURDINE,* W8ZCV

I HAVE always advocated that the new amateur build his first station and get it working; he will be much better for the experience. Many are just a little afraid to try changing anything from the parts list. The value of most components can be changed as much as 25 percent in value without adversely affecting the operation or the circuit. Indeed the ratings are sometimes + or — 20 percent of the value indicated by the color code. Resistors with larger wattage ratings can always be used if you have the space. This is sometimes considered an advantage to the operation of the set. The value of resistance can be obtained by paralleling or series connecting resistors using ohms law to arrive at your value. Resistors of lower wattage rating should never be used except in an emergency, then they should be replaced with the correct replacement value as soon as possible.

Replacing open or shorted capacitors should present no problem if the correct replacement is available. Always check any resistor in the circuit bypassed by a shorted capacitor, they have usually been overloaded when the capacitor shorted. This can easily be spotted by discoloration of the resistor due to the additional load placed upon the resistor by the shorted capacitor. Always check the resistor in the circuit with an ohmmeter to see if it has changed value. The capacitor should be replaced with one of the same or larger voltage rating and the capacity rating can be anything near the value used in the original equipment. Connecting capacitors in series or parallel can solve unusual values of capacitance. Use the handbook to help you remember the formulas for building the right capacity, if you use them often you won't need the handbook after a while.

Replacing transformers can be a task but with a little ingenuity and careful planning many transmitters can be repaired to make that schedule on time. If you have a homebrew station you can use almost any available unit that will fit in the space. A better way is to disconnect the transformer leads and wire a cable into the circuit and plug in a power supply as shown in last month's column. This can furnish power for your station until you can get a replacement unit for a permanent repair. I usually build my power supply as a separate unit for ease of replacement when necessity arises. Filament transformers for high powered finals are usually placed near the tubes to reduce the voltage drop in the filament leads to the tube. High voltage can be built on another chassis to conserve space for the final tubes.

In an emergency some 400 cycle power transformers can be pressed into service as a modulation transformer. Filament transformers can be used as output transformer for emergency repair. These are tricks that have kept many hams on the air during emergency operations. They work even if they aren't the best way to do the job.

Repairing coils and inductances can be more tricky than any other part of the transmitter or receiver. Changing any parameter of the coil will change its frequency coverage. Coils can be repaired but read the handbook carefully before attempting repair or replacement of coils in frequency determining circuits.

Learn to use your handbook correctly. Know where to find the formulas. Learn how to read the tube charts and evaluate the physical and electrical parameters of the tubes. Keep your magazines for future reference, read them and learn to understand their information, someone took a long time to write that information. You will one day be able to help the newcomer.

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

Letters to the Editor

Please read this letter carefully and you will see that we are still trying to help the newcomer and why we sometimes use the parts and methods to keep the constructural cost down to the bone. This letter from Leon Johnson, WNØDWV, P.O. Box 146, Holland, Missouri.

"Hello Walt: I'm finally getting around to writing about the modest station here. I hope it will be of interest to someone.

"The rig consists of a Lafayette HE-80 receiver and a homebrew transmitter. The transmitter is a 6L6 oscillator running about 10 watts. I got 99 percent of the parts from old television sets. Three cheers for old TV sets and for cake pans, the poor man's radio chassis. I spend most of my time on 7.158, 7.167 and 7.183. I am working 15 meters and have worked Miami. I'm planning a beam for 15 with wire elements supported by fishing poles as my dipole doesn't work so well on 15.

"I received my ticket in February, it was dated January 5 so I lost one month there and it took another month to get the transmitter working. I owe a lot to Bob Cox, K5KMK and Jack White whose call I have forgotten. They gave me the code and theory course in Blytheville, Arkansas YMCA. I know of three who took the test and I'm sure they passed and all should have their tickets.

"I must heap praise on the crew at *CQ*. You do a great job, I think the Novice section is the greatest. The main thing about *CQ* that I like is the construction articles, they are easy to build. I wish you would have more articles on amplifiers, transmitters, receivers and equipment built from old television sets. I have many of them laying around and almost anyone wanting a license has one or two, or can get them cheap enough, to build their station. This would help us to save money and get on the air. I'm only 17 and a senior in high school. We teens aren't too rich you know. I think you could give some layout ideas for the rank beginner, because there's a difference between the schematic and the physical layout. For someone who isn't experienced that presents quite a problem. It's the little things that you "old timers" take for granted that bothers us dopy little Novices. I believe that too many newcomers have been led to believe that you must have a fancy high powered rig to do anything. Actually I've learned that with a few parts you can build a rig that will give as much pleasure as the commercially built rigs. I can work about anything that I can hear, with my QRP 10

watt rig. I've had many ask me what I had in the final when I gave my power, they didn't believe me. I have worked California with a 569 and Oregon with a 569 but I hope to change that on 15 meters. I hope to go v.h.f. some day using surplus gear as that seems the cheapest way. I also would like to go ATV but guess by the time I get there it will be as crowded as the 40 meters is now.

"I would like skeds with the Western and Northeastern states for my WAS, I have 29 for 35 states, all on 40 meters. Either my receiver, antenna or something else isn't as good as it should be or something because I don't hear those rare and exotic calls that I read about in *CQ*. I always tune across the Novice and General bands and listen but I just don't hear them. I may be crazy but I'm in favor of some sort of incentive licensing even though it will deprive me of some privileges. I also think the new amateur should do some homebrew work. I hope to have at least 90 percent of my station homebrew or converted surplus.

"I'll send a picture of the shack someday. Keep up the good work of explaining circuits and giving us simple circuits that we can build. BCNU es 73. Leon."

Thanks, Leon, I am planning a complete station built around surplus TV set parts. This will have something for all classes of licenses and will be for all bands. I now have the TV sets and am working out some of the designs and it will be for many modes of communications but must wait until this winter until I can have a little more time. Thanks for the nice letter and be looking for me on the bands. I plan to get on the low frequencies this week. The antenna is up and the transmitter is ready except for the relay and switching arrangement. See you there.

I have received many letters of late along this same line that shows someone is thinking along the same lines that have been worrying me.

"Dear Walt: What in the world has happened to ham radio? Or, maybe I should say, what IS happening to ham radio?

"Wat! my RST only 579 Standby OM, let me retune my final. By the way OM wat rcvr u using? Guess the old band is going sour. Will say 73, 73 before you lose me.

"I built myself a nice little 20 watt 40 meter rig the other day. After three days carefully tuning the band and calling CQ, I worked a station in Ohio. He said I was the lowest power he had ever worked.

"I can remember when a pair of 807s was king of the band. If you ran more than ten watts on two meters you were in the elite class.

"Remember when you wrote Santa Claus for a new 6L6 or a tuning condenser? Now it's Dear Santa, please bring me a new KW linear and a low-pass filter.

"Remember when you wrote a penny post card for a *parts* catalog? Now it's a nickel for an *equipment* catalog.

"Well, Walt my electric typewriter is getting warm so I better turn it off. See you on two meters when I get my new transceiver. My 522 blew a button by-pass so I am QRT. Sincerely, John."

This letter from John M. Risinger, W5ATT/2, 15 Bayview Lane, Flanders, L.I., New York, leads me

The neat novice station of Dale Darnall, WN8PUZ, 20 North Locust Street, Buckhannon, West Virginia should work lots of DX. Here he is studying for the general class license. Watch for him on the air.

James R. Hill, K6OZL is hearing lots of novice signals aboard ship many miles East of Madagascar Island. He will still be listening for you and hoping for reciprocal licensing in his part of the world. Thanks Jim.

down the lane of nostalgia (built my first radio in 1925). It is a good thing to remember yet few of us would trade our present for the past. That was part of the growing pains. The hams that build their own equipment are the ones contributing to the development of the new equipment and that is what causes the change. The fellow with money is always ready to pay somebody else to do his equipment over or build new gear. I guess this is part of the general scheme of things. Few lead, many follow, take your choice.

Just to add a little foreign flavor to the column this month I will print a letter from Kaj Stridell, SM5DAD, Box 2080, Norrkopings 2, Sweden.

"Dear Walt: I just want to take the opportunity to QSO you, too, as I am sending an envelope to the *CQ* magazine.

"I am and am not a novice, depending on how you look at it, but I love reading your column, for I feel I never get too old to learn: you always put gems of hints in your text.

"I want to stress a point which some ham (in Portugal, I think it was) wrote to you about some years ago. That is the fact that your magazine is being eagerly waited for each month all over the world. And in most parts of the world you *cannot* easily obtain U.S. made components, or if you can they cost several times what they would cost if made in the constructor's own country. Last week I had to pay $2.65 for a TR switch to the Heathkit HW-30. I could have bought a European made one for 50¢ if I had not been in such a hurry. So please state in every description, the values along with the part numbers of the components used in all construction articles. DO PLEASE for we few foreigners that buy your magazine. I know that this is being done mostly in *CQ* but sometimes it is forgotten. This also applies to transistors, I know we have European (and Japanese) equivalents to most US types.

"Something I have been missing is a description on how to build a 6 VOLT transistorized power pack. I have seen plenty of information for 12 volt systems but I would like to know how to build a transformer for 6 volts from junk box parts and wind my own transformer.

"There is one other thing I would like to ask. Ham radio has more or less become a world wide fraternity where most of us can make ourselves more or less understood by using some sort of English language. The English language is very difficult for many peoples. Can you tell me how many amateurs there are who frequently use the international language, Esperanto? If you could find out and put it in a column later this year, put me at the top.

"73 and thanks for all your past and future nice articles. Kaj Stridell, SM5DAD."

This brings up many interesting angles to the hobby of amateur radio and I think this might solve the lingual difficulties if we either learn Esperanto and/or

[*Continued on page 98*]

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

An interesting story about County Hunting from the other side of the Atlantic, but first here is the data on USA-CA Awards issued. USA-CA-1500 Awards went to Fred, W1GF and Bob, K9WSL. W1GF also received all A-1 endorsement for his USA-CA-500 Award. "Jeep", W8RCJ/W1BUS earned USA-CA-1000 as did Bruce, WPE3EBF. Bruce is the 10th s.w.l. to receive a USA-CA Award but #1 from the 3rd district, and he is the 3rd s.w.l. to receive a USA-CA-1000 Award. Frank, WA6-KHK received a USA-CA-500 Award endorsed all A-1 and Bruce, WP3EBF received a USA-CA-500 Award endorsed all 7 mc s.s.b. USA-CA-500 Awards, endorsed Mixed, went to Ronald, K1VTM, Carl, W1ZLX, David, K1ZND, Bill, K3LSP, Bob, K7QXG, David, WØEGC and to Rundy, K4ZA/K6ZA who has been doing a fine job of giving out some rare counties with his mobile operations. He was a tremendous help to Cliff, K9EAB our #1 USA-3079-CA holder. Rundy is also well known to the DX fraternity for his operations from many rare DX countries.

County Chasing From Czechoslovakia

By courtesy of "K.D.", W6DIX/7, here are some excerpts from a letter from Jindra, OK1CG to W2NWM, translation by W2NWM.

"My friend OK1SV is unhappy because he is no longer able to ham into the wee hours of the morning and sleep only four hours as before. As for myself, I haven't been on the air during night time for some five years now; not even in the evening, for I couldn't sleep then without taking a sleeping pill. That is why I embarked, with all my remaining energy, on this Worked All California Counties project. W6's come in here usually between 5 and 8 A.M.; they used to, that is, before this sun-spot misery set in.

"I have accomplished the impossible, I made it, but eight years of concentrated effort, hundreds of airmail letters for skeds, thousands of listening hours, seem almost out of proportion. I am no diploma hunter, even though I am CHC 758, Hi. I was, so to speak, forced into that by WA6ATY who kept offering to arrange everything, including taking care of the expenses. He merely wanted me to send him the list of my diplomas, barely sufficient to make me eligible for membership. I kept ignoring the WACC, just as a lot of others. But one day I surveyed my W6 QSLs with the thought that, having that many of them, perhaps there wouldn't be too many missing counties after all. I was very surprised, when, talking to W6 hams, I learned that in twenty years only 59 California stations had qualified for that diploma, and only one non-Californian, W3FYS, and that the diploma was virtually unattainable for Europeans.

"It was then that I resolved to do a piece of work for the good name of the "OK" prefix. It was to be at the same time the "Swan Song" of my amateur career.

"Well, I succeeded, it was hard work, one of my greatest rewards was the write-up in *QST*. In my own country our *Amaterske Radio* glossed over it in just a few words.

"However, the long effort of working for the WACC was the most enjoyable period of my entire amateur activity; except, perhaps, for the days of my very beginnings. Once again I experienced moments of excitement and tension, met true ham spirit, sacrifice, comradeship, and a great love for the common cause. Long live

*103 Whittman St., Rochelle Park, New Jersey, 07662.

USA-CA HONOR ROLL

ALL 3079

K9EAB .....

1500

K9WSL 40
W1GF 41

1000

1 W8RCJ/W1BUS 85
WPE3EBF 86

500

W1ZLX 522
K1VTM 523
WA6KHK 524
K3SLP 525
K1ZND 526
WØEGC 527
K7QXG 528
WPE3EBF 529
K4ZA/K6ZA 530

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

3079	K5SGJ	W5EHY
K9EAB	K5SGK	WA8EZW
3045	WØJWD	K8VSL
WØMCX	VE3-9301	K8YGU
3037	K8KOM	W9CMC
K8CIR	**2410**	W5NXF
2800	WØVFE	**1905**
WA9AJF	**2335**	W2JWK
2780	W8UPH	**1877**
K8IWI	**2050**	W9HAS/6
2515	K3LXN	**1780**
WØKZZ	**2000**	K4BAI
2500	K9UTI	**1726**
K4VOF		KØHUU

"K.D.", W6DIX/7, who, since the death of his wife in 1961, has been traveling Colorado, New Mexico, Arizona, Utah and Nevada.

A Thoughtful Gift

YOU probably have several very near and dear friends who are Hams, for whom expensive and elaborate Christmas gifts this year are out of the question.

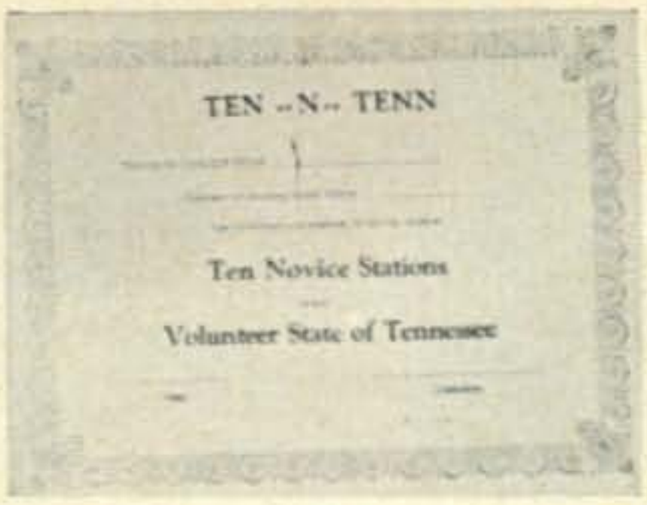
IF SO, you're not alone! Thousands of Christmas shoppers face the problem of what to get these friends . . . while holding expenses within their budgets.

A SUBSCRIPTION to CQ *and any of the fine books listed will be appreciated by those who receive it and will be a reminder of your thoughtfulness throughout the year.*

SAVE MONEY on your subscription as well as your gifts.

CHECK our Subscription envelope and rates on the opposite page.

WORKED ALL CORNHUSKERS



TEN-N-TENN AWARD

WORKED ALL JACKSON AWARD

the amateurs of California! Just for my sake they would travel to amateur-forsaken counties high in the mountains, even in wintertime; always kept their schedules and followed my progress. They kept me informed about planned expeditions into the mountains, and would arrange for me schedules with other counties. But I owe my greatest gratitude to W6DIX, who with his gear makes a yearly round-trip through all the difficult counties, thus putting them on the map. His XYL used to accompany him. Aside from the frequent QSOs, we also maintained correspondence. One day, however, the unexpected news of his wife's death left me stunned and virtually incapable of replying. His planned round-trip for the year was canceled, I was aware of his great sorrow. He wrote that he was off the air, not able to do anything, nevertheless he considered it his duty to inform me about the situation so I wouldn't keep the schedules in vain, I need not say more.

I could go on and on, even the final moments of my WACC effort were highly dramatic. Now all I needed was one last county—Plumas—and the conditions were getting worse every year. I began giving up hope of ever completing the job, but then, after a long interval, W6BIL called me again and asked how far I had progressed with the WACC. I explained my situation to him, but as he was replying the band suddenly changed and he faded out. All I gathered was that he was suggesting some sort of schedule to me. At that moment I again saw a ray of hope. We exchanged letters and he offered to make a trip to Plumas County on a Saturday and should conditions be unfavorable, we would try again the following week. He also told me that a very active YL, K6ENL, had married and had moved to Plumas County. W6BIL was going to visit her there but didn't think she would be on the air yet.

Well, the conditions were hopeless! It was nerve-wracking. Later on I could merely hear some very weak W6 working him, but I could not hear W6BIL. In spite of all that, I continued watching the band every day. Then all of a sudden, on Tuesday, on a band that was practically dead, on 14,075 kc., there was a very faint station calling me, although I had not been transmitting, yes, calling me slowly and for a long time—I knew it could only be Plumas; but oh my nerves! Yes, it was K6ENL alright, readability 5 both ways but she was S4 and I was S6—neither of us could believe our ears. She was using only 120 watts and poor antenna and was unable to hear any other Europeans. She could hardly have realized how terribly important it was to this unknown ham who she did not know and would never meet.

I was overjoyed, my gratitude to W6BIL was immense. However, because of my poor English, I was incapable of expressing it adequately. I suffered literal physical pain as I was writing my letters of thanks to all. And, of course, it had to be a woman too, to furnish, in the twelfth hour, my last county. All this, and much more, would I have liked to write, through the medium of *CQ* and *QST*, to all amateurs of California in recognition of their wonderful spirit. However, even if I had been able to write it, it would have hardly rated publication." *(Editor—So we Ws think we have it tough-Hi . . . And here is the story in* CQ, *even if a little late. . . .)*

Letters

JOE, W2JWK, writes: "Many of the boys on the net have expressed their delight at the prompt manner in which you issue the county certificates and their endorsements. Count me as a solid booster of *CQ*'s county hunting venture.

Please remind the boys to check into the net on 7223 as activity has slackened and thus many of the mobiles are not checking into the net with new counties. I devote as much time as possible at net control, but sometimes after a ten or fifteen minute QRZ, nothing shows up. Perhaps with the advent of the fall season,

NEW ENGLAND CHC CHAPTER #32 AWARD

HILLBILLY AWARD

AMATEUR RADIO COMMUNICATION AWARD

Car and trailer of W6DIX/7 at Tonopah, Nevada.

the boys will take to their operating chairs more frequently. Once again my sincere thanks Ed for your zeal and promptness. Keep up the good work, 73."

ED, W9HAS/6, writes: "I have been inactive lately since I have been in the Air Force, but I do keep up with the USA-CA Program and the County Hunters through your column in *CQ*. I hope to become active again in the near future and try to pick up some of these western counties I could not get from the home QTH. Your efforts and interest in the county hunter program are much appreciated."

CARL, WØKZZ, writes: "I am in the process of completing my book for the 2500 endorsement to my USA-CA Award, my confirmed counties stand at 2515.

"Keep up the very fine work of your *CQ* USA-CA Program column. We sure do enjoy it and it is the first thing we turn to when we open each new issue."

BOB, VE3ELL, writes: "Enjoy your column very much and have turned into an award hunter. I am retired and have complete knowledge of Canada and wish to volunteer my services to anyone who needs help on pin-pointing Canadian points in regards their counties. I would appreciate a self-addressed envelope (US stamps I can not use).

"Why oh why do the various organizations take so long with their awards? I have waited up to 2 months for some of them." *(Editor—May I suggest you send Bob an IRC to cover postage or a Canadian stamp? Write to him, Bob Lightfoot, VE3ELL, Box 352, Malton, Ontario, Canada.)*

LOUIS, K8IWI, writes: "Just a note to tell you how much I enjoy your monthly column in *CQ*. I always get a lot of pleasure from reading all the names and calls of the different hams who have earned USA-CA Awards.

"I am still busily engaged in county hunting but they come slow as I have gone quite high but I only run low power and have no beam.

Best regards Ed, and keep up the good work."

BOB, K9WSL, writes: "We enjoy your monthly column a great deal. Our county hunting is mostly a mobile operation and has made us many friends, both on and off the air. As a group, these people are FB, as I'm sure you realize.

"Tnx for your leadership and 73."

RALPH, WAØJNF, writes: "I have been enjoying your column this year and have been sort of a county hunter since I received my Novice license a little over a year ago. During this time I have been happy to give many county hunters a QSO with Vernon County Missouri on 40 and 20 c.w.

"I will sked anyone needing Vernon county on 80, 40 or 20 c.w. or on 75 or 40 fone.

"I would like to know just how rare is Vernon County and Delaware County in Oklahoma as I have a cousin there who could help. Perhaps I can also help if hunters would let me know of hard to get counties in South West Missouri and South East Kansas."

Write to WAØJNF, Ralph Porkorny, Box 406, Nevada, Missouri 64772.

Awards

Worked All Cornhuskers: The Lincoln Amateur Radio Club, Inc., of Lincoln, Nebraska wishes to announce the creation of this new VHF certificate to help put Lincoln, Nebraska on the v.h.f. map. Rules are as follows:

DX 6 meters—10 contacts with Lincoln amateurs.
2 meters— 6 contacts with Lincoln amateurs.
Local 6 meters—15 contacts with Lincoln amateurs.
2 meters— 9 contacts with Lincoln amateurs.

No charge is made for the certificate, QSLs are not required. The certificate is retroactive to 1 January, 1965. Send list of stations worked to: Custodian, Cornhusker Award, Bernie J. Sasek, WØYOY, 3030 Shirley Court, Lincoln, Nebraska 68507.

Ten-N-Tenn Award: Sponsored by *The Tennessee Ham* to encourage contacts with Novice operator in the state of Tennessee. Any station may obtain this award by working and confirming contacts with 10 Novice stations in Tennessee. Send copy of log data verified by two others with sample of your QSL card to *The Tennessee Ham*, 612 Hogan Road, Nashville, Tennessee 37220. There is no charge but a large s.a.s.e. would be appreciated.

The New England CHC Chapter #32 Award is awarded for working members of the New England Chapter #32. Five classes: Class E for working 15 members; D for 30; C for 50; B for 75 and A for working 100 members. Elected officers count double if worked in year of office. GCR List and $1.00 or 10 IRCs (DX) to Awards Chairman CHC Chapter #32. Henry Trepanier, K1PMJ, 31 Tame Buck Road, Wolcott, Connecticut 06716. TCR and MER apply. Send s.a.s.e. for membership list.

Hillbilly Award: This Honoray Hillbilly Radio Certificate sponsored by the Southwest Missouri Amateur Radio Club has been improved and the rules changed a little to make it available to more of a cross-section of hams. Work 5 Springfield, Missouri stations including one active club member station. No date limit. Send log information (QSL cards not required) and 50¢ to Hillbilly Award, SMARC, P. O. Box 291, Springfield, Missouri 65801. Present members are WØ's AH, AIP, BPD, BVG, CGJ, CXF, CZD, FGS, FNN, FXU, HUI, ICW, IWT, KWZ, NHO, RZV, SZT, TE, VJC, WRQ, YWS. KØ's BWE, HUU, IKZ (Honorary full member at K.C., Mo.), JPJ, KYM, LLJ, MXK, ZZH. WAØ's BDS, DSK, FKI, GVH, GVJ, HWJ, IIK, JJL, JYX, KFQ, LPS, LRT. WNØ's MAN, MAO.

Worked All Jackson Award, is sponsored by the Jackson Amateur Radio Club of Jackson, Mississippi and is awarded when the following conditions are met: Establish two way communications with stations in Jackson area as follows: For stations within continental U.S.—5 Jackson stations. For all others—1 Jackson station. Contacts must be made after 1 January, 1965. Send log data and $1.00 to Custodian, Worked All Jackson Award, Ross Hutchinson, 270 Lea Circle, Jackson, Mississippi 39204. If desired, special note will be made of all SSB, CW or AM, as well as all on one band.

Amateur Radio Communications Award, is issued without cost by the CRES Amateur Radio & Electronics Club (Franklin County Civil Defense Affiliate) of Columbus, Ohio. Issued for QSOs with ten club members, QSLs are required. Since they have more than seventy licensed members plus a club station (WA8JVV), operators have an excellent opportunity of achieving this certificate and winning additional endorsements for each additional ten non-duplicate QSLs. Write to CRES Amateur Radio & Electronics Club, 6200 East Broad Street, Columbus, Ohio 43213.

Hope Santa Claus remembers each and every one of you and that you have all your wishes fulfilled, such as lots of new Awards and Certificates, much new equipment and needed QSLs, and how was your year?

73, Ed., W2GT

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

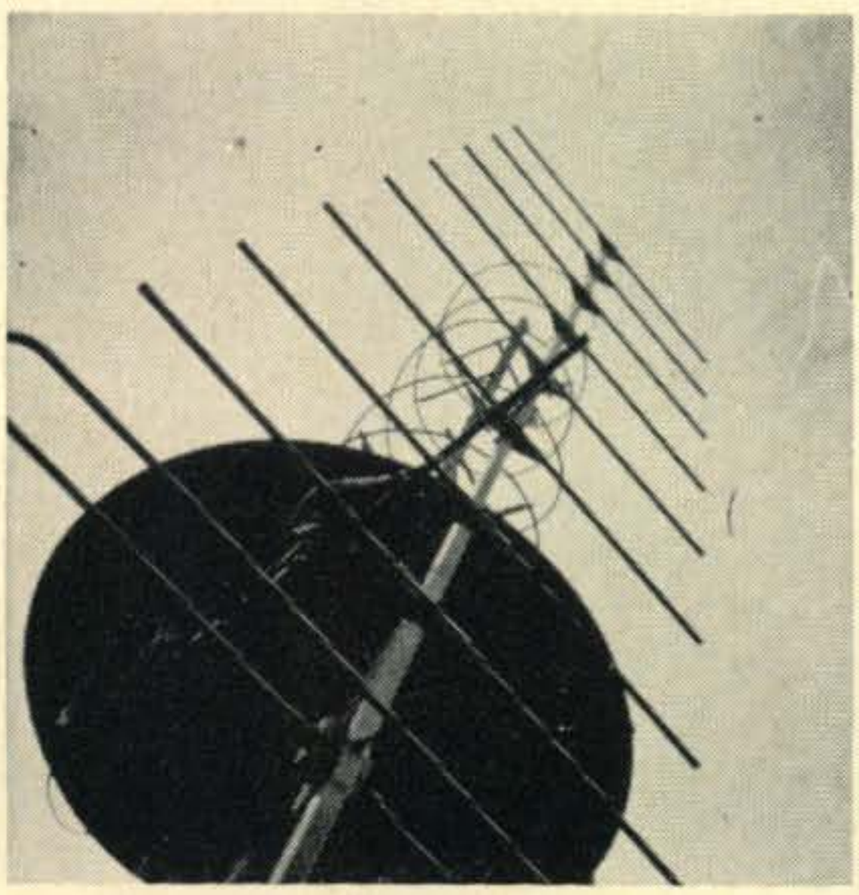
THE latest word from Project OSCAR Headquarters in Sunnyvale, Calif. is that OSCAR IV has a chance of being orbited some time in December. A deadline of November 15 has been set by NASA for delivery of the satellite package to launch officials, and an interesting race is on. At this writing, two satellites are being prepared for launching, by two different groups: The Project OSCAR Association is nearing completion of its 2-beacon package with output on 144 and 432 mc, with an outside chance that a 1296 mc beacon may also be aboard.

A second group, the Thompson-Ramo-Woolridge Radio Club also in southern California (including W6NLZ, K6OPZ and K8RVM/6) is also nearing completion of a rather exotic repeater-type package. The competition is keen, but friendly, and whichever package can be delivered by the deadline will be orbited as OSCAR IV.

Near-Synchronous Orbit

Present information indicates that OSCAR IV will be placed in a near-synchronous orbit over the equator, at an altitude of 18,200 nautical miles (21,000 statute miles) giving a view angle of 162° on the earth. That is, an area encompassing 162° of the earth's circumference at the equator, and nearly from pole-to-pole, will be within range of OSCAR IV.

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



In Bonn, Germany, space-listener M. Dieter Oslender has copied signals from almost every satellite launched to date. Shown above are his parabolic, helical, and Yagi antennas that he plans to use for copying the OSCAR-4 satellite.

Table I—
Predicted OSCAR IV Visibility

Observer's Lat. (deg.)	Θ (deg.)	In Range Hrs.	In Range Min.	Out of Range Hrs.	Out of Range Min.
0	81.0	136	19	166	43
10	80.8	136	5	166	57
20	80.4	135	22	167	40
30	79.4	133	41	169	41
40	78.8	131	43	169	19
50	75.9	127	52	175	10
60	71.8	120	55	182	7
65	68.1	112	39	190	23
70	62.8	105	46	197	16
75	52.8	88	55	214	7
80	25.7	43	22	259	40
81	< 1.0		< 1	303	1

To use table: Find the difference between the observer's longitude and that of the satellite. If this difference is equal to or less than Θ for the observers latitude, the satellite is within range. If the observer's longitude is greater than the satellites, the satellite is East of the observer; if it is less, the Satellite is West. The times indicate the duration of range between aquisition and fadeout at the indicated latitude.

The position of the satellite, relative to a given point at the equator, will move Eastward at a rate of 27½° per day, giving a ham at the equator over 5 solid days of OSCAR coverage out of every 13 days! Nearly one half the surface area of the earth will be within range at all time!

The length of time the satellite will be visible decreases with increasing latitude; that is, the closer you are to the North or South Pole, the shorter will be the "view period." Table I shows the degrees and total hours of visibility for various latitudes, assuming an orbit of 18,200 nautical miles (21,000 statute miles) above the earth.

The Two Satellite Packages

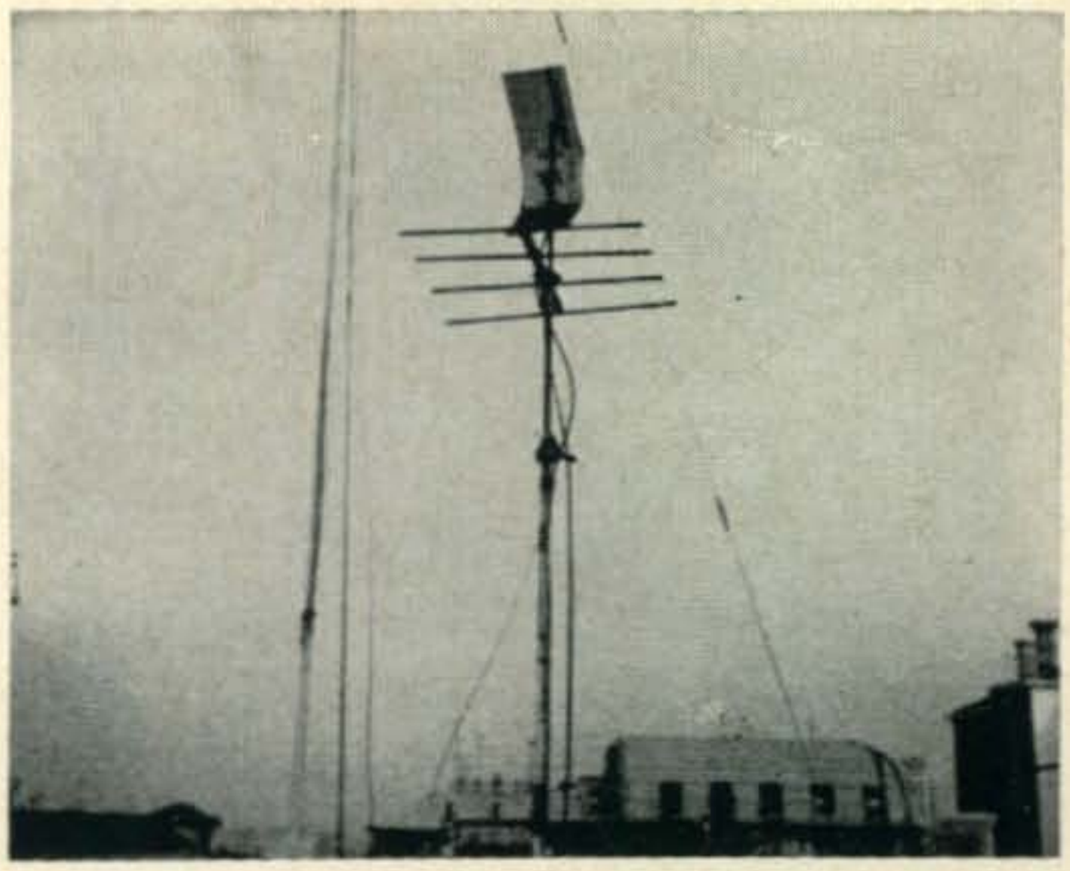
The Project OSCAR satellite will be rather routine in its operation, with beacons on 144.05 and 432.15 mc transmitting the usual OSCAR HI telemetry. Time will dictate whether the 1296.45 mc beacon will be aboard. The TRW Radio Club's package, however, incorporates a number of techniques which are new to the OSCAR program.

The TRW translator will receive signals over a 10 kc bandwidth centered on 144.1 mc, and re-transmit them over a 10 kc segment centered on 431.8 mc with an output power of 3 watts.

To facilitate satellite tracking and ground equipment adjustment, a c.w. beacon will transmit through the repeater every 10 minutes for twelve seconds. The familiar OSCAR HI will then be transmitted for four seconds for identification purposes *only*, (no telemetry), and the "10+4" cycle will then repeat, giving a total beacon on-time of 32 seconds. The beacon frequency will be 432 mc.

The satellite will be tetrahedral in shape, (four

The display model of the first OSCAR satellite is still drawing considerable attention. Here the satellite is shown on exhibit recently in Cleveland, Ohio, where large crowds viewed it with amazement. *(Photo by Damon).*



Radio pioneer Dr. Ing. Mario Santangeli, I1ER, of Milan, Italy, is standing by to copy OSCAR-4's signals. Above are Mario's 1290 mc corner-reflector and 432 mc Yagi.

sides), and will be solar powered.

Monitor W1AW for launch details, late orbit information, and information about which package has become OSCAR IV. Should OSCAR IV fail to orbit properly, the next opportunity for a piggyback launch will probably come some time in March, 1966.

Mariner-4 Shut Down

The radio-telemetry circuit between MARINER-4 and Earth was temporarily shut down by NASA on October 1, as the spacecraft's orbit around the sun carried it out of useful range. Since it was launched on November 28, 1964, MARINER-4 had transmitted to Earth nearly 50 million engineering and scientific measurements on the environment of interplanetary space and in the vicinity of Mars. It flew within 6200 miles of Mars on July 14, recording the first close-up pictures of the planet's surface.

The telemetry circuit was closed by a signal transmitted from a 100 kw transmitter at Goldstone, California, and beamed at the spacecraft nearly 191 million miles away. The signal switched the spacecraft's transmitter from the high-gain directional antenna used for telemetry transmission, to the omni-directional antenna which can be used only for tracking information.

The switch-over is only a temporary shut-down of the telemetry circuit between MARINER-4 and Earth. By mid-1967, the spacecraft's orbit around the Sun will again bring it close enough to Earth to attempt to resume telemetry contact, if the equipment aboard MARINER-4 is still operative.

Here's the man who put Spain on the space communications map. Ing. J. M. Cordova-Barreda, EA4AO of Madrid is shown at his home-built v.h.f. station used for OSCAR and meteor-scatter communications. EA4AO is anxiously awaiting the launch of OSCAR-4.

G5RV Trophy

The G5RV trophy is a new award to be presented annually by the Radio Society of Great Britain to the British radio amateur who has contributed the most to amateur radio communications.

The first recipient of the G5RV trophy is Bill Browning, G2AOX, for his contributions in preparing information on orbital predictions for the OSCAR-3 satellite, and the sound technical advice and information freely given by him which enabled many radio amateurs to participate actively in the experiment.

The handsome trophy will be awarded to G2AOX at the RSGB's Annual General Meeting to be held in London on December 17. The congratulations of this column are also extended to G2AOX.

Bulletin

It has just been reported that an extremely large, unidentified, nearly spherical payload, led by eight smaller objects, has been sighted on a peculiar polar orbit, having a perigee at chimney-top level. Monitoring by radio amateurs and space-listeners in all areas of the world disclose odd-sounding transmissions over a wide range of frequencies, which are believed to be emanating from the larger object. The signals appear to be fully modulated by a husky, jovial voice, proclaiming, "Peace On Earth, Goodwill to Men —Merry Christmas to all, and to all a good night."

73, George, W3ASK

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

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

80 meters	3620 kc
40 meters	7040 kc
40 meters (narrow shift)	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.60 mc
2 meters	146.70 mc

AUTOMATIC-frequency-control (a.f.c.) for radioteletype reception is a very nice feature as it compensates, up to a point, for the *other* fellow's drift. It is an electronic method of varying the b.f.o. in the receiver in such a manner that it will maintain the *mark* tone within close enough tolerance to enable the converter, or terminal unit (TU), to make solid copy. The action can be so adjusted that control of the signal will be kept until the signal or the receiver drifts to the edge of the useful band-pass of the channel filters in the TU. (We are speaking in terms of an audio-type of TU, most common in usage.)

Modification of the station communications receiver is required, or at the minimum a connection to its i.f. amplifier. A completely "outboard" adapter must then be constructed, such as the one shown on page 157 of the *New RTTY Handbook*. Those of us who do not hesitate to dig into our receivers can just add a silicon diode, connected to act as a variable capacitive reactance, across the b.f.o. Figure 1 shows the simplicity of the hook-up. Of course the error-correcting voltage must come from some kind of discriminator that samples the *mark* tone.

The AN/FGC-1, Part VI
Automatic Frequency Control

Most surplus AN/FGC-1 terminal units (RTTY Column, *CQ*, July '65) contain an a.f.c. panel which puts out the required error-correcting voltage for control of a reactance device connected across the receiver b.f.o. The old Press Wireless AN/FRR-3 and Wilcox CW-3D receivers contained a reactance tube for use with the a.f.c. panel of the AN/FGC-1. In these days of solid-state devices, a silicon diode is used to perform the same function.

Figure 2 shows a simplified schematic diagram of the a.f.c. circuit. This circuit keeps the *mark* frequency within ±50 cycles of its proper value of 2125 cycles. If this frequency deviates from 2125, a d.c. voltage appears in the output; which, when applied to the receiver reactance device, causes a compensating change in the b.f.o. frequency in the receiver(s). The *mark* frequency passes through the 2125 cycle filter to the control grid of tube V_2 where it is amplified. It is further amplified in tube V_3. The output of V_3 contains two branches. In one branch a portion of the output passes through a 0.1 mf capacitor and a resistor network which impresses one-half of the output voltage on the plates of dual-diode V_4. The plates of V_4 are biased about —23 volts by means of the 130-volt supply acting through a resistor network. If the peak voltage of the a.c. output of tube V_3 exceeds about 46 volts, tube V_4 conducts and pulses of curent pass to ground through V_4. As in similar a.v.c. circuits, the resulting current through the resistor network which is connected between the plates of V_4 and ground impresses a negative potential on the grid of V_2 thereby reducing its gain. Thus V_4 and its associated circuit acts as an automatic volume control and maintains the output of V_3 substantially constant with a peak voltage somewhat greater than 46 volts. A negative voltage is impressed upon the control grid of V_1 by the a.v.c. circuit, which is twice the value impressed on V_2. When V_3 has its normal output, this potential is sufficient to cut off V_1.

Should the radio frequency signal be so far from normal that the *mark* frequency falls outside of the 1600-2500 cycle pass band of the 2125 cycle filter, the high impedance of the filter then reduces the strength of the signal and prevents operation of the a.f.c. circuit. It is therefore necessary to by-pass the filter in order to develop an a.f.c. voltage. This is the function of V_1.

When the *mark* falls outside of the filter pass-band, the output voltage of V_3 drops below its normal 46 volts and the bias to V_1 decreases,

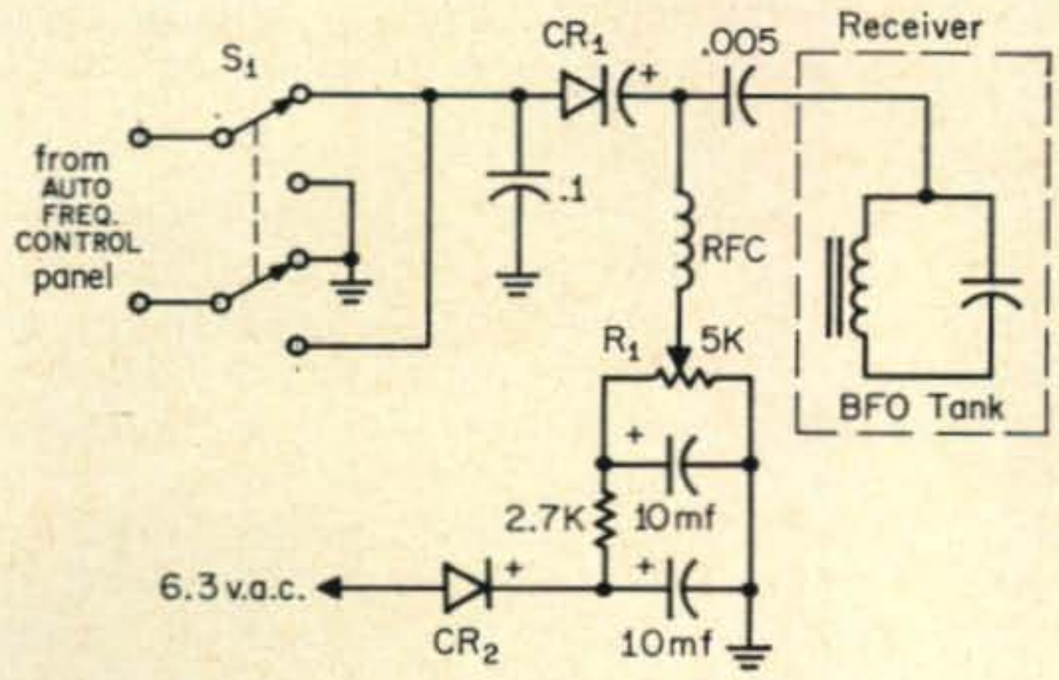


Fig. 1—Silicon diode reactance shift circuit. S_1 is a reversal switch. CR_1 is an International Rectifier Type 6.8SC20 Semicap, and CR_2 can be almost any type of diode. Adjust R_1 until a 1-volt d.c. input results in a 1000-cycle shift in the b.f.o. frequency.

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

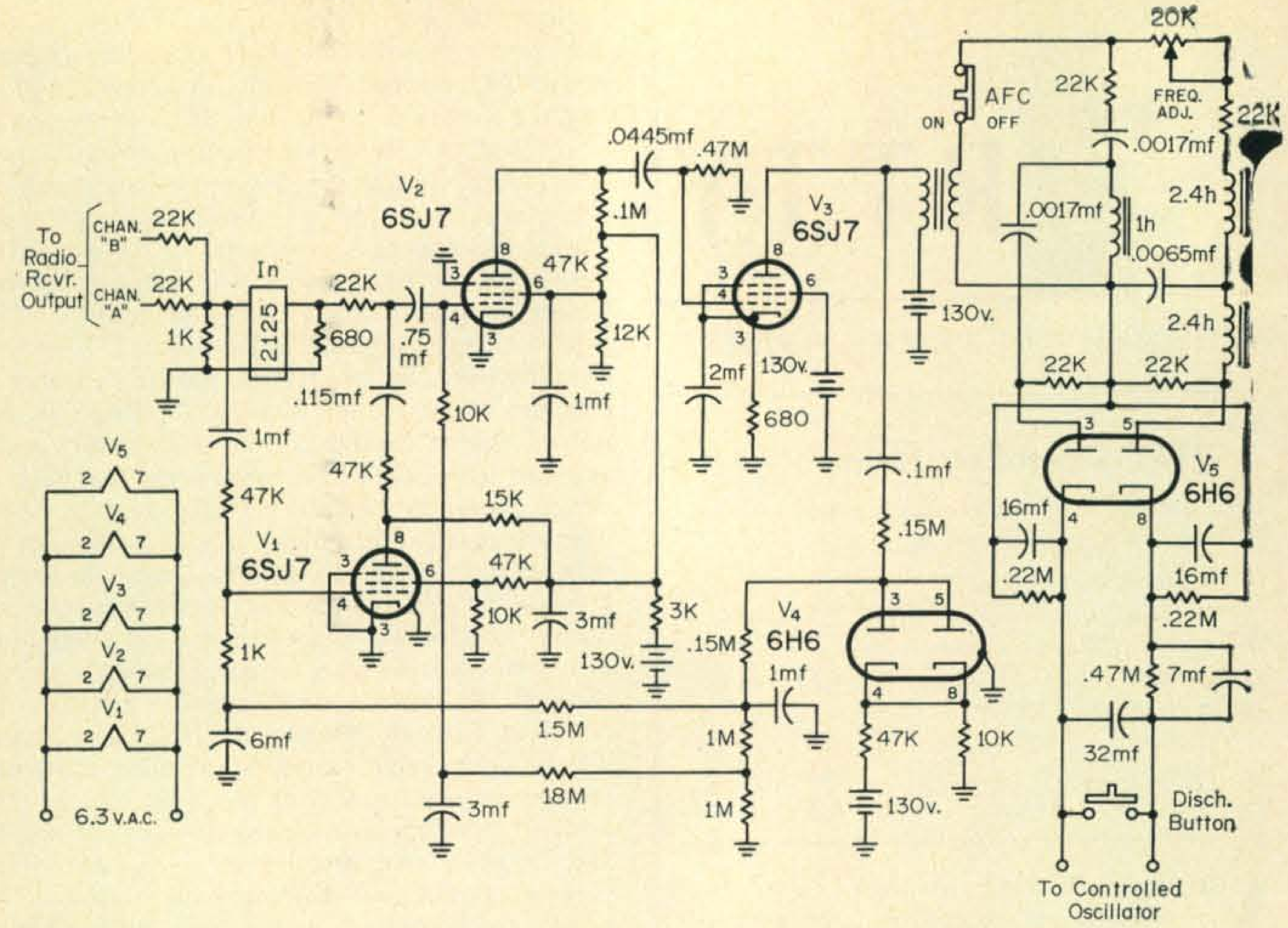


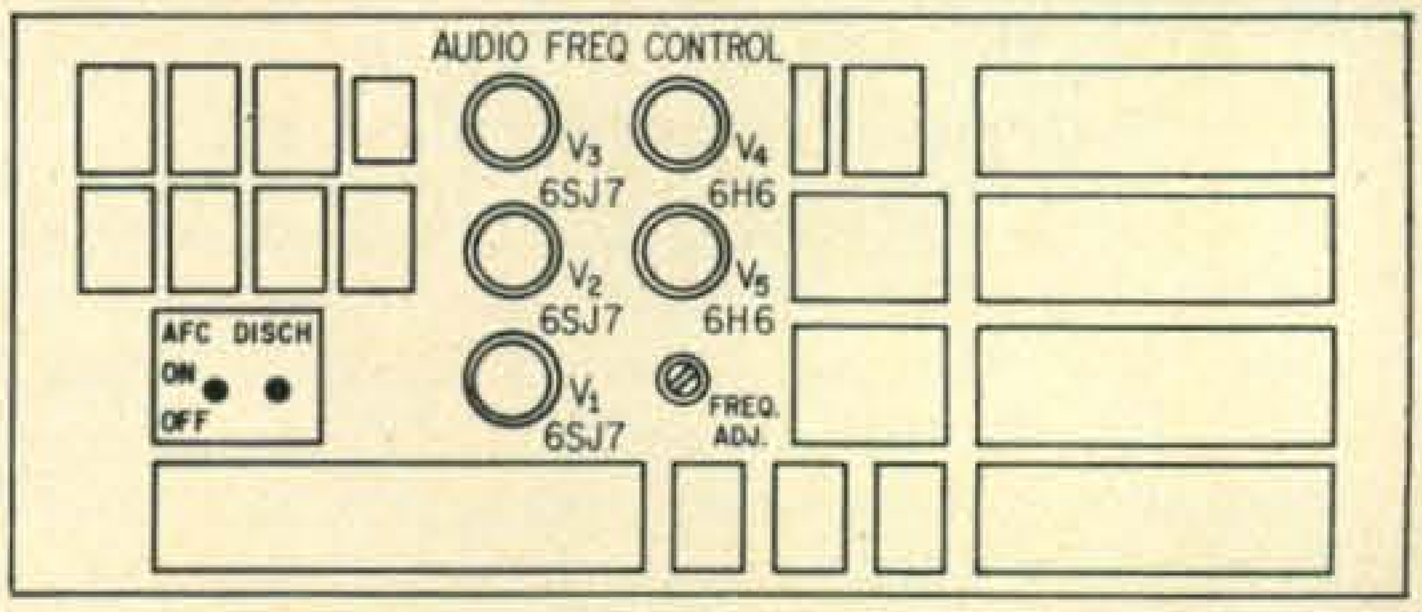
Fig. 2—Simplified schematic of automatic frequency control circuit.

allowing it to become operative. V_1 then becomes a by-pass for the filter and permits the developing of an a.f.c. voltage. This voltage acts continuously to bring the *mark* within the filter pass-band. When this is accomplished, V_1 is again disabled by the development of normal a.v.c. bias. The loss through V_1 when that stage is active is actually greater than the loss through the filter, so that the a.v.c. bias developed when the by-pass path is operative is less than normal and is not sufficient to disable V_1 until the *mark* comes within the pass-band of the filter. The time required to discharge the *R-C* circuit supplying a.v.c. bias to V_1 is about 10 seconds. This means that if a *sudden* frequency change in the order of several hundred cycles or more occurs during normal operation, approximately 10 seconds must elapse before the a.f.c. can restore the tuning.

The other output of V_3 is fed to a high-pass and a low-pass filter in parallel, which act as a discriminator. These filters are adjusted by the FREQ ADJ knob to have the same losses at 2125 cycles. The outputs of the two filters are rectified in V_5. When the frequency is 2125 cycles, equal currents pass through the two diodes, so that no voltage exists across the output terminals. If the frequency is lower than 2125, it passes through the upper filter to the upper diode, whereas the lower filter allows little or no current in the lower diode. Thus the upper output terminal is positive in respect to the lower terminal. Similarly, if the frequency is higher than 2125, the lower terminal is positive with respect to the upper. Since the latter is usually grounded (in the receiver), the upper terminal in this case is negative with respect to ground.

The error-correcting voltage is about ±1 volt for a frequency departure of ±40 cycles from 2125. The receiver reactance device in the original receivers was set up so that a control voltage of 1 volt caused a 1000 cycle change in the b.f.o. frequency, therefore the control voltage tends to increase to a value much greater than −1 volt. But, as it increases, the b.f.o. changes frequency in the direction to *decrease* the output frequency. When the control voltage reaches −1 volt, the output frequency will have decreased 1000 cycles, establishing equilibrium; and so the controlled frequency will remain 2165 cycles (2125 plus the 40 necessary to make a 1000-cycle correction).

[*Continued on page 100*]



Front view of the Automatic Frequency Control panel as it is installed in the AN/FGC-1, usually at the top of the rack, just under the bay terminal strips and fuse storage panel.

YL

LOUISA B. SANDO,* W5RZJ

BY vote of amateurs in the State of Idaho, W7GGV, Helen Maillet, of Pocatello, has been chosen "Idaho Ham of the Year" in recognition of her public service work, which has continued ever since she became licensed in 1956. As reported in October *CQ*, Helen served as Asst. Dir. of Communications for the Senior Girl Scout Roundup at Farragut, using call K7GS. Emergency work has included handling traffic during the Yellowstone earthquake in Aug. '59 and the eastern Idaho floods in '62 to '64.

For the past eight years W7GGV has been Radio Officer for District One (eastern Idaho), coordinating traffic from District to State and District to County. She is a faithful check-in on the Daily CD, Third Emergency and FARM nets and has been net mgr. and NCS of the latter. Helen served as SCM from '59 through '63. She is active in YL nets, is secretary of the LCLYL net, and was 7th D/C for YLRL in '61. Helen holds 55 certificates, is a member of CHC and custodian of Chap. 33/73 "Eyewink" membership certificate.

W7GGV may be found on 80 through 10 meters and she also operates a Heath 2-er for local CD work. Gear includes a Viking II and SX 101 and she has a Swan 400 for s.s.b. Antennas include a Hornet tri-band beam, dipoles for 40 and 80 and a 2-meter ground plane. OM is "Pop," K7CXP, and they have one daughter.

Congratulations, Helen, on this well-deserved honor! According to *Ham Hill News,* which announced Helen's selection, a bronze cup goes with the tribute.

---

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Colorado Wx Net

Tnx to Kayla, WØHJL, for sending us a copy of the FB feature article in *The Denver Post's* "Empire Magazine" for July 11, '65, describing ham participation in the Colorado Weather Net. Started some ten years ago by Bob, WØNVU, after the Purgatoire River flooded Trinidad, it has grown from 10 members to 45, and is in operation six days a week. Wx instruments are read about 6 a.m. and between 6:30 and 7:30 the information is passed on the net to WAØBAD, WAØBXR, KØZSQ or WØZFU who phone it to the Wx Bureau at the Denver Airport. Here reports are sent via teletype to area radio & TV stations and on AP wires. Weather patterns are made at the Bureau using reports from areas where there are no official weather stations, and small planes especially depend on the reports of the net.

YLs mentioned in the article were Val, KØ-ZSQ, at Commerce City, who is net manager, and Ann, WØWZN, at Palmer Lake. When the disastrous storm and flooding hit Palmer Lake in June, Ann and her jr. YL, Charline, immediately contacted Civil Defense Hq. in Denver and Colorado Springs, and the Air Force Academy sent equipment and personnel to assist the 300 motorists stranded on the highway. The YLs remained at their mobile rig for 8 hours until land-line communications were restored, and worked another 16 hours to relay message re the safety of Palmer Lake residents.

Ann got into ham radio via her son Norman, who became KØDNP in '59. When he left for college she got tired of dusting the unused rig so got her own license. A year ago Charline, a sophomore and science major at Southern Colo. State College at Pueblo, got her call, WAØLDU. Ann joined the wx net in '60 and since then has transmitted about 1500 wx reports.

Val, KØZSQ, licensed five years ago, started checking into the Wx Net in '62. Besides being net mgr. she is NCS two days a week. Val holds sectional, regional and area net certificates for Colorado Hi Noon Net, Twelfth Region and Pacific Area. She prefers c.w.—holds 25 CPC—

KØZSQ, Val Eldridge, net mgr. of the Colorado Weather Net.

Members of BAYLARC at the San Mateo County Fair operating WA6YBE (County Civilian Defense station) on Aug. 8, '65. In 12 hours the YLs handled 86 pieces of traffic and explained the use of ham radio in CD operation. L. to r., K6USC, WA6OGK, WA6PKP, WA6PJL, WB6GID, K6HIW, WA6ALK, W6BDE.

WØWZN, Ann Meck, (right) with her daughter Charline, WAØLDU, handled emergency traffic at Palmer Lake following the disastrous floods in Colorado in June.

and enjoys building as well as operating. She has second radiophone license and is studying for first.

Val also holds RACES license and helps her OM on his C.D. programs as State Radio Officer. His call is KØDCW and his Dad's is KØPGQ. Val's oldest son is WAØGCM and her younger one is interested, and both boys hold commercial tickets. Top of the list of Val's other hobbies are her four grandchildren!

Other YLs checking into the Colo. Wx Net include WØVLS, Eleanor, and KØLCZ, Hazel.

1965 Midwest YL Convention

Members of LARK (Ladies Amateur Radio Klub) are sponsoring the 1966 Midwest YL Convention, with W9SJR, Bernice, as chairman. It will be held May 13-15, 1966 at the Flying Carpet Motor Inn at Rosemont, Ill. Registration is $2 to April 1; thereafter $2.50. Tickets available from K9TRP, Diane Price, 6123 N. Rockwell, Chicago, Ill. 60645.

Here and There

LARK elected these officers for '65-'66: Pres. K9IWR; V.P., K9EMP; secy, K9FHM; treas., WA9CCP; P/C, K9ZWV; Novice Rep., WA9-ABG; editor of *Pinfeathers,* K9TGK.

Recently elected officers for WAYLARC: Pres., W3RXJ, Irene; V.P., W3CDQ, Liz; secy, WN4VLI, Brooke; treas., W3UTR, Meg; exec. member, W3UXU, Betty; rep. to Foundation for Amateur Radio, K4LMB, Ethel.

Calling "CQ YL" . . .

It's getting toward that "gift-giving time" again. Why not tell your OM you'd like a copy of "CQ YL" (or give *him* a copy), or get one for a friend or DX pal? "CQ YL" is the one and only book about the YLs. With the addition of several supplements in the years since it was published, the book is up to date through 1965 YLRL officers, and the addition of two entire new chapters brings it current through all the YLRL Conventions held to date. Order copies from W5RZJ (QTH at head of column); price $3, postage paid.

Happy Holidays and all best wishes for 1966!

33—W5RZJ

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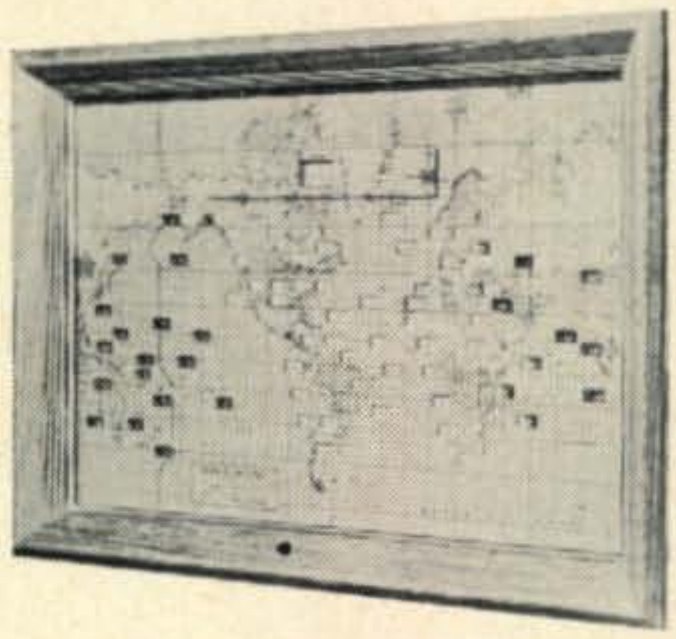

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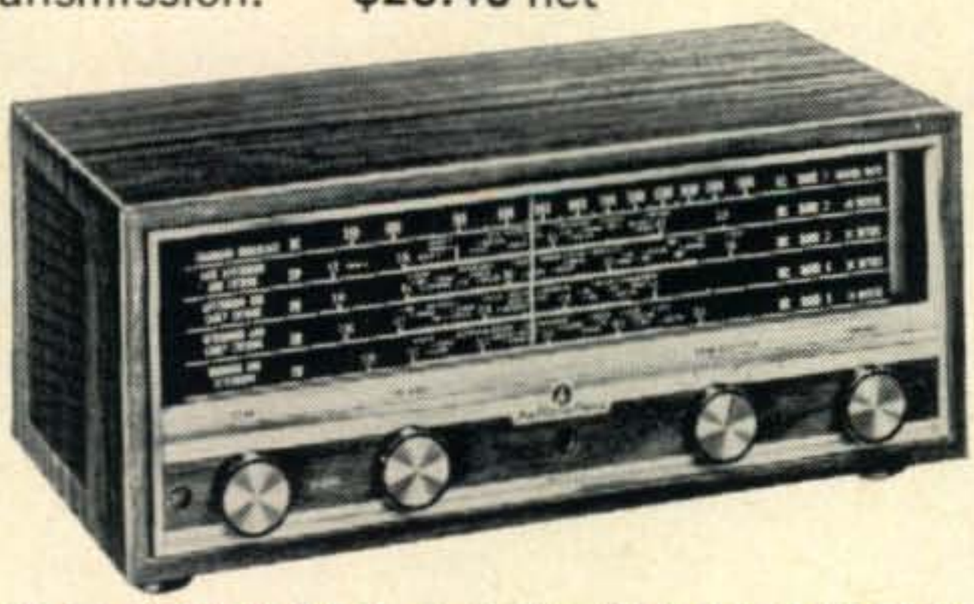

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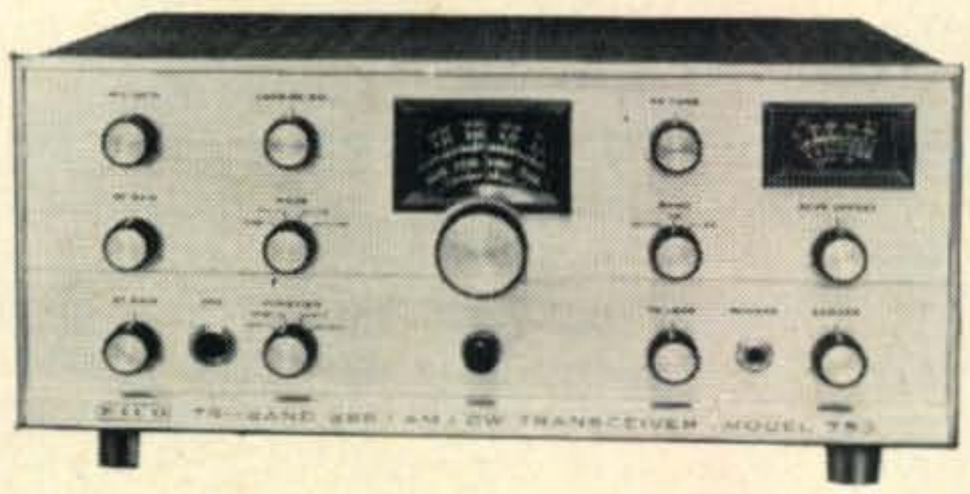

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– Elliot Berelson, WA2HDP

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For further information, check number 40, on page 106

Feeding Linears [*from page 53*]

The usual tricks of changing link turns and adding a capacitor in series or parallel in cut and try method as shown in fig. 3 will solve your problem.

Adjusting the linear is the real key to success and will try your ingenuity. You will really have to forget your old class C experience and try a new bag of tricks. The ordinary ham isn't the proud possessor of a scope so he has to do the job without one. To do a really good job, one should use a scope. One thing that really is a must, is some sort of output power measuring device[2], because in your tune-up you will find that the highest input current doesn't necessarily mean highest output. Figure 4 shows such a device that can be hung on the antenna. Notice that there is a power dividing network to reduce the output voltage for use on the vertical plates of a scope.

Another necessary gadget is a dummy load. There are several good loads on the market at reasonable prices. However, the old light bulbs still do a pretty good job.

If you have no scope and cannot borrow one, then proceed as follows: Tune up the exciter for proper excitation to the final. You can hang your handy dandy power measuring device on this unit too if you desire. (See fig. 5.) Now put the power output measuring device on the final and adjust coupling to feedline. Be sure the final amplifier tuning is set for maximum output at proper plate dissipation at resonance. If the coupling is increased, the d.c. input goes up but the output remains constant or even decreases. The point of maximum output for maximum input current is the proper adjustment for the linear amplifier. Now that you have reached this point, you must check to see if your amplifier flat-tops. This means you have exceeded the dissipation of the tube and hence, any output above this is just lost power. In addition this produces thumping or shot type interference on the band. There is a simple way to check for this condition; vary the amount of carrier insertion from your exciter (note the power output meter) until you reach a point where more carrier insertion gives you no rise in plate current and power output. This is really the proper adjustment. Listen on your receiver (without antenna) and get checks on the air. If OK, you are in business.

Scoping

If you are the proud possessor of a scope, use the set-up in fig. 5. The correct way to adjust a linear amplifier is with a scope and a two tone oscillator. Anyone who owns a scope we will assume knows how to operate it. The adjustments of your transmitter are not any more difficult than without a scope—and as a matter of fact, the procedure you follow is exactly the the same. All the scope does for you is to show you how you are adjusted and enables you to

[2]Chapin, W., "The Transmitter Tune-Up Box," *CQ*, November 1964, P. 47.

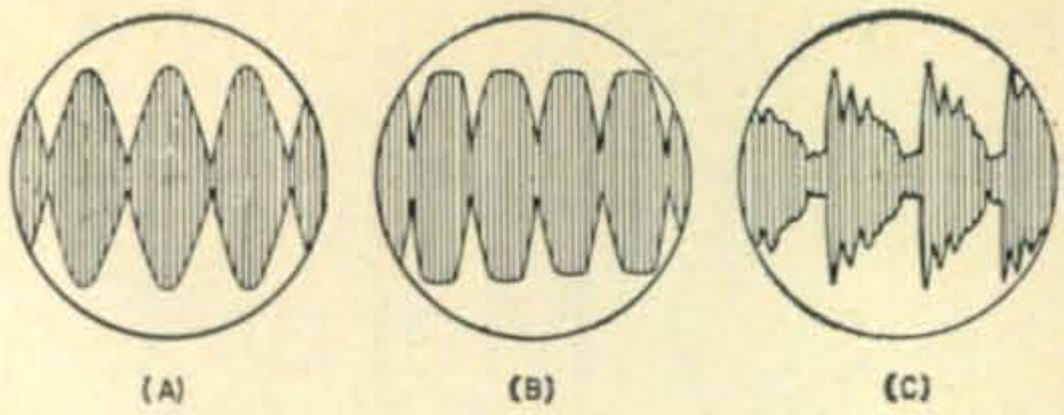


Fig. 6—Various two tone test patterns show linear amplifier performance clearly. (A) shows a proper two tone test pattern. (B) indicates flat topping while (C) might be a typical voice pattern.

see what adjustments do to clarify the problem. A two-tone test is useful in checking the linearity of the transmitter. Figure 6A is a properly adjusted two-tone test pattern and 6B shows flat topping or distortion. If you use some sort of audio compression, you will be able to see the benefits by using it on voice—removing and checking results. Where you have several linear amplifiers, you may have to back up from the final to check on problem areas. Figures 6B and C are typical patterns. Other patterns will show other problems such as parasitics, etc.

Linear amplifiers are very useful beasts when properly used and tamed. They are easy to abuse —and once you have yours adjusted, you will have to operate it carefully to avoid fouling up the bands with broad signals and shot type interference. ■

RTTY A-Z [*from page 39*]

a power supply. The simplest thing to do is use one's local loop power source, since the set requires a maximum of about 25 ma. The test set contains six basic electrical circuits. It will be recalled that, at 60 w.p.m. and a baud rate of 45.45, a signal of approximately 23 c.p.s. is created. One of the circuits, (fig. 105) is an oscillator that produces a 20 c.p.s. signal. The circuit used two W.E. type 255-A polar relays, S_1 and S_2, to accomplish this. These are the two relays located in the left hand compartment. Naturally, these two relays must be in proper adjustment in order for the oscillator circuit to function properly. There is an oscillator circuit that produces a 10 c.p.s. signal which is similar to that of fig. 105.

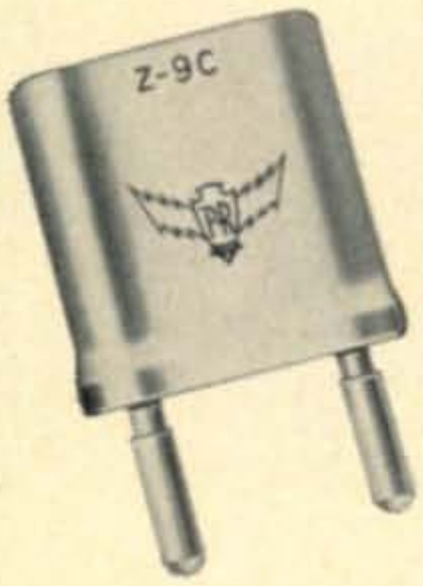
The schematic diagram of the test set circuit for determining the bias of a relay under test is shown in fig. 106.

The Oscillator Circuit

The 20 cycle oscillator circuit is shown in fig. 105. The frequency of the circuit is determined from the series-resonate circuit composed of inductor L_1 and the bank of capacitors C_2, C_3, C_4, C_5 and C_6. This resonant circuit is shock excited from the action of polar relays S_1 and S_2.

Polar relays S_1 and S_2, in fig. 105, must be operating properly before the test set can be used to test other polar relays, or as a source of alternating current signals. This can prove to be a sticky problem unless one has two properly adjusted Western Electric Type 255-A relays to

Meet the NEW PR Z-9C Crystal



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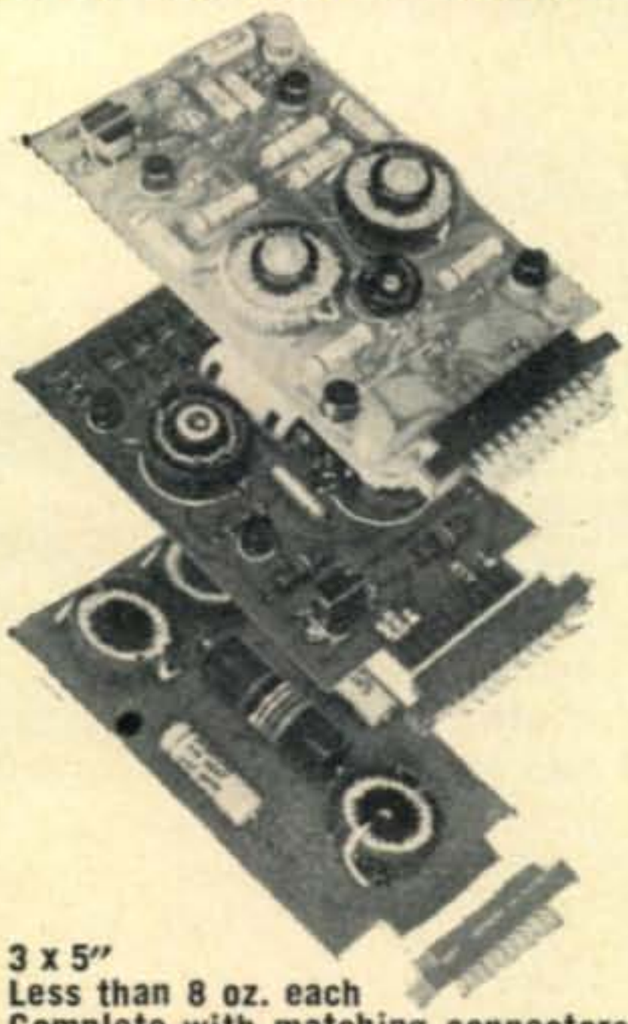

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For further information, check number 50, on page 106

RTTY From A to Z [*from page 90*]

start with. The test set is equipped with a 100-0-100 milliammeter, as shown in fig. 67. This meter should vibrate near its zero position, making equal excursions to either side of this point when switch K_6 is put in the respective "dots high" and "dots low" positions. This is an indication that polar relays S_1 and S_2 are in proper adjustment. If none of one's relays can pass this test, then one must be able to borrow two properly adjusted relays or face the task of first properly adjusting two relays without the use of the test set. One might be inclined to ask at this point, "If this can be done, then what is the point of obtaining an I-193-C Test Set in the first place?" Actually, the test set would be of some value under such circumstances, since one could plug in the relay, which is being adjusted, in socket S_1 or S_2 from time to time as it is being adjusted in order to check its operation. One should probably find or properly adjust a relay for socket S_1 first. The set may be used as a source of a.c. to test other RTTY gear after relays S_1 and S_2 are functioning properly.

I-193-C Test Set Summary

There are numerous individual circuits in the I-193-C Test Set manual, such as the circuits shown in figs. 105 and 106. Space does not permit the reproduction of all of those circuits here, nor does space permit a further discussion of their functions. As previously mentioned, one of the important functions of the test set is in the determination and adjustment of polar relay sensitivity. This and the other functions are adequately covered with numerous circuits and pictures in the 98 page manual.

It is hoped that the data given here has given the reader sufficient information to realize the value of this test set to any RTTY shack. The subject of distortion, some of its causes, methods and devices used in connection with its measurement have been covered. Next month the author will cover an RTTY distortion measuring set that is commercially available at a price that many amateur RTTY'ers can well afford.

[*To be continued*]

2 KW on 2 [*from page 45*]

Screen and plate potentials are applied *simultaneously* and the grid bias is adjusted for a resting plate current of 250 milliamperes. A small amount of r.f. drive is applied to the amplifier and the grid and plate circuits brought to resonance. The link loading capacitor C_1 is adjusted for lowest s.w.r. on the coaxial line from the driver. Driving power is slowly increased, while dipping and loading the plate tank circuit. Plate loading and grid drive are juggled until the desired parameters outlined in the "Amplifier Operating Characteristics" (fig. 15) are achieved. Grid and screen currents are sensitive indicators of amplifier operation,[6] and these, together with some form of r.f. output meter, will permit the operator to quickly adjust the amplifier for optimum operating parameters. For best linearity, the amplifier should be slightly overcoupled to the antenna so that the r.f. power output drops about two percent from maximum value at the point of proper loading. Under the two kilowatt p.e.p. rating, the amplifier will deliver 1200 watts to the antenna circuit, with a power gain of over 22 decibels. Intermodulation distortion products are low and the signal, when driven by a clean s.s.b. exciter is a pleasure to to listen to. Neutralization, of course, is not required and the amplifier tunes up "just like on the d.c. bands." ■

[6]Meacham, D., "Understanding Tetrode Screen Current," *QST*, July 1961, p. 26.

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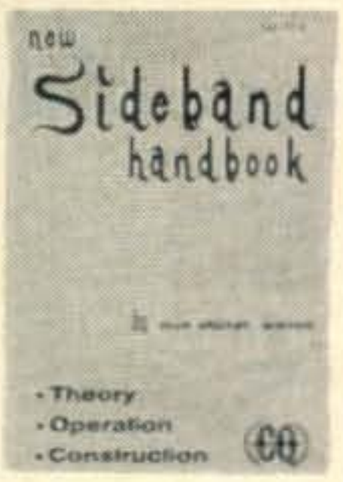

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CQ Reviews the Transcom SBT-3 Transceiver [*from page 51*]

Construction

The construction, workmanship and layout must be seen to really be appreciated. All stages, except the final, are assembled and wired on printed-circuit boards which are those made to Mil Specs of glass-epoxy rather than the cheaper and less desirable synthetic-resin boards ordinarily used. All soldering on the boards has been neatly done by hand and there is no maze of tangled wires from the breakouts of the interconnecting wiring harness.

Another Mil Spec procedure we've not seen in ham gear is that the leads for the small glass diodes are looped once before they are inserted in the circuit board. This relieves strain on the glass bodies of the diodes and leaves additional lead length for dissipating heat during soldering. The loops also offer a convenient place for attaching a heat sink, such as a pair of long-nose pliers or tweezers, when soldering is being done.

Like the RECEIVER TRIM (preselector tune) and the LOAD control, the r.f., a.f. and mic gain controls are adjusted by thumb-wheels. Numerals appear on the face of each wheel for reference settings. Other controls have conventional knobs. If the carrier null should require readjustment at any time, it may be done with a screw driver through an access hole without removing the cabinet.

The v.f.o. dial is calibrated in 5 kc steps and is driven with a pinch drive that provides a very slow tuning rate of 40 knob revolutions to cover each band. On 80 and 20 one turn of the knob covers about 5 kc, on 40 it tunes about 2.5 kc per turn. The dial window has two hairlines; one is used for l.s.b. on 80 and 40, the other for u.s.b. on 20 meters. One thing that is lacking however, is a means for setting the hairline or the v.f.o. frequency for calibration purposes.

Phono-type jacks are used for the antenna and the speaker connections on the rear apron. A mic jack on the panel accommodates a 3-way phone plug (PL-068). The power-cable connector has split-forked prongs for positive and secure contact. The case has mounting feet for tilt-up positioning at fixed locations and a gimbal bracket is available for mobile installation.

Power Supply

Two types of power supplies are available; one for mobile use from a 12 v.d.c. *negative*-ground source; the other for fixed use with 117 v.a.c. and which has a built-in speaker and a console cabinet. With 12 v.d.c. operation only the Transcom d.c. power supply should be used because of the special filament voltage needed for the p.a. tubes. The size of the d.c. supply is only 4" × 6¾" × 6¾", making it feasible to mount behind the dash. The speaker in the a.c. supply is 4" × 6" and there is a relay with contacts for actuating a linear amplifier. Size of this unit is 4⅞" × 7" × 8¾" (H.W.D.)

Performance

The performance of the Transcom SBT-3 measured up to the given specifications. In addition, on receive the relative gain between each band was found to be within 2 db. A.g.c. figure-of-merit was 6 db a.f. output rise with an 80 db increase of r.f. input signal (10-100,000 μv). On transmit, two-tone tests indicated excellent linearity.

Operationally the rig tunes up easily and quickly without any fuss. There appears to be no hesitancy when the p.a. tube filaments go on for transmit. The mic gain is ample and no matter how loud you yell into the mic, there is no flattopping caused by the p.a. itself. As with any a.l.c. system, the degree of compression can be overdone, so it must be handled discreetly, in which case on-the-air reports indicate a nice sounding signal.

On receive the a.f. quality is excellent and sounds very clean. The a.g.c. operates very smoothly without annoying pumping and the recovery following a transmission is instantaneous to the ear. The v.f.o. tuning is velvet smooth and the slow tuning is ideal for mobile work. There is some noticeable parallax between the hairline and the dial calibration markers, and the numerals for the 40-meter band are a little too high in the dial window for easy recognition in mobile use. However, after you get accustomed to it, it is not bothersome.

What we like most about the SBT-3 is that it requires little space, particularly in our compact car.

The Transcom SBT-3 Transceiver is priced at $299.50. The SBA-3 a.c. power supply in console case with speaker is $99.50. The SBD-3A mobile power supply is $99.50. Mobile mounting kit costs $3.50. The manufacturer is Transcom Electronics, Inc., 375 Hale Ave., Escondido, California 92025. —*W2AEF*

Contest Calendar [*from page 67*]

Once again we make the request of all of you who did any operating in our contest, to please send in your log, your few contacts might be the ones we need in our cross-checking. And don't underestimate your efforts, you might be a surprise winner.

The Christmas holiday season will soon be upon us, may yours be a very happy one, and may the New Year bring loads of new DX.

73 for now, Frank, W1WY

Propagation [*from page 70*]

Southern Brazil, Argentina, Chile & Uruguay	08-10 (1)* 10-14 (2)* 14-16 (1)* 06-07 (1) 07-12 (2) 12-14 (4) 14-15 (3) 15-17 (2) 17-18 (1)	06-07 (2) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-18 (4) 18-19 (3) 19-22 (2) 22-06 (1)	20-22 (1) 22-01 (2) 01-04 (1)	22-06 (1) 00-02 (1)†
McMurdo Sound, Antarctica	09-11 (1)* 06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 16-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-03 (1)	21-00 (1) 00-02 (2) 02-05 (1)	*Nil*

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Carrier Suppression	50 db
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Antenna Input Impedance	50 ohms unbalanced

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For further information, check number 31, on page 106

VHF [*from page 73*]

with the present antenna, but the echoes are now about 2 to 3 db out of the noise in a 60 cycle filter using the paramp with about 450 watts output from the transmitter. I can get slightly less feedline loss; I still think the feed for the dish can be improved for a couple of more db and the transmitter can put out more power. I also think I might be able to improve the receiver front-end a bit." *Vic's letter goes on at great length. Shame we don't have space to run all of it.*

METEOR SHOWER DATA

Night Showers

Quadrantids	Jan. 1-4
Lyrids	April 19-23
Aquarids	May 1-6
Aquarids	July 26-31
Perseids	Aug. 10-14
Giacobinids	Oct. 9
Orionids	Oct. 18-23
Leonids	Nov. 14-18
Geminids	Dec. 10-14

Daylight Showers

Cetids	May 19-21
Perseids	June 4-6
Arietids	June 8
Taurids	June 30-July 2

NOTE: Year-to-year variation is negligible, making this data chart an accurate two meter shower DX reference for any year.

Thirty

For co-columnist K2ZSQ, this month's report marks my 61st VHF column for *CQ* and 14th in direct collaboration with K2UYH. Through the years we have grown with *CQ* and more recently with, Al Katz, developed a column that is perhaps more balanced and comprehensive than ever. Your support of our efforts has been increasingly encouraging over these years, and we both wish to take this opportunity to say a heart-felt thank you.

Next month we will outline an entirely new v.h.f. program for 1966, a program that we feel will offer something for everyone, including many new awards and advance contest info.

For now, let us wish you a most Merry Christmas. (Two meter men must catch the Geminids & Arietids showers to insure a happy New Year).

73, Bob, K2ZSQ and Allen, K2UYH

Novice [*from page 78*]

English it would add much to our enjoyment of our hobby. I think that learning an International language will do much to further the cause of world peace. We must be able to understand our neighbor if we are to really get along with him. Kaj, all of the construction articles that I write will have all electrical values as part of the parts list, this I pledge for all of the nice letters that I have received from the peoples of other lands. I DO appreciate your many letters.

Not all of our letters praise the column as does the above, once in a while I'm wrong. Witness this letter

sent by Joe Picior, WB2GYP, 181 Monroe Street, Franklin Square, L.I., New York. It was addressed to the Editor and forwarded to me.

"Editor *CQ*: I appreciate your nice NOVICE colum (n). (Reading it helped me get started.) *But* how about helping them right? Please check solid state power supply diode polarities in the general purpose power supply in the September '65 issue (vol 21 #9) page 89. Thanks best 73's Joe.

P.S. I read your magazine every month and keep up the v.h.f. gear."

Thanks, Joe, for the information. You are right, the drawing of the diodes are reversed but the marking is correct as shown. Check this in your copy and reverse the drawing of the diodes but leave the + sign as shown. I always go back to the original copy and draw any corrections and reference the correct copy in the article. I checked my power supply and it is correct so I lost no diodes. By the way, I also have a power supply just like this except I use a bridge and get twice the voltage and use the center-tap for the 325 volts for the exciter. This for a unit that uses a linear final. Tell you more about that later. I'm glad you read the column, Joe. Like I said, we all make mistakes, Thanks again.

Help Wanted

If you have problems with getting a license or getting the rig to go let me try to get someone nearby to help you. Now, no one can get you a license except yourself, but maybe you can use some personal advice or help. Write, Walter G. Burdine, W8ZCV, Waynesville, Ohio, and give us the information.

Those needing help now are: Earl Jones, Jr. GB.73 524 Ringo, Mexico, Missouri 65265 needs help with code and theory from a local ham.

Ronnie R. Abbott, R.F.D. #3, North Vassalboro, Maine is a handicapped aspirant that could use some help from a local and possibly the loan or donation of some used equipment to set up a station. Locals have a chance to do their Boy Scout deed of the year.

My good friend, Lawrence "Pelly" Morris, WA9INV, Box 184, RR#1, Lawrenceburg, Indiana would like to obtain by any means legal, a book on the Clegg Interceptor "A". He says that with a book he might be able to put in a better signal but for about 75 miles he seems to consistently put in an S-9 signal here.

To those who get this magazine within the next two months let me be the first to wish you all the best of seasons greetings and may you have the best year of your ham radio life this new year. Just remember, give a little of yourself and time to help make someone else happy and you will be happier for the deed. Merry Christmas and Happy New Year.

73. Walt, W8ZCV

RTTY [*from page 86*]

The a.f.c. circuit will tune the receiver in 1 or 2 seconds. If, however, the frequency should suddenly be changed several hundred cycles, it would take about 10 seconds for the receiver to be retuned, because the delay circuit associated with V_1 must discharge before this tube can become active. A steady *space* lasting about 5 seconds can be sent without causing the b.f.o. to depart excessively from the correct value. If this signal is prolonged to about 10 seconds, the b.f.o. tuning is changed so that this *space* becomes approximately 2125 cycles. It will then require a steady *mark* of 10 or more seconds for the correct tuning to be re-established.

The AN/FGC-1 a.f.c. circuit is connected to both channels *A* and *B* at the radio receiver audio outputs. A knob, marked AFC, is provided on the a.f.c. panel so that the circuit may be made inoperative by turning it to OFF. The DISCH button is provided to short circuit the output momentarily when testing, in order to

save the time which would otherwise be needed to discharge the 32 mf capacitor in the output circuit.

On the Bauds

W1LZB of Braintree, Mass., is on 80 with a Model 19, a 32v-3 running 165 watts, and an NC-183. Oldtimer W1BGW of Boston, Mass., is on 7140 kc Sunday mornings with narrow shift. W1SNN of Framingham, Mass., uses a Boehme Model 5C converter with his 51J-4. K1MQK of Waterbury, Conn., uses a Model 15 with a GSB-100 and an NC-300.

W2YEQ of Babylon, L.I., uses a 75S-3 and a Model 19 with an HT-32 driving a pair of 813's. W2NQW of Port Jervis, N.Y., runs 100 watts to an 811 and has Model 14 printer and TD. W2TAP of New York Citv works 20. Atlantic Surplus Sales, 250 Columbia Street, N.Y., 11231, has Teletype manuals in stock. W2QFR of New Rochelle, N.Y., makes the required 14 copies (for comments to the FCC) on his Model 28, using an endless tape loop. W2JGE operates 80 from W2GDU in Freeport, L.I., using a KWM-2. W2JBZ of Spring Valley, N.Y., is on 80 as is K2DON of Staten Island, N.Y.

Oldtimer W3CRO of Springfield, Pa., runs a KW to a 4-1000A on 80, and has a new pair of SP-600JX receivers for diversity reception; and, a new Model 28ASR to go with his old Model 26 and Model 14's. W3AZR of Telford, Pa., is building the Twin City TU. K3UNX of Camden, Del., was on 146.32 with a TDQ transmitter (a.m.). K3OJX of King-of-Prussia, Pa., uses tape on 80. K3MIU of Bedford, Pa., is also on 80. W3UQX of Allentown, Pa., runs 400 watts on 80 and has Models 15 and 19. WA4TPS of St. Petersburg, Fla., and W5SKU of New Orleans, La., both work 20 meters.

W7PBV of Boulder City, Nev., reports the following Nevada stations with Model 15 machines: WA7ARZ, WA7BEU, W7CTK, K7DNE, W7HQS, K7NYU, W7PRM, K7PYF, K7RKH, K7ZOK, and W7PBV.

W8TGT of New Martinsville, (WETZ), W. Va., has some Model 28 printers and TD's for sale. K8RFU of New Philadelphia, Ohio, uses a W2JAV tube TU with switchable filters for 850, 340, and 170 cycle shift; and a Marauder on 80, 40, 20, 15, and 10 meters. Charlie reports increased activity on 29,050 kc. *(We would like to hear from the rest of the groups in Ohio, N.Y., and N.C. reported using this frequency for f.s.k.)* K8CPC of Rochester, Mich., has problems with his WE J86205J loop supply *(Who can help?)*

W9GFS of Evansville, Ind., uses a Model 14 strip printer on 80. Phil started in with a Model 12 in 1953. WA9CGW of Jacksonville, Ill., has a Model 15 and is looking for a schematic of his Boehme 5C converter. WØLFH of Algona, Iowa, is using the late WØBP's AN/FGC-1 in diversity. The WØBP Net (Minnesota) meets on 7140 kc with narrow shift Sunday mornings.

DX printed from 20 meters at W2JTP during late August: FG7XX, Guadeloupe Island; I1WT, Firenze, Italy; G2HIO, England.

Comments

Our mail bag has contained many nice letters of appreciation for this series of RTTY Columns on the AN/FGC-1. Naturally, a unit of this magnitude could not be covered in a regular magazine article, even if in two parts. So, knowing that there were quite a few units of this type kicking around, simply because no manual was available (or because it was so big!), we decided to pass along our information and experience in the form of a series of RTTY Columns. Having one in actual operation for several years at W2JTP was a great help, too.

All that remains to be covered is the power supply, and perhaps a short run-down on the line-up procedure. So, stay with us, and if you have the opportunity (and the room!), grab one and enjoy this phase of RTTY.

A Very Merry Christmas, Byron, W2JTP

For further information, check number 41, on page 106

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QSL's . . . 18 samples 10¢ . . . Filmcrafters . . . Martins Ferry, Ohio.

QSL's WSL's XYL-OM's (Sample assortment approximately 9¾¢) covering designing, planning, printing, arranging, mailing eye-catching comic, sedate, fantabulous. DX-attracting, Protopay, Snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minn.

QSL's BROWNIE—W3CJI . . . 3111 Lehigh, Allentown, Pa. Samples 10¢ with catalogue 25¢.

QSL's CB, WPE Samples 10¢ Nicholas & Son Printery P.O. Box 11184, Phoenix, Arizona 85017.

QSL CARDS—100 3-color, glossy $3.00. World globe in silver; report form on reverse side; Free samples. RUSPRINT, Box 7575 Kansas City, Missouri, 64116.

HUNDRED QSL's: $1. Samples, dime. Meininger, Jesup, Iowa.

QSL's—Ham and CB, related products. Free Samples. April Sign Co. 56290 Van Dyke, Washington, Michigan.

QSLs. Large Selection, including photos, rainbows, glossy stocks, cuts, etc. Fast Service. Samples, dime. Ray, K7HLR, Box 1176 Twin Falls, Idaho, 83301.

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ELIMINATE Mobile Vibrator Noise. Revolutionary device outmodes noise-creating vibrator. Completely transistorized unit plugs directly into vibrator socket. No moving parts. Same size as vibrator. 12 Volts. Not a kit. Comes completely wired ready to use. **For negative ground only.** State make and model of transceiver. $11.95 PPD.-$5.00 deposit on all C.O.D. orders. Tel-Trol Systems, 2180 Bronx Park East, Bronx, N. Y.

PRINTED CIRCUIT BOARDS Hams, Experiments. Many different projects. Catalog 10¢ P/M Electronics, Box 6288 Seattle, Washington 98188.

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GIANT 20th Anniversary Catalog. TV Cameras and Electronic Equipment. Free copy. Denson Electronics, Rockville, Conn.

For further information, check number 42, on page 106

For further information, check number 43, on page 106

SELL: Elimac 4x250B tubes. Guaranteed good. $6.50 each, $10.00 pair. Prepaid in U.S.A. Send check or money order. Everett Stidham, Jr., W5JLQ, 722 South 30th, Muskogee, Oklahoma.

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Checks and/or money orders are to be payable to CQ Ham Shop, and all correspondence in connection with Ham Shop should be directed to: muriel e. mark, c/o *CQ Magazine* 14 Vanderventer Avenue, Port Washington, L.I. N.Y. 11050.

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CRYSTALS, Transformers, Pyranol condensers, etc., top quality surplus. Write for Bulletin No. 865. R & M Electronics, Box 5234, Knoxville, Tennessee 37918.

NEED ANY BAND coils fitting HRO-7 and components or unit for ART-13 AC Power Supply. G. Evans, W4WVS, 803 Rosselle St., Jacksonville, Fla.

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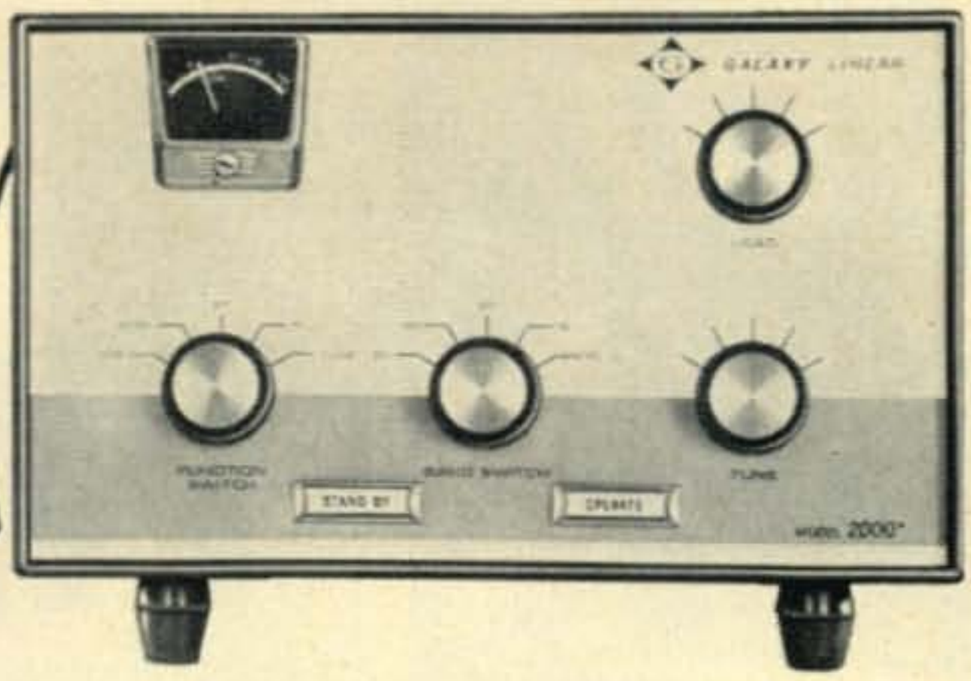

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For further information, check number 3 on page 106.

RCA Electronic Components and Devices, Harrison, N.J.

*Message Sixty-Six (66) listed in ARRL Log Book.