CQ

June 1960

50¢

The Radio Amateur's Journal

COLLINS S/LINE where beauty is more than skin deep

Finely finished in blue-gray tones, Collins S/Line gives your ham shack the most modern and distinctive decor. Controls and meters on the panels of Collins S/Line provide you with maximum operating convenience and efficiency. But exterior styling is only a fraction of Collins advanced design. It goes deeper. Inside each unit of the Collins S/Line you'll find the latest circuitry, the careful craftsmanship and quality components that make Collins S/Line truly a system-engineered single sideband radio station.

From microphone to antenna, Collins S/Line operates as an integrated high powered SSB ham station. With Collins 75S-1 Receiver you get SSB, CW and AM reception on all amateur bands between 3.5 and 29.7 mc. The 75S-1 can cover the entire HF spectrum between 3.5 and 29.7 mc by selecting the appropriate HF beating crystal.

The 32S-1 Transmitter, with an input of 175 watts P.E.P. on SSB and 160 watts on CW gives you strong, clear signals.

Add the 30S-1 Linear Amplifier and you can operate at the full legal limit on SSB, and 1 kw on CW. Front panel switching on the 30S-1 lets you operate on two SSB power levels; 100 watts from the exciter alone, or the 1 kw meter average input for SSB.

Collins 312B-4 Speaker Console integrates the Transmitter, Receiver, Linear Amplifier and other accessories into one complete operating unit.

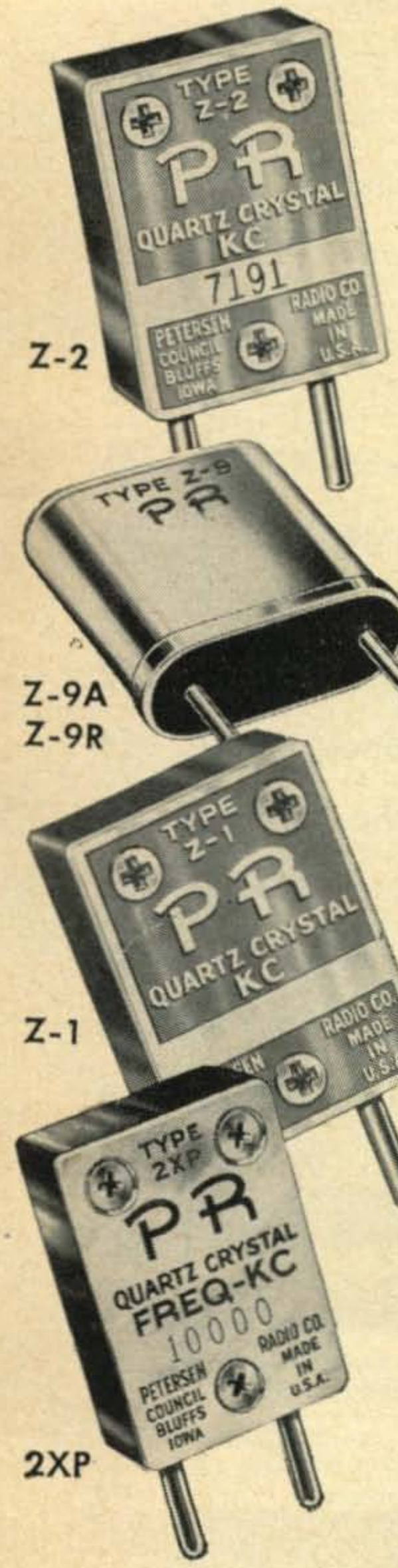
Visit your Collins Distributor and give the S/Line your own thorough inside-and-out investigation. See for yourself, why, when it's Collins S/Line, beauty is more than skin deep.

COLLINS

For further information, check number 1, on page 126

It pays to insist on PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934



Z-2

Z-9A
Z-9R

Z-1

2XP

AMATEUR TYPES

40 and 80 Meters, PR Type Z-2
Rugged. Low drift, fundamental oscillators. High activity and power output. Stands up under maximum crystal currents. Stable, long-lasting; ±500 cycles..... **$2.95** Net

2 and 6 Meters, PR Type Z-9A
Third overtone; multiplies into either 2-meter or 6-meter band; hermetically sealed; calibrated 24000 to 24666, and 25000 to 27000 Kc., ±3 Kc.; .050" pins..... **$4.95** Net

6 Meters, PR Type Z-9A
Fifth overtone; for operating directly in 6-meter band; hermetically sealed; calibrated 50 to 54 Mc., ±15 Kc.; .050" pins. **$6.95** Net

CITIZENS BAND CLASS "D"
Type Z-9R, Transmitter
FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225; calibrated to .005%. (Be sure to specify manufacturer of equipment)..... **$2.95** Net

CITIZENS BAND CLASS "D"
Type Z-9R, Receiver
Specify I.F. frequency, also whether I.F. is above or below transmitter frequency. Calibrated to .005%. (Be sure to specify manufacturer of equipment)..... **$2.95** Net

Type Z-9R, Radio Control
FCC assigned frequencies in megacycles: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255; calibrated to .005%. (Be sure to specify manufacturer of equipment)..... **$2.95** Net

Type 2XP
Suitable for converters, experimental, etc. Same holder dimensions as Type Z-2.
1600 to 12000 Kc., (Fund.) ±5 Kc..... **$3.45** Net
12001 to 25000 Kc. (3rd Overtone) ±10 Kc..... **$4.45** Net

ALL PR CRYSTALS ARE UNCONDITIONALLY GUARANTEED.
ORDER FROM YOUR JOBBER.

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

Type Z-1, MARS and CAP
Official assigned frequencies in the range. Calibrated to .005%.
1600 to 10000 Kc..... **$3.45** Net

Type Z 1, TV Marker
Channels 2 thru 13.... **$6.45** Net
4.5 Mc. Intercarrier, .01% ..... **$2.95** Net
5.0 Mc. Signal Generator, .01% ..... **$2.95** Net
10.7 Mc. FM, IF, .01% ..... **$2.95** Net

Type Z-6A, Frequency Standard
To determine band edge. To keep the VFO and receiver properly calibrated.
100 Kc. .. **$6.95** Net

Z-6A

PETERSEN RADIO CO., *Inc.* 2800 W. Broadway
COUNCIL BLUFFS, IOWA

EXPORT SALES: Royal National Corporation, 250 W. 57th Street, New York 19, N.Y., U.S.A.
For further information, check number 3, on page 126

CQ—The Radio Amateur's Journal

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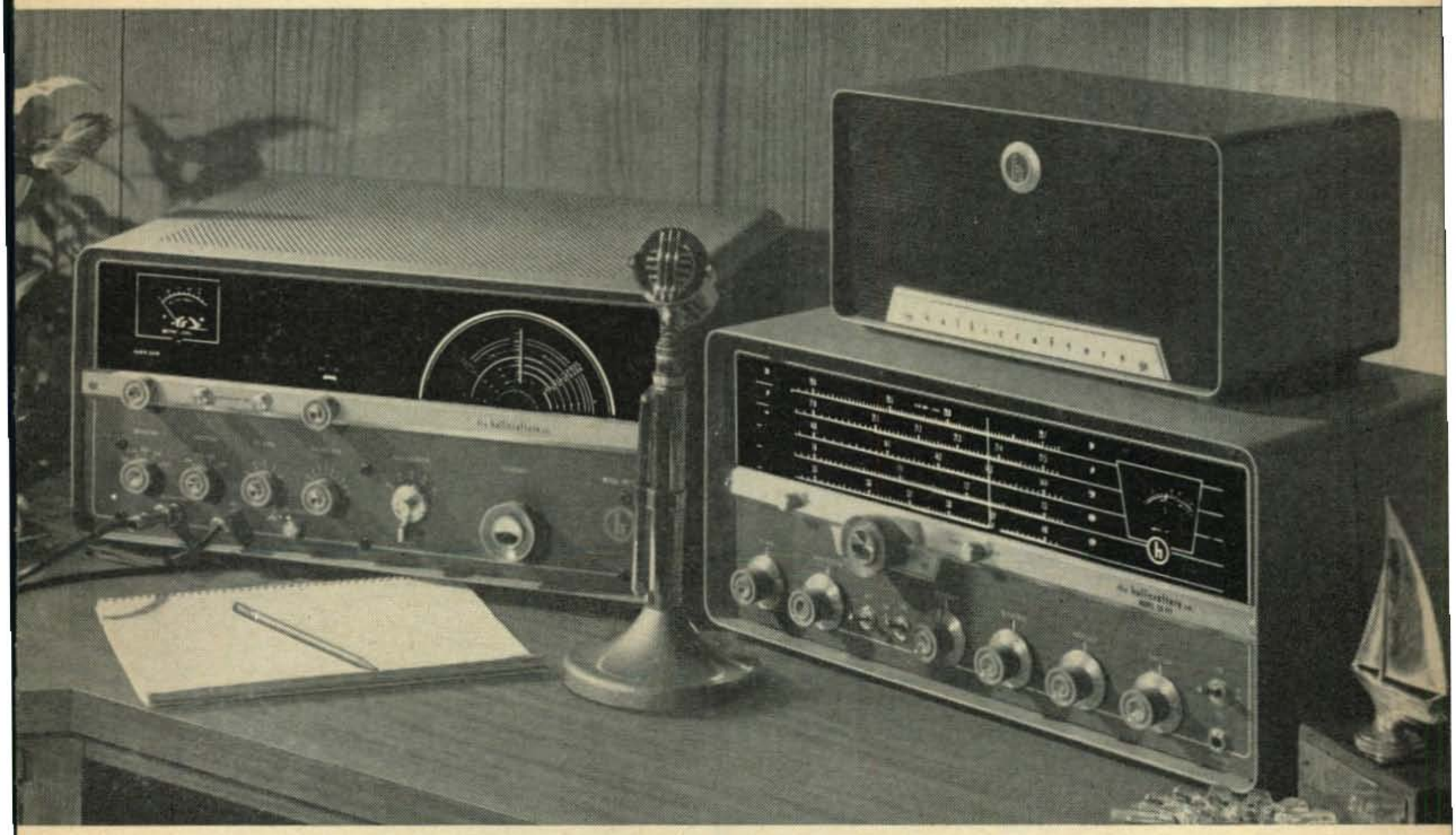
FROM **hallicrafters**

AN ENTIRELY NEW CLASS OF SSB EQUIPMENT



The engineering team that developed the incomparable SX-101 and HT-32 now offers a precision rig that puts Single Sideband within reach of all.

SX-111 Receiver $249.50. Here's a CW/AM/SSB receiver with the essential performance characteristics of the renowned SX-101 . . . at a price that can put it in your shack tomorrow. CW/AM/SSB reception; complete coverage: 80, 40, 20, 15 and 10 meters in 5 separate bands, 6th band tunable to 10 Mc. for WWV. Upper/lower sideband selection; sensitivity: 1 microvolt on all bands; 5 steps of selectivity: 500 to 5000 cycles. Dual conversion, crystal controlled 2nd converter, famous Tee-Notch filter, built-in crystal calibrator.

HT-37 Transmitter $450.00. A precision-engineered CW/AM/SSB transmitter with the same power, rugged construction and smooth, distinctive speech quality of its big brother, the famous HT-32. VFO employs double reduction disc drive, fixed T.C. Sideband suppression 40 db. at 1000 CPS. Power rating: 70-100 watts P.E.P. output CW or SSB. 17-25 watts carrier on AM phone. Two 6146's in the final. 3rd and 5th order distortion products down 30 db. Instant CW CAL signal from any transmission mode.

the new ideas in communications are born at . . .

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Canada: Gould Sales Co., Montreal, P.Q.

For further information, check number 4, on page 126

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department editors

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Frank Anzalone, W1WY — *contest calendar*

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Sam Harris, W1FZJ — *vhf*

George Jacobs, W3ASK — *propagation*

Byron Kretzman, KØWMR — *rtty*

Marvin Lipton, VE3DQX — *club bulletins*

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Charles Schauers, W6QLV — *ham clinic*

Don Stoner, W6TNS — *novice & semiconductors*

Igor Sovern, K2MIB — *art editor*

CQ, the Radio Amateurs' Journal is published for active hams by active hams. CQ endeavors to be a true and honest reporter for those interested in the hobby. Suggestions for improvement are welcomed.

Authors would do well to send for the CQ Style sheet which will explain our confused system of abbreviations and symbols. The article "Author Author" (October 1952 CQ) tells all about how to write artices for CQ, how much we pay, etc. Reprints of this article are available from CQ if you have been improvident in keeping up your radio library.

CQ CERTIFICATES:

The WPX Award is granted for two-way contact with certain number of amateurs in different prefixes of the world. Full details are contained in the WPX Record Book which is available for 15c from CQ. Application forms are free.

The WAZ Award is granted for contacting all of the amateur zones of the world. Current standings of amateurs working for this award will be found in the DX column. A DX Zone map of the world is available free from CQ. Send stamped envelope.

Special SB Certificates are available from the Sideband Department for operators providing proof of contact (QSL cards) with stations in 50, 75 and 100 countries using two-way sideband. Send cards directly to the SB Editor.

TECHNICAL INFORMATION:

Our 15-year cumulative index may be obtained free from our circulation department by enclosing a stamped, self addressed envelope (8¢). Most back issues are available at $1 from us. Check our "Back Issue" ad for details on those not available.

THIS MONTHS COVER:

It's June again and time to "head for the hills". As you can see Jim Holt, KØLSQ, Pete Dahl, KØBIT, and John Luce, KØEEM, (the photographer) are doing just that.

Atop Sugar Loaf Mountain in Winona, Minnesota and equipped with rigs to operate 160 through 6 meters this team shows how much fun Field Day can really be.

That's Pete, KØBIT tuning the 15 meter beam; and in case you think his pasttime is limited only to outdoor activities, check page no. for his WAZ.

Photo credit for the April cover was inadvertently given to K4LYX, it should have been Dr. L. J. Polskin, K4LTX.

For further information, check number 5 on page 126.

AMATEURS IN ALASKA . . .
HAWAII . . . *everywhere*

are telling each other
about the fine-sounding
patches put on by
stations using
the new GONSET

Hybrid-balanced
PHONE PATCH

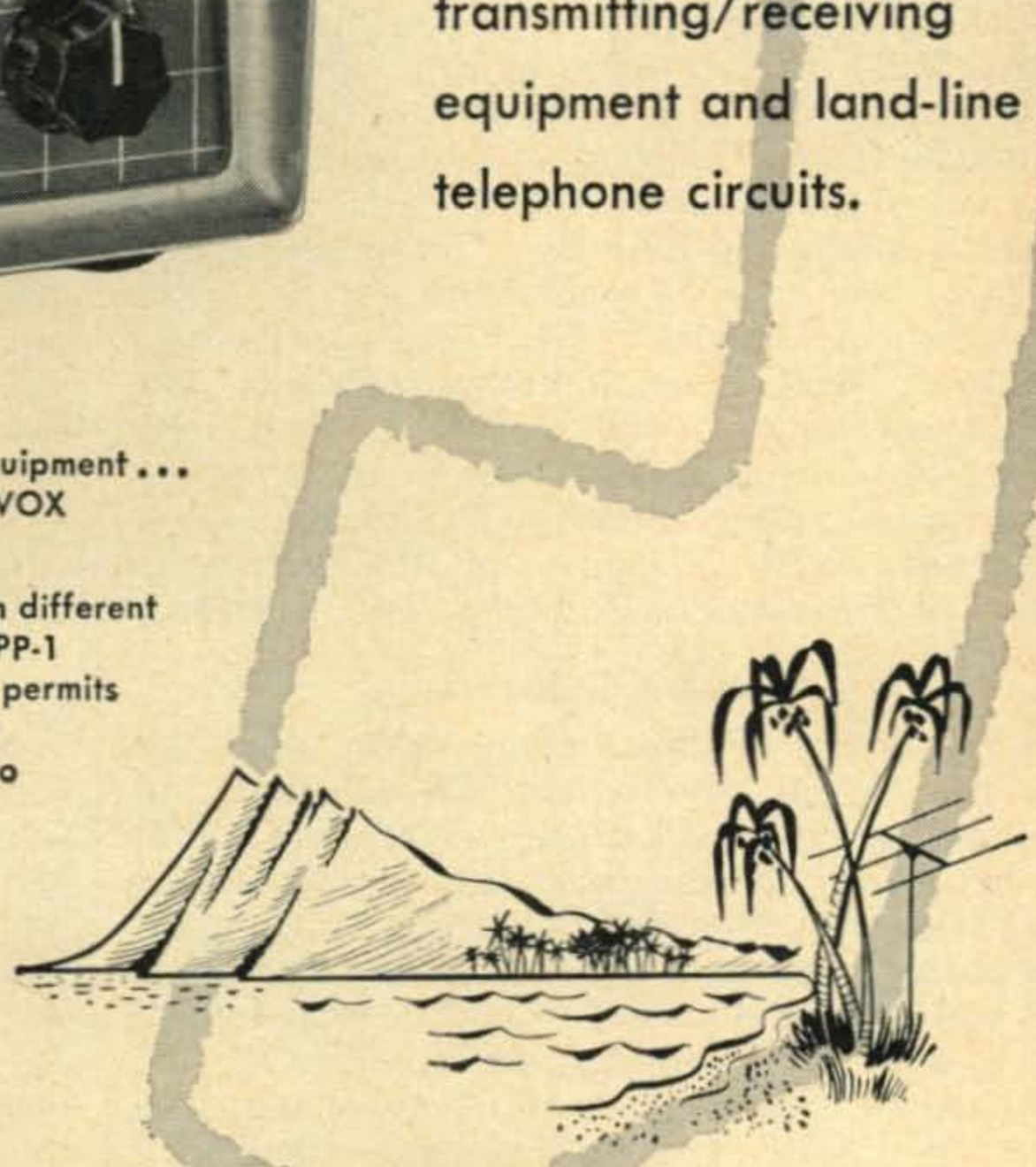
Here . . . in one compact, industrial-designer-styled unit . . . the ideal "patch" between amateur station transmitting/receiving equipment and land-line telephone circuits.

Use GPP-1 with any transmitting/receiving equipment . . . use it to particularly fine advantage with the VOX circuits in Gonset and other SSB equipment.

Required fone line balance often changes with different circuits and varying line conditions. Gonset GPP-1 incorporates adjustable hybrid balancing . . . permits you to optimize balance for any particular set of conditions . . . and has a panel instrument to show you when balance is correct!

Meter also switches to indicate line level under actual patch conditions. Now, you can completely avoid line overload with consequent crosstalk . . . at the same time assuring proper voice level for clearest conversation.

Simple indeed to install . . . equally simple to operate.



rther information, check number 6, on page 126

Model #3273 . . . . 44.50

GONSET **GONSET** *Division of Young Spring & Wire Corporation*

801 SOUTH MAIN ST., BURBANK, CALIFORNIA

In Our Opinion . . . .

Field Day

As usual, the month of June is a big one for amateur radio. . . . That time of the year when we hitch up our wagons and head for some likely place on which to participate in the annual ARRL Field Day exercises. Aside from the natural enjoyment of this popular contest, we have always felt that Field Day was a little extra-special in as much as it is an excellent demonstration of our ability to organize and effect emergency communications when the need arises. Amateur Radio is, aside from a hobby, a valuable public service . . . a ready pool of trained communications people who are prepared to organize on little or no advance notice, for public welfare.

Field Day is, in some ways, much similar to an Air Raid drill. It keeps us in a state of preparedness, while demonstrating to the masses our unchallengeable ability as a communications force. It shows, unquestionably, that Amateur Radio is always on it's toes . . . with the added bonus of one heck of a good time.

We believe last years' Field Day was the biggest ever. Well over 13,000 participants. We should top this by a fair margin in 1960. Lets all get out this year and turn in a whopping score for both the contest, the League and Amateur Radio. We'll see you from W2CGK/2 the station of the Amateur Radio Society of Queens.

March CQ Survey

We can say, without exaggerating, that the response to our March editorial columns and contents survey was excellent. Well over 2,000 surveys were received, indicating just who liked what and why. Many of your suggestions as to new features, column expansions and deletions, etc., will become a part of *CQ* in the near future. Just to start things rolling, we have put *all* our columns on a monthly basis effective with the June, 1960 issue. This will guarantee that each and every reader will find his specific interest in the book every month. We might add that the RTTY boys really swamped us with requests for more column space and articles. Seems RTTY is really growing. The Citizens Band column will be deleted starting with the July issue. Lee Aurick, W2QEX, who did such a fine job as C/B Editor, now becomes *CQ's* Technical Editor. Lee will be responsible for the majority of the technical features which will appear in *CQ* as well as reviewing new commercial equipment. Lee's approach should give *CQ's* reviews a new "Accurate" flavor. Next month's issue will have a complete breakdown of the survey. Keep an eye peeled!

Here at the office . . .

We're about to put a full-fledged hamstation here at the office. Don't know just what our call will be at the time of this writing, but no doubt you'll be hearing us in the near future.

Aside from the amateur station, we're also installing a complete lab to facilitate the test and evaluation of equipment to support our construction projects. Our first project will be a complete 200 watt SSB exciter in a package about the size of a 75A-4. Yep! The power supplies in there too, and the final is a new RCA 7270 beam tetrode. Watch for it in an early issue.

Contest . . .

One thing that *CQ* has harped on again and again is the fact that as amateurs we should retain and encourage our skills in building ham gear. To wit we introduce a new contest to foster this kind of thinking, the Homebrew Contest. Send a set of good quality photos and schematic diagram to: CQ Home Brew Contest, 300 West 43rd Street, New York 36, N.Y. Your entry may be anything in the way of ham equipment. Application of novel circuitry counts just as much as an attractive front panel layout. To the three best entries we will award a free three year subscription to *CQ*. To three runners-up a one year sub on the house. The winner will be selected from the top three entries. His gear will appear on the front cover of *CQ*. Fame as well as fortune.

73, Barry, K2IEG

FROM HEATH ....9 NEW RADIO AMATEUR KITS

GC-1
$99.95
$10.00 dn.,
$9.00 mo.

TEN-TRANSISTOR "MOHICAN" GENERAL COVERAGE RECEIVER KIT (GC-1)

An excellent portable or fixed station receiver! Many firsts in receiver design for outstanding performance . . . ten transistor circuit . . . flashlight battery power supply . . . ceramic IF transfilters. The amazing, miniature transfilters used in the GC-1 replace transformer, inductive and capacitive elements used in conventional circuits; offer superior time and temperature stability, never need alignment and provide excellent selectivity. Other features include telescoping 54" whip antenna, flywheel tuning, tuning meter, large slide-rule dial and attractive, rugged steel case in gray and gray-green. Covers 550 kc to 30 mc in five bands. Electrical bandspread on five additional bands cover amateur frequencies from 80 through 10 meters. Operates up to 400 hours on 8 standard size "C" batteries. Sensitivity: is 10 uv, broadcast band; 2 uv, amateur bands for 10 db signal to noise ratio. Selectivity: 3 kc wide at 6 db down. Measures only 6½" x 12" x 10". 20 lbs.

- **Heathkit XP-2:** plug-in power supply for 110 VAC operation of GC-1. (optional extra). 2 lbs. **$9.95**

HD-20
$14.95

100 KC CRYSTAL CALIBRATOR KIT (HD-20)

Align or check calibration of your communications gear with this versatile ham aid. Provides marker frequencies every 100 kc between 100 kc and 54 mc. Transistor circuit is battery powered for complete portability. Accuracy is assured by .005% crystal furnished. Measures only 2½" x 4½" x 2⅝". 1 lb.

7 more kits on following pages

HEATHKIT® . . . WORLD'S FINEST HAM GEAR

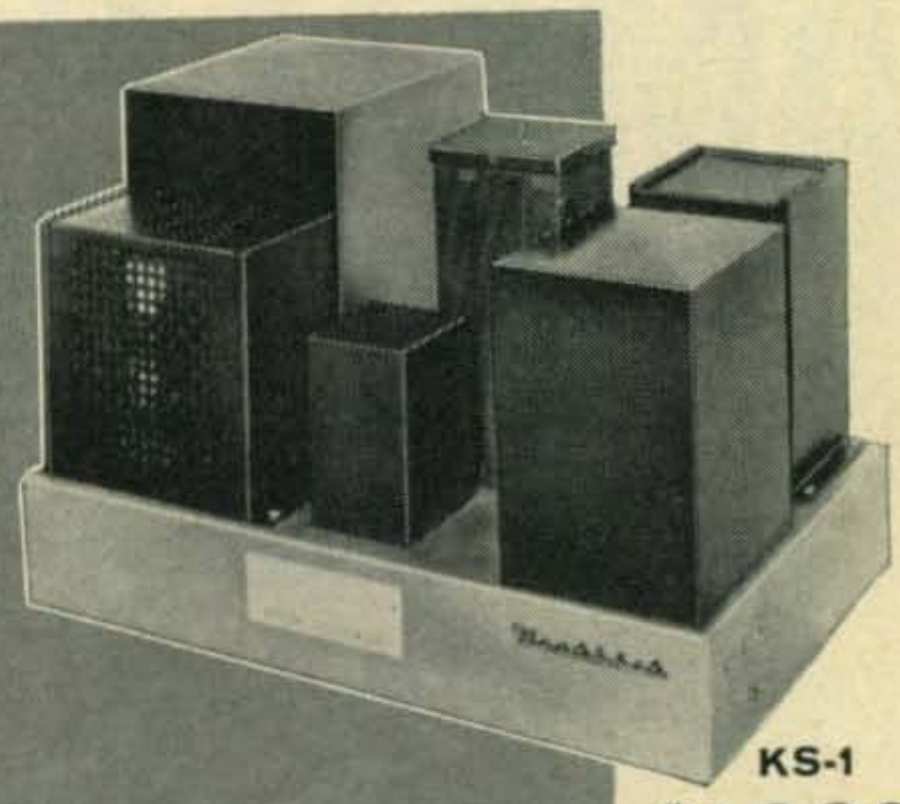
KL-1
$399.95
$40.00 dn.
(Write for time payment details)

"CHIPPEWA" KILOWATT LINEAR AMPLIFIER KIT (KL-1)

Here is a top-quality kilowatt rig with all the features you've been looking for. Operates at maximum legal power input on all bands between 80 and 10 meters, in SSB, CW or AM linear operation. Premium tubes (4-400A's), forced air cooled with centrifugal blower. Grid neutralized, continuous plate current monitoring. extensive TVI shielding. Features both tuned and swamped grid circuits to accommodate all popular exciters. Operates class ABI for SSB and AM linear service and high efficiency class C for CW service. Convenient panel controls include power switch, tune-operate switch, HV on/off switch, final bandswitch, meter switch, grid bandswitch, grid tuning, mode switch, plate tuning, plate loading and bias adjust. Accessory connectors are provided on the rear apron of the chassis for complete compatability with all control circuitry in the Heathkit "Apache" Transmitter. Two meters provided; one monitors final plate current; the other indicates switch selected readings of final grid current, screen current, and plate voltages. Send for complete specifications now. 70 lbs.

A PERFECT COMPANION FOR THE "CHIPPEWA" KILOWATT POWER SUPPLY KIT (KS-1)

Ruggedly constructed for heavy-duty use in medium to high power installations, the KS-1 fills the requirements of a top-notch power supply with economy and safety. Features an oil-filled hermetically sealed plate transformer, "potted" swinging choke input filter and 60-second time delay relay. Line filters minimize RF radiation. Maximum DC power output is 1500 watts. Nominal voltage output, 3000 or 1500 volts. DC current output, average 500 ma, maximum 1000 ma. Control circuitry is arranged to allow remote installation. The KS-1 employs two 866A half-wave mercury vapor rectifiers in a full-wave, single-phase configuration. Power requirements: 115 V, 50/60 cycles, 20 amperes; 230 V, 50/60 cycles, 10 amperes. 105 lbs.



KS-1
$169.95
$17.00 dn.,
$15.00 mo.

XC-6
$26.95

XC-2
$36.95

6-METER CONVERTER KIT (XC-6)

Extends frequency coverage of the Heathkit "Mohawk" and most other general coverage receivers into the 6 meter band. Converts 50-54 mc signals to 22-26 mc. 3-tube circuit provides two RF stages and low-noise triode mixer. Calibration accuracy assured by .005% overtone crystal supplied. Provision for external RF gain control. 6 lbs.

2-METER CONVERTER KIT (XC-2)

This top-quality 2-meter converter may be used with receivers tuning any 4 mc segment between the frequencies of 22 and 35 mc when appropriate crystal is used. Converts 144-148 mc signals to 22-26 mc with .005% overtone crystal supplied. High quality parts used throughout. Silver plated chassis and shields. 7 lbs.

IN KIT FORM TOPS IN TRANSMITTING POWER

TWO BRAND NEW MODELS
HEATHKIT 10 & 6 METER TRANSCEIVER KITS

Complete ham facilities at low cost! The new Heathkit transceivers are combination transmitters designed for crystal control and variable tuned receivers operating on the 6 and 10 meter amateur bands (50 to 54 mc HW-29 and 28 to 29.7 mc for HW-19) in either fixed or mobile installations. Highly sensitive superregenerative receivers pull in signals as low as 1 microvolt; low power output is more than adequate for "local" net operation. Other features include: built-in RF trap on 10 meter version to minimize TVI; adjustable link coupling on 6 meter version; built-in amplifier metering jack and "press-to-talk" switch with "transmit" and "hold" positions. Can be used in ham shack or as compact mobile rigs. Not for Citizen's Band use. Microphone and two power cables included. Handsomely styled in mocha and beige. Less crystal. 10 lbs.

VIBRATOR POWER SUPPLIES: VP-1-6 (6 volt), VP-1-12 (12 volt). 4 lbs. Kit; **$8.95** each, wired; **$12.95** each.

HW-19 (10 meter)
HW-29 (6 meter)
$39.95 each

HD-19
$34.95

HYBRID PHONE PATCH KIT (HD-19)

Add the thrill of phone patching to your ham hobbying, while rendering valuable public service during emergencies and in countless other instances. The HD-19 puts a top-flight phone patch in your ham shack at the lowest price anywhere! Features: voice control (VOX) or manual operation; large, easy to read VU meter for continuous monitoring of output to 600 ohm line; specially designed hybrid transformer providing better than 30 db isolation between receiver and transmitter circuit; separate receive and transmit gain controls. Switched circuitry allows VU meter to be used as null depth indicator. Provides effective match for 3 to 16 ohm speaker impedance. 4 lbs.

ORDER DIRECT BY MAIL OR SEE YOUR HEATHKIT DEALER*
*The convenience of Local Heathkit Sales and Service costs but a few dollars more.

HEATH COMPANY
a subsidiary of DAYSTROM, INCORPORATED
Benton Harbor 12, Michigan

All prices and specifications subject to change without notice. Please include postage on orders to be shipped parcel post. 20% deposit is required on all C.O.D. orders. All prices are NET F.O.B. Benton Harbor, Mich., and apply to Continental U.S. and Possessions only. Dealer and export prices slightly higher.

HEATHKIT®

FREE CATALOG!

Describes over 150 easy-to-build electronic kits in HI-FI, Test, Marine, and Ham radio fields. To get yours, fill in this coupon and mail today!

ITEM	MODEL	PRICE

NAME _____

ADDRESS _____

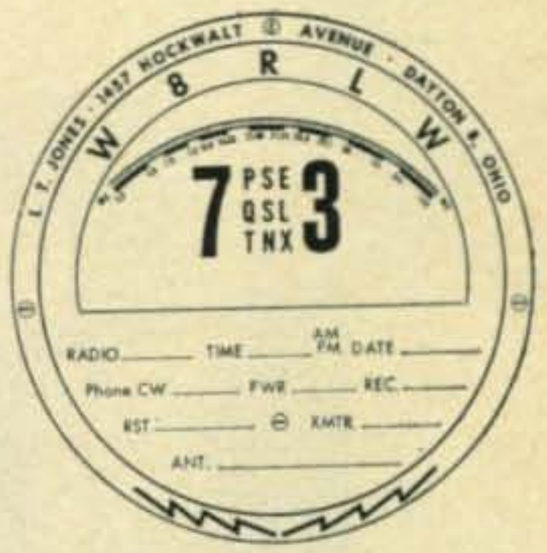
CITY _____ ZONE _____ STATE _____

For further information, check number 7, on page 126

QSL contest

Winner

Runners Up



HAMMARLUND HX-500

SSB TRANSMITTER

- A 100-watt SSB transmitter for amateur and commercial use on the 3.5, 7, 14, 21 and 28 to 30 MCS bands.
- Separate dial scale for each band, or portion of 10 meter band.
- All crystal included for all amateur bands — nothing extra to buy.
- Frequency readability to 200 cps, or better.
- Stability after warm-up better than 100 cps.
- Provides choice of upper, lower, double sideband, CW, FM, FSK for RTTY plus 40 cycle identification keyed shift.
- ALC adjustable to prevent overdrive.
- 50 ohm fixed pi output.
- Built-in antenna changeover with receiver antenna input connection.
- Adjustable RF level controls output power when employed with high power linear.
- Carrier suppression 50 db or better.
- Unwanted sideband suppression 50 db or better.
- 3rd and 5th order distortion products down 30 db or better.
- Spurious frequencies down 50 db or better.
- T.V.I. proofed.
- VOX and anti-VOX controls conveniently located on front panel.
- Key and mike input provided on front panel.
- RF level meter range 60 db with adjustable sensitivity control.
- Self-balancing diode balanced modulator.
- Overall audio response 300 to 2300 cps.
- Shaped CW keying.
- FM-FSK center frequency adjustment on front panel.
- 60 kcs filter type SSB generator.
- Provision for metering final plate current.
- Unitized construction.

$695.00 Amateur net.

ASK YOUR DEALER—
OR WRITE FOR DETAILS

Established 1910

HAMMARLUND
MANUFACTURING CORPORATION, INC.
460 W. 34th STREET, NEW YORK 1, N. Y.
A DIVISION OF TELECHROME

For further information, check number 8, on page 126

Feenix, Ariz.

Deer Hon Ed:

I just heering about Big 1960 Amchoor Convenshun in New York to be holding this coming August, so are riting you post-hasty to reserving some eggsibit space. Yes, you reeding me five by nine, eggsibit space I wanting. I reelizing most peeples who wanting eggsibit space are manufackshureers, but I wanting nice eggsibit space just for Scratchi

In casely you thinking Scratchi crazy, let me telling you Scratchi crazy like Hon. Fox. Just thinking, what are you having at big internashanal convenshun—thousands of amchoors walking around, all loaded down with bux!! Boy oh boys, all that money laying around wateing to end up in sumbuddies pocket. It are a dreem come true.

Are not being to partikular about eggsibit space. Just anything neer center of other eggsibits. Are also assuming you giving speshul rates to amchoors who not being manufackshureers. You see, I not coming to advertise anything, but just coming to raking in the bux.

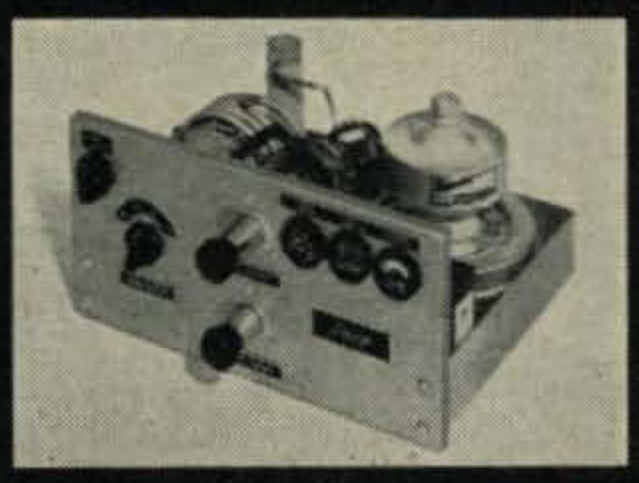
Planning on putting sign over booth which saying: "Between Technical Talks Coming in and Meeting Hashafisti Scratchi — World's Greatest Amchoor". Around the booth will be chairs to sitting in, and some few small signs saying things like: "Ask About Scratchi's QRM Eliminaytor"; or "QSL Cards Printed While You Wate"; or "Prizes Given Away Every Hour on the Hour"—stuff like that there.

How I planning on making money?? Very simple, Hon. Ed. Suppose amchoor asks about QSL cards. I telling him I having small printing press there, and if he thinking of some country he not working, I printing up QSL cards from that country as favor to him, and he can filling in dates of QSO and his call. All Scratchi is asking is two-bits—just to covering cost of cardboard and ink.

Also asking him to leaving QSL card of his with me as souvenir of our chat. If he being Dee-X, can selling it later to someone else, or taking it home and using it myself.

You thinking amchoors might be catching on to what I doing? Begging Hon. Pardon, but me not thinging so. You see, I also serving slitely-aged cacktus jooce. Not selling it—just asking

[*Continued on page 22*]



YOU ARE LOOKING AT ONE OF THE SMALLEST 1-KW TRANSMITTERS EVER BUILT

Designed by Jo Jennings, W6EI, of San Jose, California, this AB_1 SSB amplifier is only 5½ inches high, 11 inches long and 7 inches deep. At the heart of this exceptional table-top miniaturization is an Eimac 4CX1000A ceramic tetrode. This rugged tetrode provides high power in a small package. And its integral-finned anode cooler keeps blower requirements at a minimum. With many outstanding features such as these, Eimac ceramic tubes are most often the starting points in the design of compact, efficient SSB equipment for amateur and professional use.

EITEL-McCULLOUGH, INC. • SAN CARLOS, CALIFORNIA

Eimac

For further information, check number 10, on page 126

Letters..... to the Editor

Wyoming QRM

Editor, *CQ:*

I have been considering this letter for some time. Last night, browsing through the October, 1959 issue of *CQ*, I came upon W5ZBC/5's letter to you concerning an article by OL' Joe about interference with DX operation. You might say this served as the final "kick in the pants."

My QTH, being in Wyoming, (which most hams claim is rare) I try to be on the high bands (10-15-20) as much as possible. I do most of my work on 10, and being 14 years old, a freshman in high school, I don't get home until 4:00 P.M. (MST) week days. I usually "fire up" on 10 meters. This gives me about an hour of operation before 10 drops out, then I usually move to 15. When I call CQ, anywhere from 5 to 20 stations pile on frequency and proceed to holler at me. For example, yesterday I was enjoying a very fine rag-chew with W3JT and I developed transmitter trouble which proved to be nothing more than a few strands of braid shorting across to the center conductor of my coaxial feedline to the beam. This didn't take more than a few seconds to fix. I called W3JT again, for I was only off the air for a few minutes. Whether W3JT returned or not I do not know, for immediately there were 4 or 5 stations calling me. I admit I'm not perfect and that I have made my mistakes, but I distinctly called W3JT and no one else. I would have gladly QSO'd someone else (after I found out if W3JT was gone) which I did, but I did this rather grudgingly.

As I said before I realized that there are few hams in Wyoming and not many of us on the high bands. All we are asking is a little respect under *The Amateur's Code*. The few hams in Wyoming can't do all the work.

I hope this letter strikes home and is printed, because I'm sure some of the other hams around the state feel the same way.

Rusty Leone, K7HEA
Bear Claw Ranch
Dayton, Wyoming

Novice?

Editor, *CQ:*

In CQ for March 1960 page 50, the illustration entitled "Typical Novice Station" caught my attention as having something wrong with it . . . suddenly it dawned on me and I shall expose it as erroneous, misleading and crass canard!

1. A typical Novice would not have a mike . . . he would be pounding brass.
2. His QSL display is non-Novice calls.
3. His receiver could be used by a General or Technician licensee.
4. He is definitely a tyro because his shack is too neat!

I hereby expose this "Novice" of yours as either a Technician or a General . . . come on now, tell the truth and shame the devil.

John P. Stone, W3JQE/2

Cover

Editor, *CQ:*

I do not generally pay attention to my husband's ham magazines, but what XYL could resist your March 1960 cover. I was sure no XYL I knew would miss it. I called them all by phone to be sure and see it.

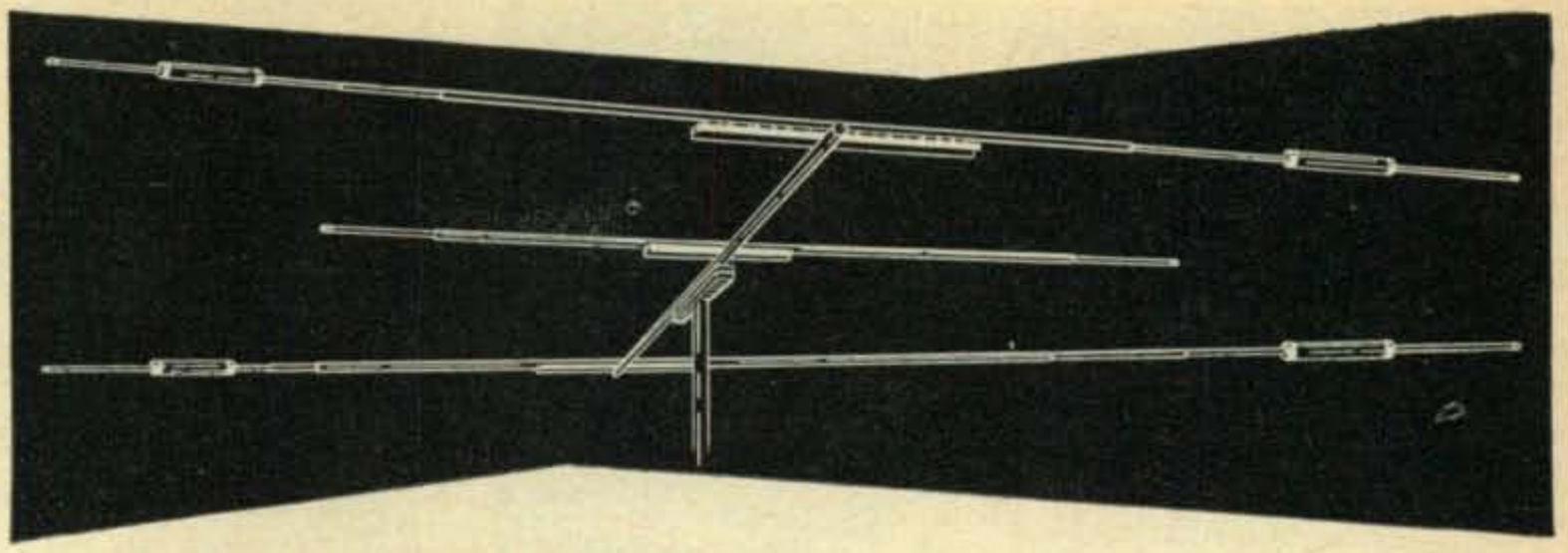
XYL, Des Moines, Iowa

Editor, *CQ:*

Immediately on looking at the woundrous cover of the April issue the thought occurred to me how many others would have thought a better title would have been: "For The Birds."?

Arthur W. Woods, M.D. W4GJW
1637 11th Ave. So.
Birmingham, Ala.

WHAT'S NEW?



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For further information, check number 12, on page 126

Receivers

Editor, *CQ:*

. . . For quite a while now the cost of commercial receivers has been going higher and higher while the construction methods have been going lower and lower, now maybe it is possible to construct a stable long wearing receiver from resistors and condensors with less precision.

I can of course understand the manufacturer's position; he is in a competitive field, and in order to sell, he must use poorer components, lighter cabinet and the like, and this finds the "poor as a churchmouse" type amateur (myself), in a situation he can not bear. He must buy an old second hand receiver that does not perform like he would like it to, or he must go "surplus" or he must consider building the whole thing from scratch.

Therefore I congratulate you on your recent articles on several different types of home made receivers, and I would like to suggest that you keep up the good work and publish material on good home made receivers.

In view of the falling prices on transistors, I would also like to suggest that you publish a series of articles, one each month on a transistorized receiver, and in each article, cover one stage of the construction, such as, chassis the first month, audio strip next month, I.F. strip next month, R.F. strip, SSB detect etc. until the project is complete, This would not only keep up the interest in building the rig, but would allow sufficient space for complete coverage of the details of the stages for even the novice builder. Also it would be desirable to run two receivers, one H.F. and one VHF for the two segments of the ham population. Not everybody wants a receiver that will cover 80 CW.

Thanks again for the receiver articles, we're all smarter because of them, this is what advances the state of the art.

Nelson G. Beals, W1MUZ
135 Gibson Road
Bristol, Rhode Island

Logic

Editor, *CQ:*

For a logical conclusion, all syllogisms must be accounted for. No other way. In the issue of home-spun versus manufactured gear, I think there are two missing factors. For a more logical answer, let us face them:

Is an incapacitated individual—in any form to be denied the world's best hobby because he or she cannot form the fingers around a soldering gun or hold a piece of wire? Are we to deny our hobby to an individual who cannot take more than the bare minimum of time for operating, and blame him for using his time building?

Another factor is economic. There have been several recessions and a near-depression in the last decade—now, are we to tell a worker in a factory making things for amateur radio (A worker with wife, children, a small car and large mortgage), that his livelihood is corrupting the morals of a few hobbists? And that he should quit, shut down the plant, all to satisfy the beliefs of a few purists? 1959 was a $25,000,000 business year for our companies supplying us. Twenty million the year before. Can these facts be disregarded?

I feel that anyone just getting interested, should buy a receiver, listen intently and answer their own questions by experience. Then they would not be tempted to buy much they do not exactly need. Familiarity with gear is one good answer.

At one time, half the equipment at my station was home-built.

Charles F. Smith Jr, W3UJP
4660 Wilburke
Pittsburgh, Pa.

14.3—14.350

Editor, *CQ:*

Re: 20 meters most of the solutions seem to try to put things back like they were before. Let's face it. We needed the space, and we don't have it, so why not use it in an intelligent manner?

We can't make rules taking from the W ham what is legally his to use. We can establish sensible operating practices and make them work with the help of public opinion.

I feel sure that the AM and CW boys would be happy to be left in peace at the other end of the band without starting a civil war. . . .

I haven't worked much on 20 but I think a special spot

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MODEL 20A — 20 watts PEP. Bandswitched 160 thru 10 meters. SSB—DSB—AM—PM and CW. Magic eye monitors carrier null and peak modulation. Ideal for driving AB1, AB², and most Class B linears.

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IF adapter RM-455 or RM-80 or RM-50 .....$9.95
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For further information, check number 14, on page 126

on both hands would attract DX to work W and VE again if we handle it in a reasonable manner.

Ed Snow, W2BZN
139 Edgeview Lane,
Rochester 18, N. Y.

Editor, *CQ:*

Reading your comments on CW in the 20 meter band in the March issue of *CQ* served to crystallize some thoughts that have been bothering me lately. Even though I have been on the air for several years most of this has been on phone. Now I find that CW is appealing to me more than ever. I am well aware of the legal allocation for phone and CW on all bands but over the period of years there seems to have been sub-allocations among the brotherhood concerning local and DX segments on both phone and CW. Perhaps there are many who feel as I do that we don't want to deliberately QRM someone but are having to learn the hard way just what these segments of the various bands are. Would you mind giving us a general breakdown on the various bands as to where most of the hams go for DX, Local, or what have you. I think that this would help many of us, so that we would not blunder into some legal but, courtesy-wise, forbidden territory.

No doubt that I could learn the hard way as some others are doing, but since this sub-allocation is a matter of a gentlemen's agreement some specific knowledge would enable some of us to continue being a gentleman, and not unknowingly clobber someone.

Paul A. Saxon, M.D., K6VZL
308 West 20th
San Bernardino, California

Editor, *CQ:*

In view of the invitation for comments on the recent expansion of the 20 meter phone band and the suggestions advanced in the Sideband column I would like to advance the following proposal.

All North American stations cease conducting contacts with *each other* on the frequencies between 14.3 and 14.32 mc. If, as it has been stated, we were in danger of losing the top 50 kcs because it was not populated with W stations, it is reasonable to assume this possibility would be diminished if the segment set aside for the DX boys was totally within the band rather than on the edge.

If DX stations call CQ within this 20 kc segment, North American stations may answer on their frequency if the calling station indicates he is listening on his own frequency.

North American stations would not use these frequencies except for the reason stated above.

The above proposal, if given enough publicity to become effective, would avoid the carnage likely to develop if the SSB stations move down the band to the vicinity of 14.2 Mc.

Bob Moren, W4INL

Editor, *CQ:*

First off, let's see some of the reluctant sidebanders give up "by courtesy arrangement" the portion 14.250 to 14.275 mc. to the AM boys and move on up to the upper 75 kc. "gift" region.

Then while we are in a "courteous" mood let's give the DX SSB boys who wish to work us a chance and at the same time assume that an AM station might like to work him.

This could be done by letting them work both ends from the middle. Let the DX sidebanders who are working us in from 14.265 to 14.285.

This may make both AM and SSB contributing and benefiting, but first we have to have this "courtesy arrangement."

Joe Bolen, W5JUE

Whole Band

Editor, *CQ:*

Re: editorial in *CQ* for April 1960. I agree that the WØ CW station who opened up zero beat should have listened and picked a clear spot. However, I think, a point has been missed somewhat in the statement "Let's try and keep CW in the CW bands and fone in the phone bands." As you and all of us know, the CW band is the *whole band.*

Kind of a small point to bring up, but I am sure that you do not want *CQ* to give any false impressions.

William B. Gould, W1NP
926 Woodgate Avenue
Elberon, New Jersey

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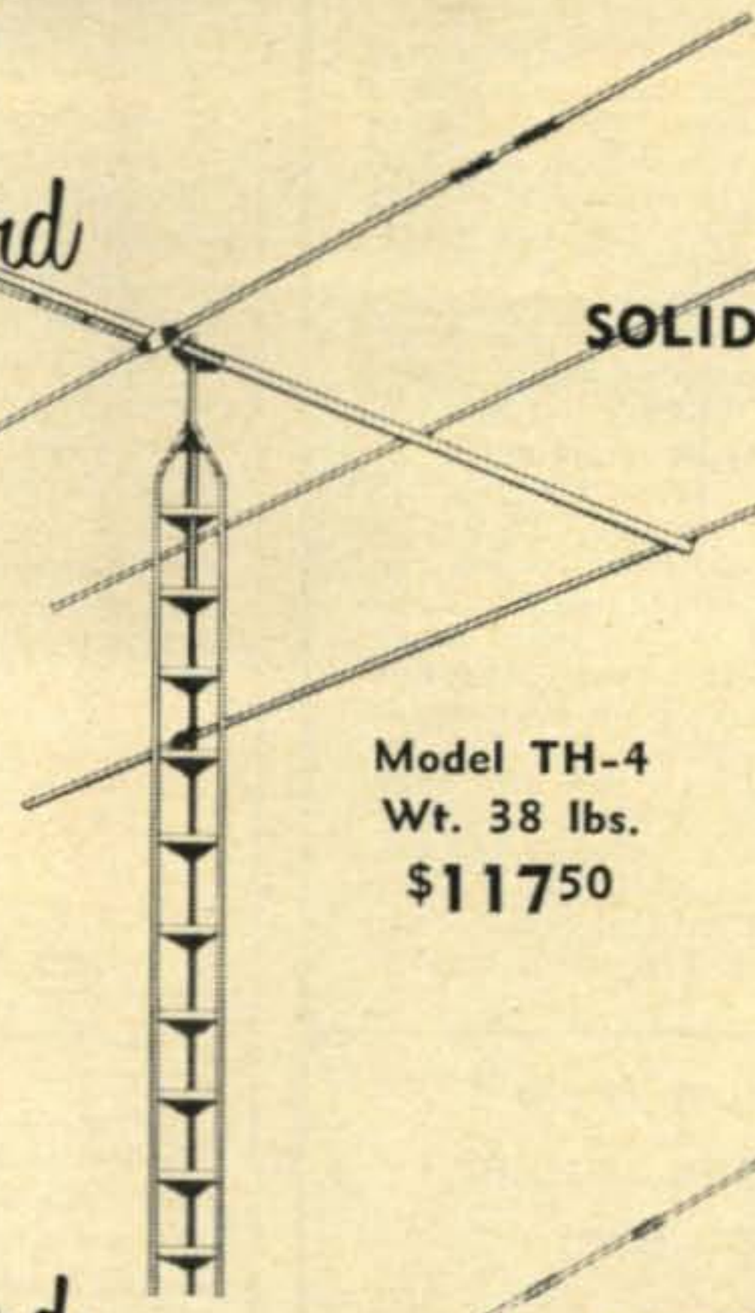
High Q Slim Traps result in a minimum element loading and true full size performance. Longest element 32 ft. Full size elements and full sized boom spacing of 16 ft. allow this beam to operate within theoretical size limitations producing maximum forward gain. The beta matching system is completely factory pre-tuned and requires no further adjustment. This system permits design of array for maximum gain and F/B with no compromise for matching. Exceptional bandwidth maintains low SWR over entire band, at resonance 1.05 on 10M, 1.15 on 15M and 1.1 on 20M. Dipole shunt fed with 52 ohm coax. Interlaced 4th Element makes possible choice of optimum spacing on all 3 bands.



Model TH-4
Wt. 38 lbs.
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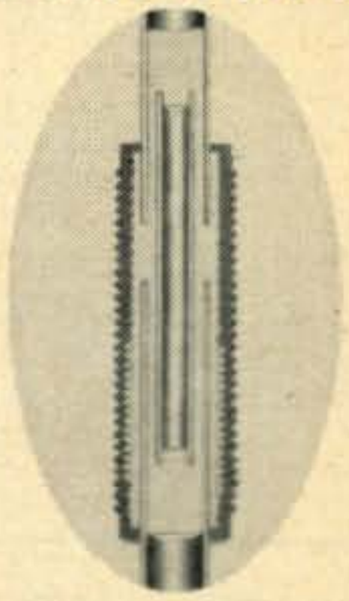

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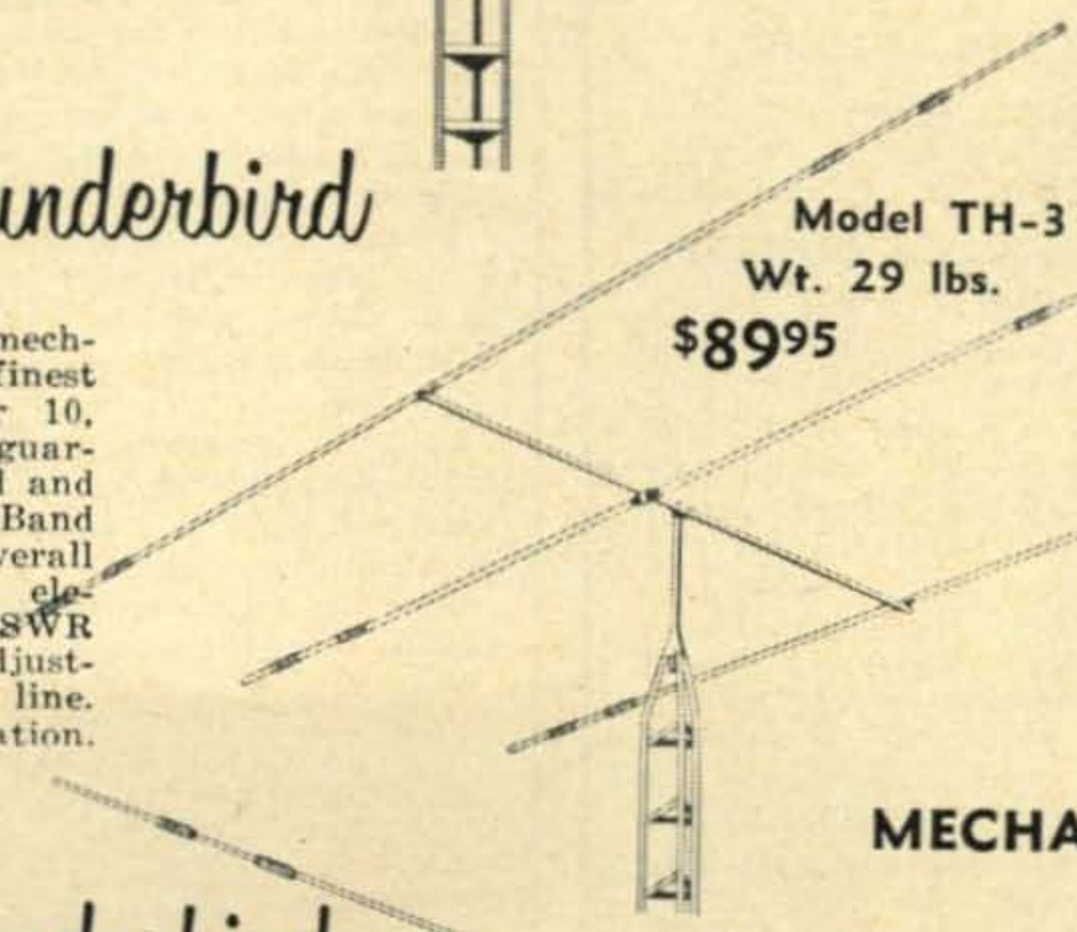

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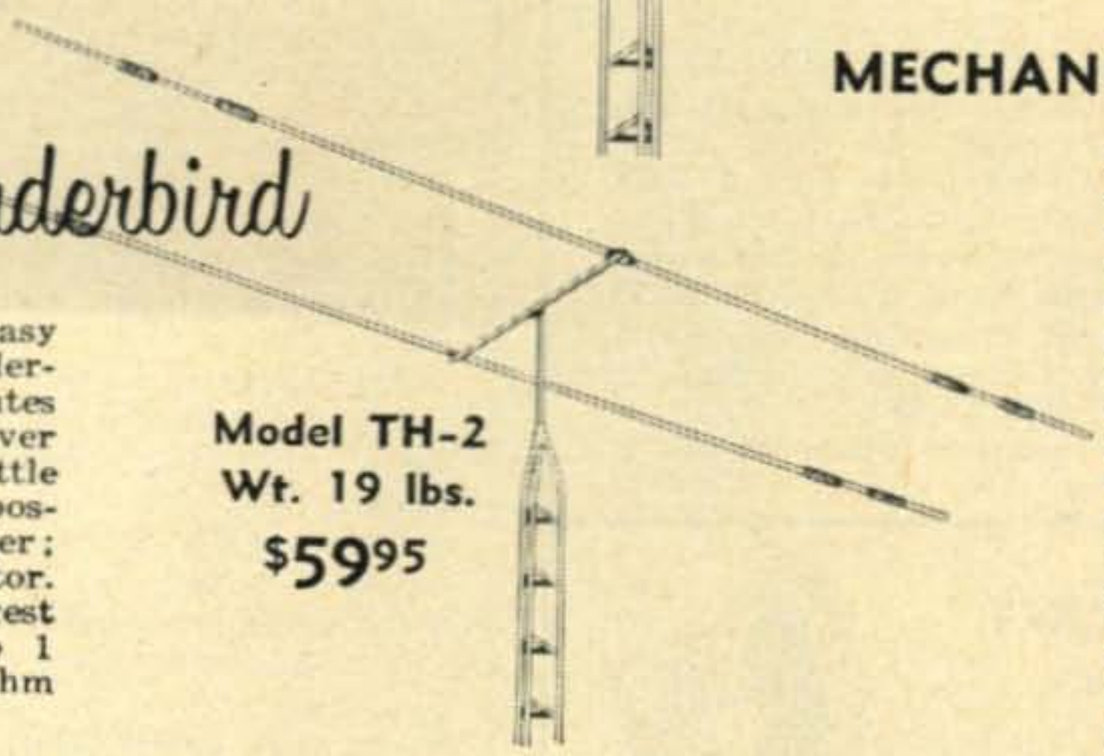

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For further information, check number 16, on page 126

Editor, *CQ:*

In the April 1960 *CQ* there appeared an editorial about CW operation between 14.1 and 14.2 mc. Although I do not operate there, it occurs to me that perhaps the WØ mentioned had a good reason for being there.

A most casual inspection of the band between 14.0 and 14.1 mc. would lead one to believe that Latin American phone staions have little of this mutual respect for their fellow amateurs. Indeed 20 CW is beginning to sound like "Saturday night in Rio." Several times I have heard it suggested by CW operators that, in view of this situation, perhaps we should make more efficient use of our CW privileges between 14.1 and 14.2 mc.

Perhaps the WØ was among the vanguard of a horde which will migrate there to convince our Latin brethren that a gentlemen's agreement can be outfitted with teeth when the situation warrants.

This situaion surely merits thoughtful and diplomatic consideration by the radio societies of the countries concerned but if this is not soon forthcoming that WØ may have company.

D. A. Contini, W4YUU
2086 Thomasville Rd.
Tallahassee, Fla.

Morocco Reciprocation

Editor, *CQ:*

Another voice for reciprocity! I know you can't print all of these cries, but I must throw in my two-cents worth. Perhaps my tale of woe isn't unique, but it's awfully big to me.

Prior to leaving my previous base in the states I took the test and then sat back to await the results and (hopefully) the arrival of my ticket. The wait was interminable. The multitude who have sweated it out before me understand! However, on the very last day of my leave before departing for overseas, *it* arrived.

The prospects of being away from loved ones and a swell hobby was considerably lessened. I had visions of nightly QSO's with stateside hams—even shipped some gear including an SX-101.

The blow came when I arrived here. No need to go into details. The story is too old. All I can say is that I am the most disappointed would-be ham in existence. I've heard some sad stories in ham circles, but who ever heard of a ham that has *never* used his ticket?

So I am relegated to building and being an SWL. Have fun fellows—I'll miss you.

M/Sgt. Owen K. Nading, KØYYF
3922nd USAF Hospital
APO 30, New York, N. Y.

150 Watts

Editor, *CQ:*

Have just read your April letters to the editor, page 24 and can't agree with the suggestion by Mr. Bowman that everything but SSB should be bannned. CW, AM, and SSB all have there place and each one to his own liking, me, I perfer CW.

The only way to reduce QRM is to kick out the commercial stations in our bands and strive for clean rigs; clicks chirp, drift and splatter should be eliminated, either by having OO's, the FCC, or the D.O.T. keep their ears open and have the hams co-operate by keeping their transmitters in good shape, and by following a few simple rules for more efficient operations.

If the present ham population keeps increasing like it has, could be that the best way to reduce QRM would be to reduce the power limit allowed to say 150 watts. There are many W/K stations running under the 200 watt mark that have worked over 100 countries and haven't caused as much QRM as the KW crowd. I think that this possibility should be looked into, and given some hard thought by those in charge. The other British Empire countries with their limits of 150 watts are doing a FB job. There is no reason why the W/K/VE boys can't do the same, and that would give everyone a better chance to compete for DX on even ground.

Ernie Crump, VE3EGG
Galt, Ontario

Editor, *CQ:*

In reference to W4INL's letter in the April edition, he is on the right track but barking up the wrong tree. Mr.

Moren would come much closer to the actual situation if he would direct his attention to the Conditional—"send in a boxtop"—license, with its full privileges.

Retain the Novice license; it provides the opportunity for building good operating procedures as well as giving the beginner a chance to acquire technical competence. The present licensing set-up is quite suitable, with the exception of the Conditional license. It is becoming increasingly apparent that this is an area demanding scrutiny by the proper authorities.

Gene Shepard, KØDKA
Grinnel, Iowa

SCRATCHI [*from page 12*]

for two-bits to covering cost of getting glasses washed. So, if anybuddies figyouring out what Scratchi doing when they having drink of cacktus jooce, they better man than most.

After they having cupple shots of cacktus jooce, then can explaneing about Hon. Raffle. Selling tickets for one bux each, or six for five bux. Winner of raffle can selecting amchoor reseever of his choice. Also having drawing every hour on the hour at which giving away small prize. These small prizes I getting from Hon. Junk Box. Pretty slicky way to getting rid of junk-box stuff, you not thinking?

Where I getting reseever for winner? Hon. Ed., you not reely thinking. Not planning on having any winner. And, if anybuddies complaneing, just telling them they winning one of hourly prizes when they not around, making them ineligible for reseever, giving them junk-box prize, and everything hunky-dunky.

If you thinking Convenshun Authorities being sticky about hole thing, then I can having somebuddies win reseerver, after Scratchi practising up on magic-stuff so when he drawing winning ticket it being for amchoor what not there, or something.

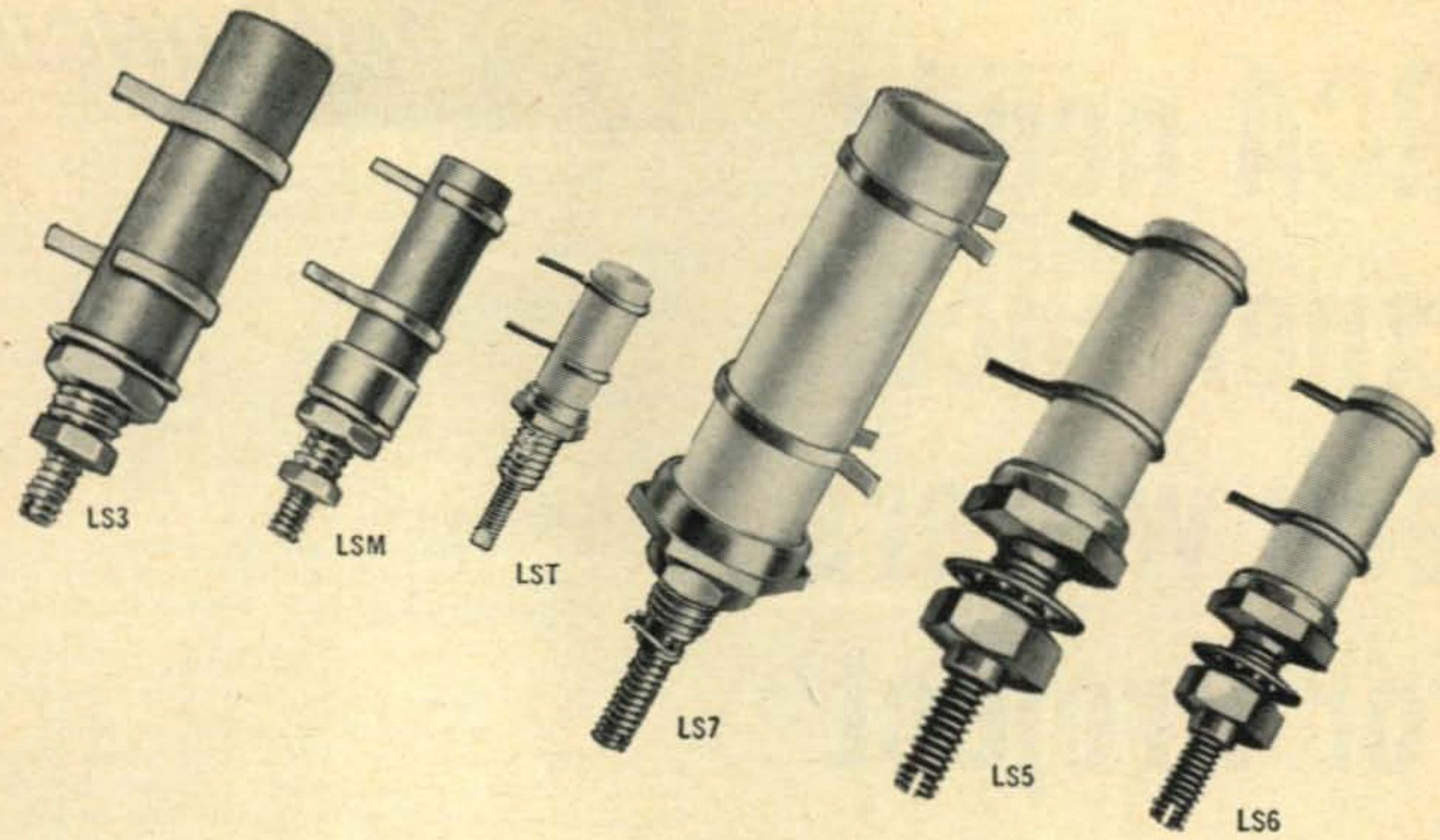
One item I reely thinking are going over big are Scratchi's QRM eliminaytor. Are reely quite simple. You figyouring what amchoor are cawsing you QRM, then you putting his name and address on box, and sending it to him. Won't he be surprised to opening box and finding nice 5-foots rattlesnake!! Of coursely, I'll having to put sign on box saying "Rattle OK" so it going thru males okay.

Will be having another item of inteerst to all amchoors. Rattlesnake skins for hanging on mobile whips. Making available for one bux without rattle and two bux with rattle. This cost for rattlesnake skin not reely selling price—more like handling charge.

Also, if Hon. Brother Itchi's lettuce crop coming along, can bringing back to New York in stayshun wagon cupple boxes lettuce for making samwiches to going along with cactus jooce.

So, it's off to New York in August. Letting me know air-male speshul rush how much booth space will costing, and meanwhile I'll be painting some sand so can selling sand from Painted Desert—not reely selling it, just small charge to covering cost of sand and paint.

Respectively yours,
Hashafisti Scratchi



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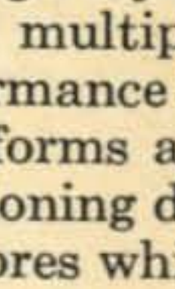

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For further information, check number 20, on page 126

Totah ARC Picnic

The annual picnic and gathering of The Totah Amateur Radio Club, Inc. will be held this year at Pine River Dam, (Vallecito Res.) which is about twenty miles northeast of Durango, Colorado over the Fourth of July weekend. There are plenty of camp sites for camping overnight, horseback riding, boating, water skiing, rocks for the rock-hounds, fishing and plenty of room for just plain relaxation. Bring along any surplus gear that you might want to swap. It is planned to monitor 7225 kc and 29.600 kc, so that assistance may be given in locating the camp site, or ask the local Forest Ranger for Directions.

Further information may be secured by contacting W5POI, W5SGC, K5WTQ or W5CIN, or drop a postal card to P. O. Box 24, Farmington, New Mexico for a prompt reply.

San Fernando R.C.

The San Fernando Valley Radio Club announces it's 4th Annual Hamfest—Picnic to be held on Sunday, June 5th at Victory Van-Owen Park, Valley Plaza, near Victory and Laurel Canyon Boulevards, in North Hollywood, California. Among the many games and contests will be Transmitter Hunts on 6 and 2 Meters, Code sending by left foot, Tube Identification, a Swap Table, Auction of Surplus ham gear, and special events for the harmonics. Those attending are asked to bring their basket picnic lunches, but other refreshments will be furnished free by club members. Grand prize will be a Gonset G-63. Admission for all events, including refreshments, will be $1.00. For those mobilizing into the area, the official club station W6SD will be operating rigs on 80, 6 and 2 meters commencing at 10 AM when the "coffee and donut dunking" sessions start. For additional information, contact George Rudelis, K6RVB, 5027 Zelzah Avenue, Encino, California.

Braille Institute

The Braille Institute Radio Club (WA6GLN) meets every Tuesday evening for the purpose of holding a class for blind radio hams. Bill Richardson (K6VVM), the instructor (who is also blind), reports the need of donated equipment such as transmitters, receivers and antennas (or parts used in assembling these) for graduates who would like to set up their own stations.

Anyone having such items lying around his garage and willing to donate them for a worthy cause should send Bill a QSL, or else contact the Braille Institute of America, 741 North Vermont Avenue, Los Angeles 29, California.

Penn-York Hamfest Assn.

The Second Annual Hamfest of the Penn-York Hamfest Association will be held on Saturday, June 18, 1960, at the Legion Hall, Elkland, Pa. The program will include speakers, contests, door prizes, dinner, and a special program for the ladies. For further information, drop a card to: Penn-York Hamfest Assn., c/o C.A.R.A., P. O. Box 301, Corning, N. Y.

Worked All Nova Scotia Award

1. Awarded to any amateur outside Nova Scotia, New Brunswick, and Prince Edward Island, who submits proof of having established CW and/or Phone contact with amateur stations located in each of the eighteen Counties of Nova Scotia. A contact with Sable Island may be substituted for a missing County.

2. For those amateurs in Nova Scotia, new Brunswick, and Prince Edward Island proof of contacts located in each of the eighteen Counties of Nova Scotia, or seventeen Counties plus one from Sable Island must be submitted, in addition to ten different Counties on different bands submitted in the first eighteen.

3. Contacts must have been made after June 1, 1960 and any or all amateur bands may be used.

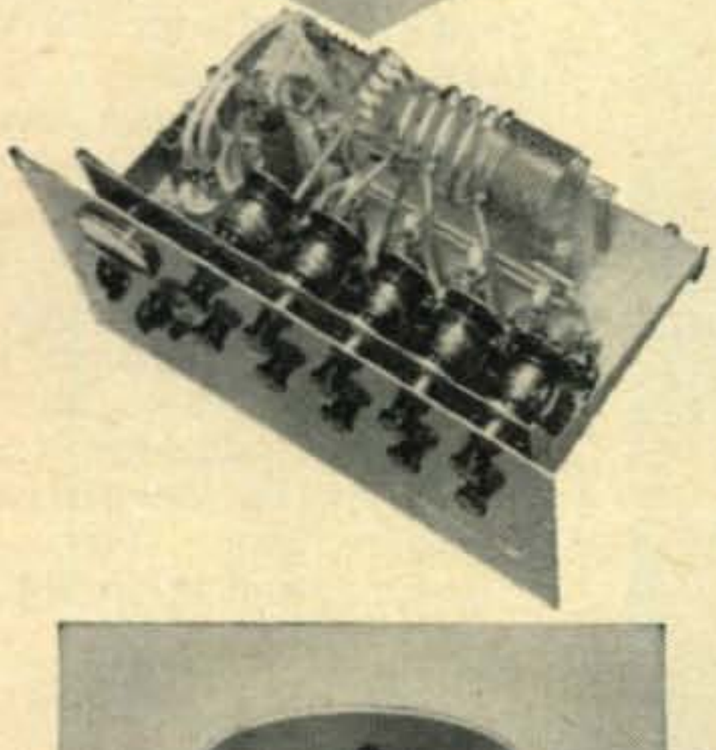
4. Contacts made only from home QTH (meaning same location for proof submitted) or portable within ten miles radius of home QTH. (mobile contacts not to be offered as proof.) Field Day stations or other groups journeying

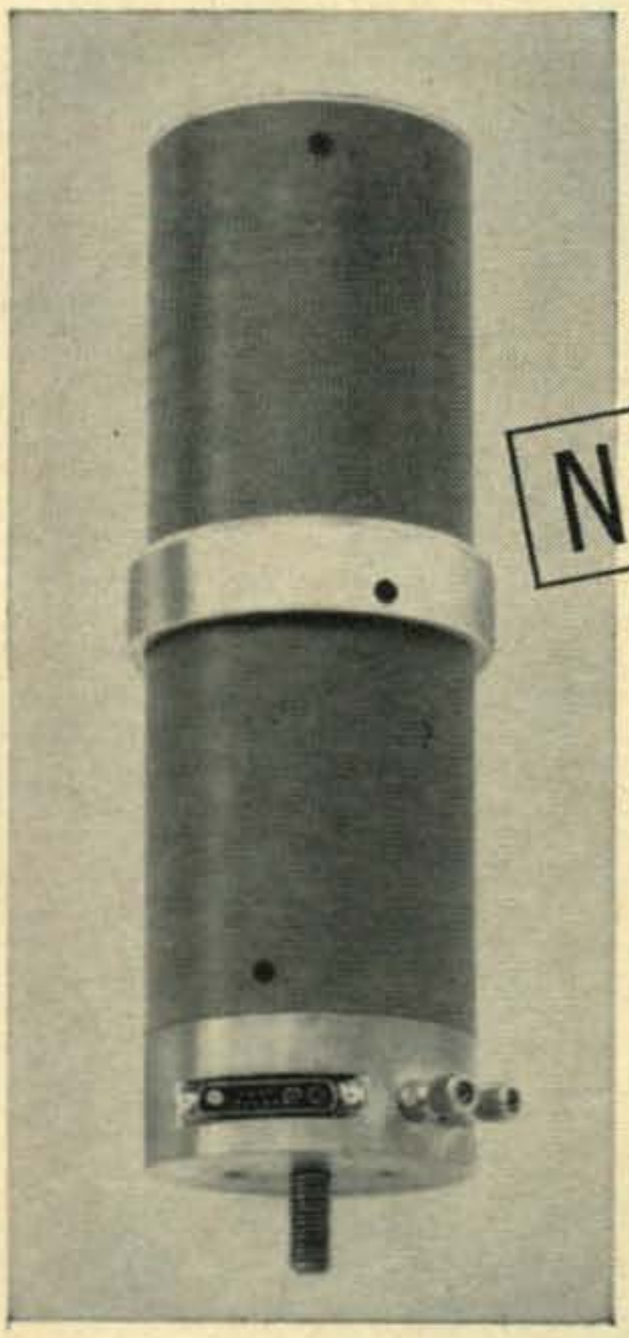
[*Continued on page 95*]

• *"HIGH POWER IN SMALL PACKAGES"*

NEW LINEAR AMPLIFIERS from YUBA-DALMOTOR

NEW





NEW

In constant search for more favorable size and weight ratios, the imaginative engineering at Yuba-Dalmotor has developed two new compact linear amplifiers.

MODEL DM 4000
Complete and Instantaneous Band Switching

For the first time complete and instantaneous band switching with either local or remote control, from 2 to 30 MC, 2 to 5 bands. Unit is capable of 3000 watts PEP input on SSB, also suitable for AM, CW, FM and FSK. Highly efficient and compact through use of Jennings vacuum components, and 3 water-cooled Eimac high power tetrodes in a grounded grid configuration. High degree of linearity attained through use of screen clamping. Adaptable for amateur or commercial service – for portable, fixed station, or portable-mobile use. Available in cabinet or rack mounting.

NEW

MODEL DM 1000
Specifically for mobile SSB Operation

A completely new design concept in mobile communications – developed for SSB operation. Designed for bumper mounting, this unit puts the RF power directly into a conventional whip antenna. High power Eimac tetrode is used in highly efficient circuit, cooled by small amount of recirculating water. Rated at 1000 watts PEP input with minimum grid drive. Easily interchangeable plug-in units give multi-band operation.

For full details on either of these new compact linear amplifiers contact –

● The FCC permits a maximum of 1 KW average power input for the amateur service. In SSB operation under normal conditions this results in peak envelope power inputs of two times average or more, depending upon individual voice characteristics.

YUBA

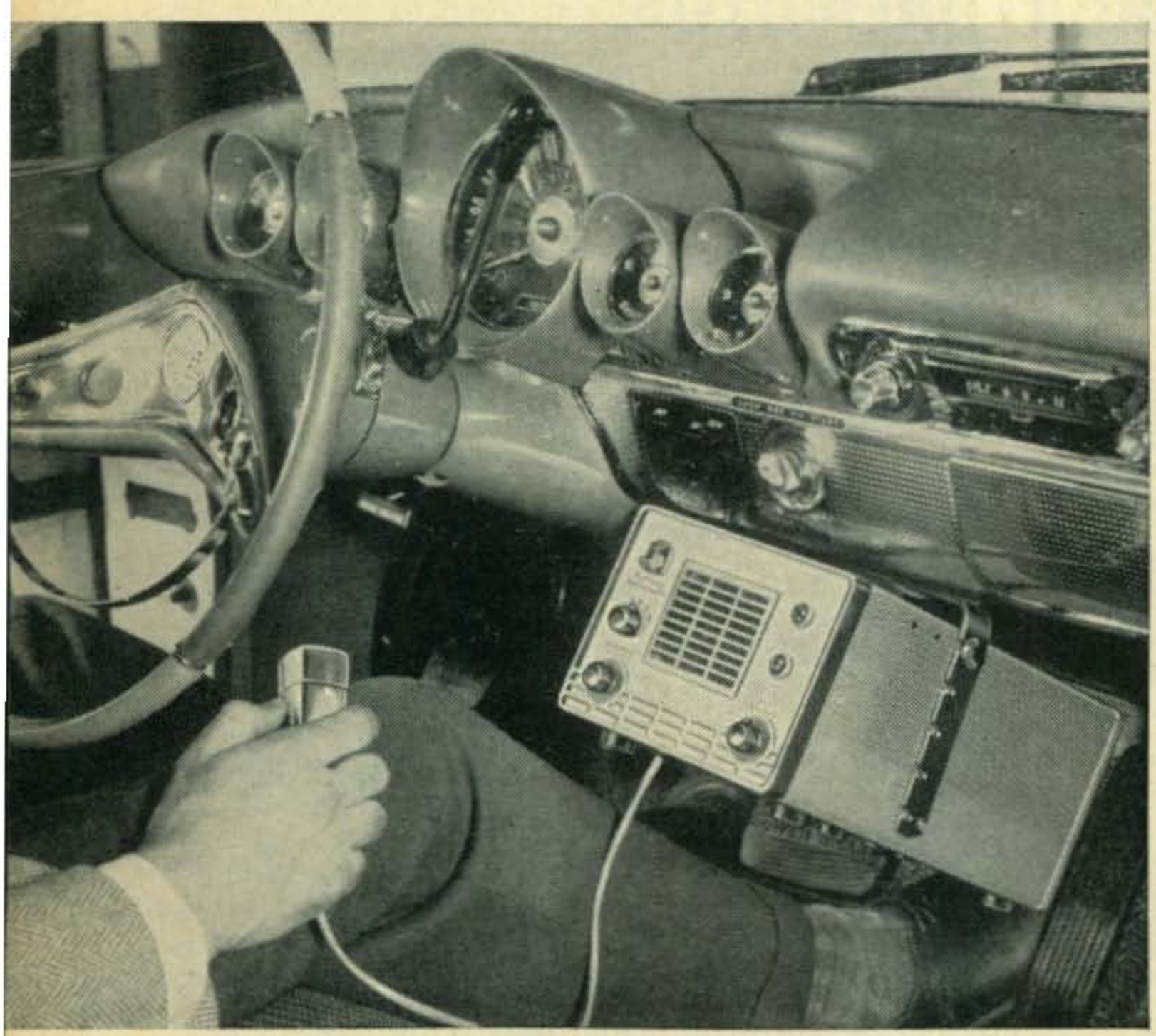
specialists in electronic and electromechanical equipment

YUBA-DALMOTOR DIVISION
1375 El Camino Real, Santa Clara, California

YUBA CONSOLIDATED INDUSTRIES, INC.

For further information, check number 21, on page 126

Viking transmitters and accessories... 1st choice of amateurs the world over!

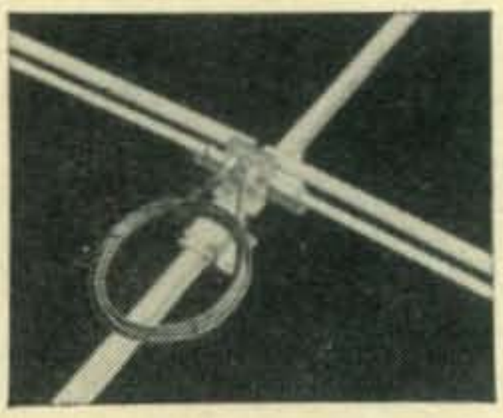


NEW... FOR 10 METERS!

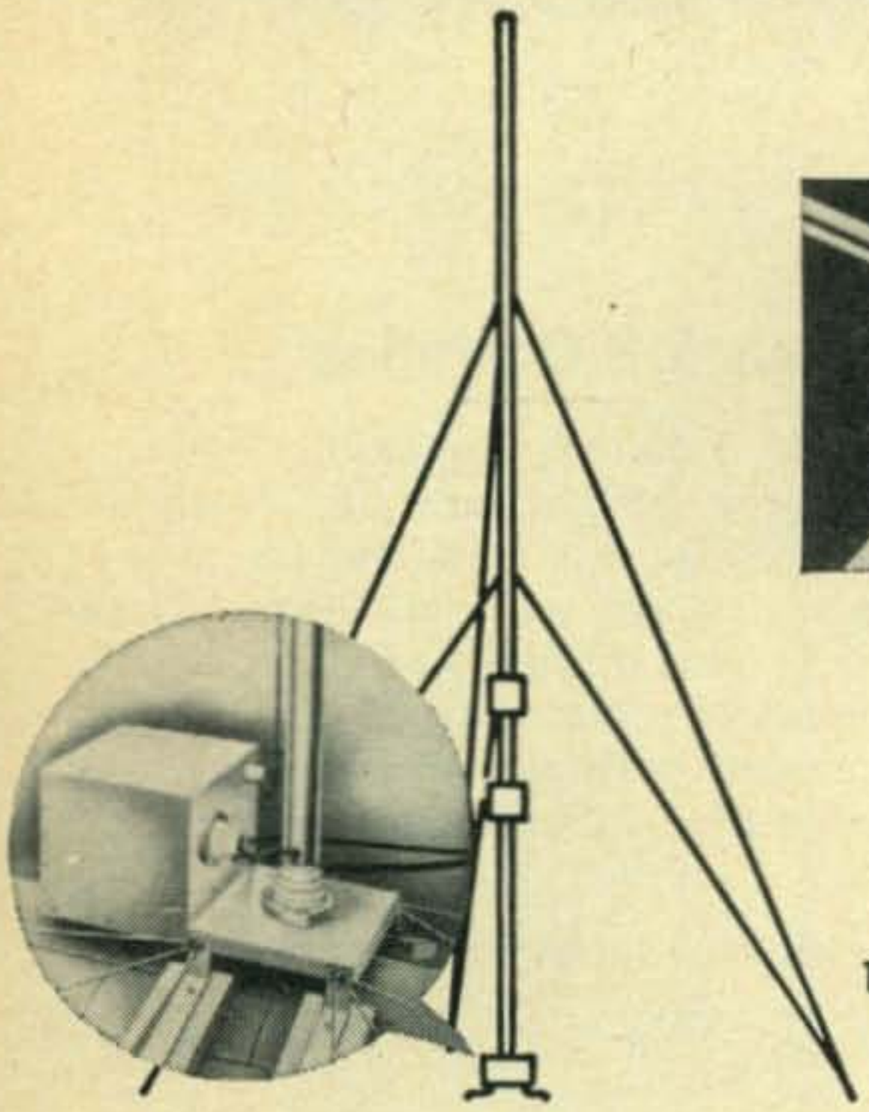
10-Meter Messenger

Ideal for fixed or mobile operation, the new 10-meter "Messenger" is a complete 10-tube (including rectifier) crystal-controlled transceiver! Superhet receiver offers excellent sensitivity and selectivity—with effective ANL, AVC, and Squelch circuits. 10 watts input delivers a solid signal. Wide range pi-L network output circuit—self-contained power supply. Pre-tuned for 29.4 to 29.7 mcs—covers any 5 frequencies within a 300 kc segment of the 10-meter band. Compact . . . lightweight . . . easy to install. 5⅝" high, 7" wide, and 11⅜" deep. For 6V D.C. and 115 volts A.C., 12V D.C. and 115 volts A.C., or 115 volts A.C. only. Complete with tubes, microphone, power cords, and crystals for one frequency covering 29,640 kc, national calling and emergency frequency. For complete details write for specification Sheet 737.

Cat. No.		Amateur Net
242-201	115 V only	$129.75
242-202	115 V & 6 V	$139.75
242-203	115 V & 12 V	$139.75



138-420-3



137-102

PRE-TUNED BEAMS—Rugged semi-wide spaced beams—pre-tuned for 20, 15, and 10 meters. Approximately 9.0 db gain over tuned dipole—greater than 27 db front to back ratio with low SWR. With 3 element beams, boom and balun. For 52 ohm coaxial transmission line.

Cat. No.		Amateur Net
138-420-3	20 meter beam	$139.50
138-415-3	15 meter beam	$110.00
138-410-3	10 meter beam	$ 79.50

"MATCHSTICK"—A fully automatic bandswitching vertical antenna system—may be mounted on roof top, ground, or in any limited space location. Completely pre-tuned—low SWR on all bands 80 through 10 meters. Low vertical radiation angle for DX. Impedance: 52 ohms. Complete with 35' mast, base tuning network, relays, control box and 9 Dacron guy ropes.

Cat. No. 137-102 . . "Matchstick" . . . . . Amateur Net $129.50

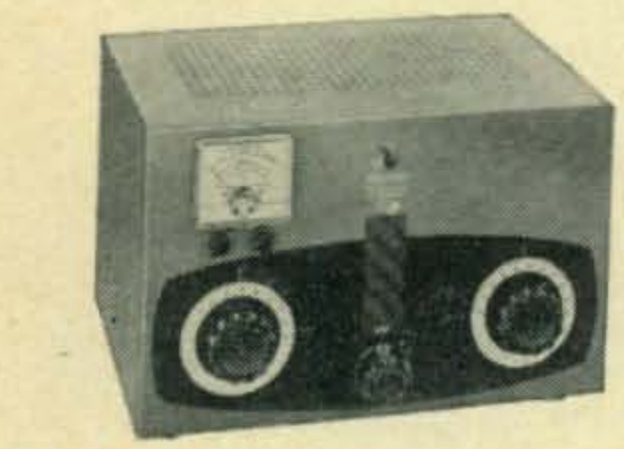
"MATCHBOXES"—Provide completely integrated antenna matching and switching systems for kilowatt or 275-watt transmitters. Bandswitching 80, 40, 20, 15, and 10 meters. No "plug-in" coils or "load-tapping" necessary.

275 Watt "Matchbox"—Designed to match a 52 ohm coaxial link line to reactive and nonreactive loads ranging from 25 to 1500 ohms for balanced lines; and 25 to 3000 ohms for unbalanced lines. For transmitters with a maximum power input of 275 watts.

Cat. No.		Amateur Net
250-23-3	With directional coupler and indicator	$86.50
250-23	Less directional coupler and indicator	$54.95

Kilowatt "Matchbox"—Handles unbalanced line impedances from 50 to 2000 ohms, and balanced line impedances from 50 to 1500 ohms. For transmitters with a maximum power input of 1000 watts.

Cat. No.		Amateur Net
250-30-3	With directional coupler and indicator	$149.50
250-30	Less directional coupler and indicator	$124.50



250-30-3

250-23-3

COMING SOON... the all new Viking filter-type sideband transmitter with 60 db sideband suppression

The world at your finger tips!

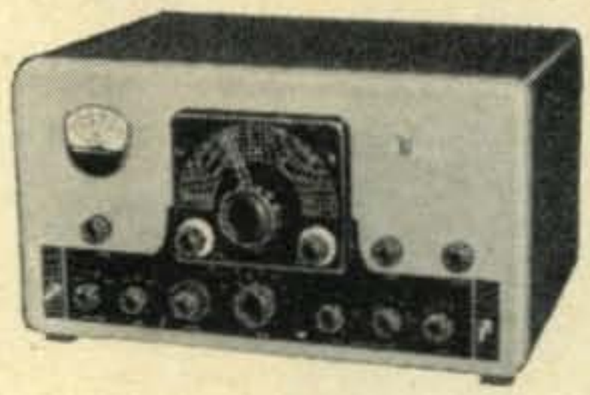
VIKING "KILOWATT" AMPLIFIER—The only power amplifier available which will deliver full 2000 watts SSB* input, and 1000 watts CW and plate modulated AM. Continuous coverage 3.5 to 30 mcs. Excitation requirements: 30 watts RF and 10 watts audio for AM; 10 watts peak for SSB.

Cat. No.		Amateur Net
240-1000	Wired and Tested	$1595.00
251-101-1	Matching desk top, back and 3 drawer pedestal, FOB Corry, Pa.	$132.00

*The FCC permits a maximum of one kilowatt average power input for the amateur service. In SSB operation under normal conditions, this results in peak envelope power inputs of 2000 watts or more, depending upon individual voice characteristics.

"RANGER" – 75 watts CW and 65 watts phone input. Bandswitching 160 through 10 meters. Built-in VFO or crystal control. With tubes.

Cat. No.		Amateur Net
240-161-1	Kit	$229.50
240-161-2	Wired	$329.50



"VALIANT"—Instant bandswitching 160 through 10. 275 watts input CW and SSB (P.E.P. with aux. exciter) 200 watts phone. With tubes.

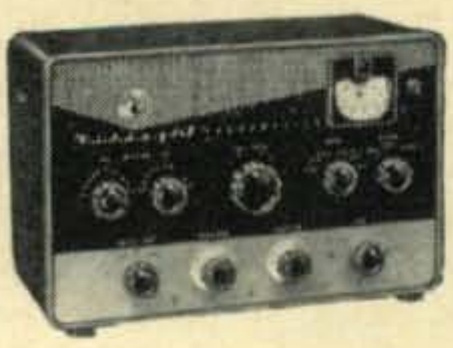
Cat. No.		Amateur Net
240-104-1	Kit	$349.50
240-104-2	Wired	$439.50

"FIVE HUNDRED" – 600 watts CW input; 500 watts phone and SSB (P.E.P. with aux. SSB exciter). Bandswitching 80 through 10. With tubes.

Cat. No.		Amateur Net
240-500-1	Kit	$749.50
240-500-2	Wired	$949.50

"THUNDERBOLT" AMPLIFIER—2000 watts P.E.P.* input SSB; 1000 watts CW; 800 watts AM linear. Continuous coverage 3.5 to 30 mcs. With tubes.

Cat. No.		Amateur Net
240-353-1	Kit	$524.50
240-353-2	Wired	$589.50



"6N2"—Instant bandswitching coverage of both 6 and 2 meters. Power input rated at 150 watts CW, and 100 watts AM phone. With tubes.

Cat. No.		Amateur Net
240-201-1	Kit	$129.50
240-201-2	Wired	$169.50

"6N2" THUNDERBOLT AMPLIFIER—Input rated 1200 watts P.E.P.* SSB and DSB, Class AB_1; 1000 watts CW, Class C; 700 watts AM linear, Class AB_1. Continuous coverage 6 and 2. With tubes.

Cat. No.		Amateur Net
240-362-1	Kit	$524.50
240-362-2	Wired	$589.50

"COURIER" AMPLIFIER – Class B linear rated 500 watts P.E.P. input with auxiliary SSB exciter; 500 watts CW; 200 watts AM. Continuous coverage 3.5 to 30 mcs. With tubes.

Cat. No.		Amateur Net
240-352-1	Kit	$244.50
240-352-2	Wired	$289.50

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Your complete guide to amateur radio's most exciting equipment. Write today for your free copy.

FIRST CHOICE AMONG THE NATION'S AMATEURS

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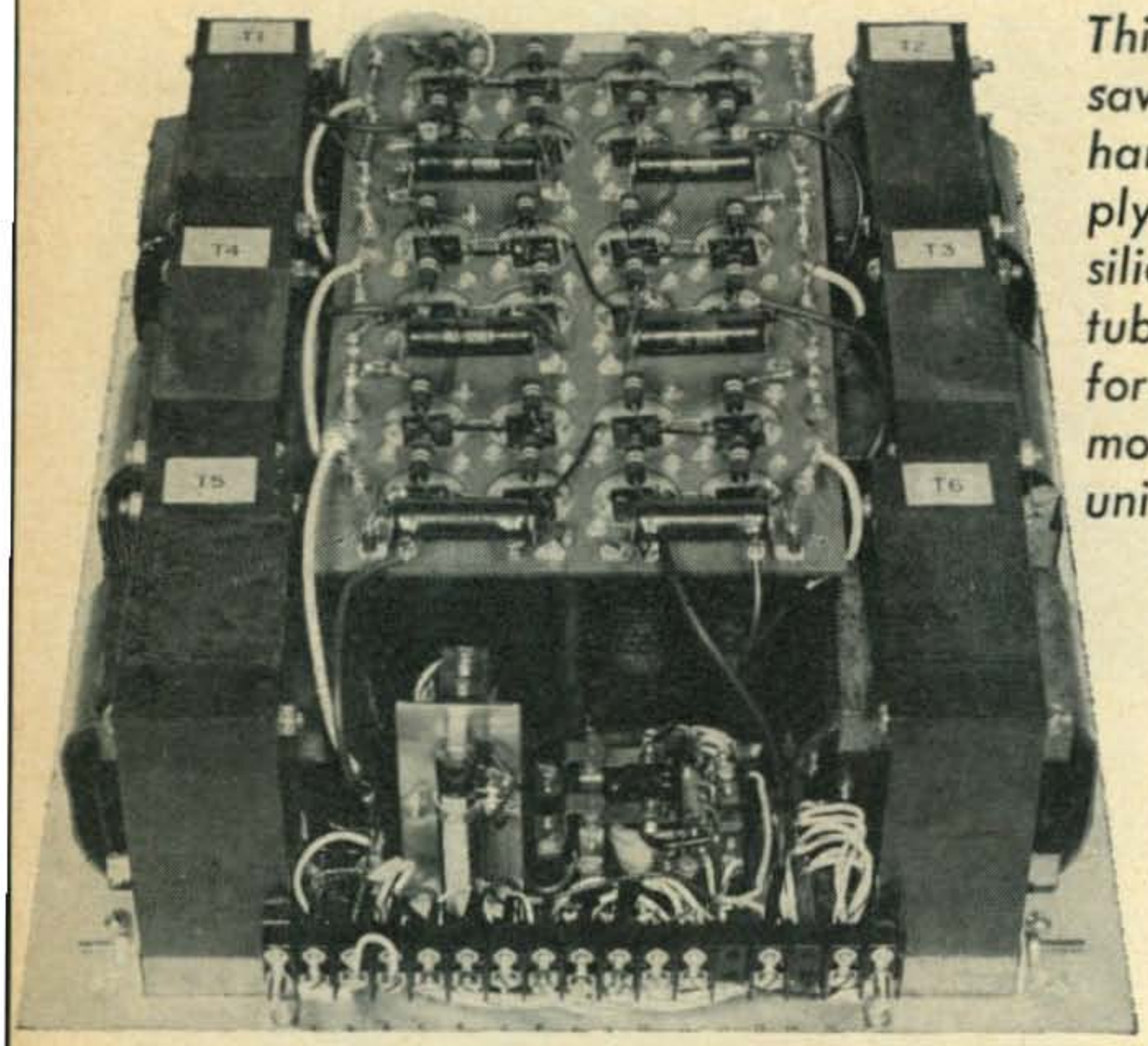
E. F. JOHNSON COMPANY • WASECA, MINNESOTA

For further information, check number 22, on page 126

A Novel 4200 Volt—500 Mil Plate Supply

J. L. Roemisch, W1JM/W2AHU



This unit applies a number of novel, space saving design factors which greatly enhance the desireability of the power supply. For example, low cost, high efficiency silicon diodes are used eliminating tubes, tube sockets and rectifier filament transformers. Whether you use standard rack mounting or remote supply design, this unit will adequately fulfill your needs.

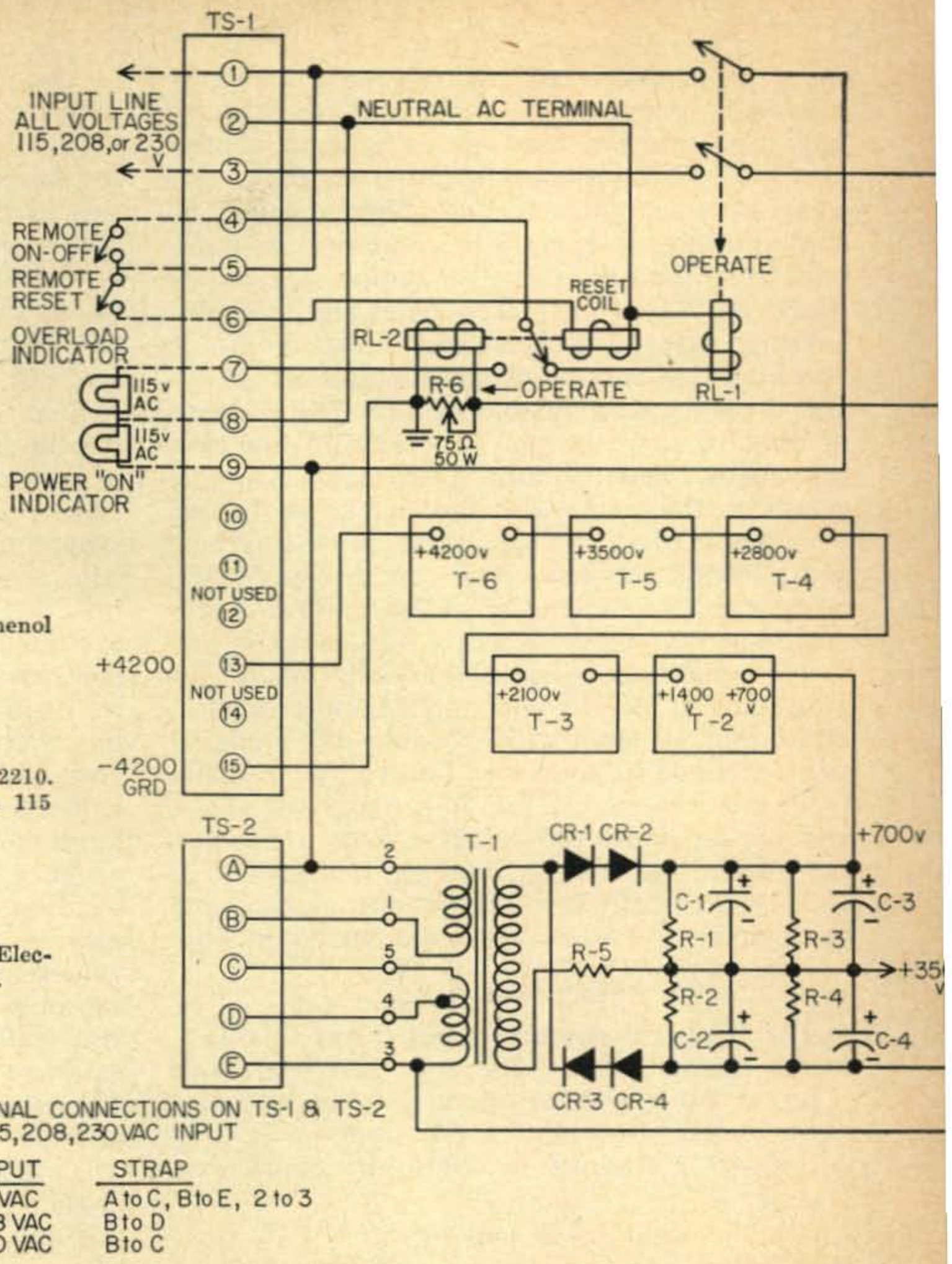
Recently I had the problem of obtaining a 4 KV—500 mil power supply to run that new final with the 4-1000A. I do not presently know of any suitable commercially available supply, nor was I able to locate standard components to build such a supply. All the available supplies or components stopped at 3 KV; therefore I felt others may also have the same problem especially since some new amplifier kits being offered will work best with 4 KV on the plate. In examining the types of 3 KV power supplies available I found that they all used the conventional L-C type of filter, usually with only one choke and a capacitor of 4 or 8 mf. A power supply using a single section L-C filter has poor dynamic regulation and is unsuitable for SSB work. A detailed analysis of this problem is contained in the *G.E. Ham News*, Jan.-Feb. 1954, Vol. 9, No. 1, so we will not go into it further in this article. Suffice to say that if you want headaches, go ahead and use the L-C supply and you will learn the hard way.

Fortunately I knew of a concern that had developed a novel power supply for their high power Frequency Converters that could be rearranged for my purpose. The resulting unit is shown in the accompanying photograph. The schematic is shown in fig. 1. This unit is novel in that it is the first commercial high voltage power supply that I know of, that utilizes silicon diodes throughout. This supply has excellent dynamic regulation, in fact I could find no sign of the "ringing" common to L-C type filters with the application of a step function load as occurs in SSB and CW operation. The silicon diodes require no warmup time and generate no *rf* hash. Last, but very important, screen voltage can be obtained in 350 volts steps simultaneously, without bleeders or series resistors. This last point appealed greatly to me because I could get my 350 volts for the 4-1000A screen without trouble and with extremely good regulation. You can also obtain 700 volts or 1050 volts screen voltage for that 4-400A or 4-1000A when used for SSB in Class AB1.

Another advantage to this supply is that since six (6) small and relatively inexpensive transformers are used instead of one big monster costing a fortune, the effect on the pocketbook, in the event one transformer should fail is not so painful.

Construction

The supply consists of six modules, each having identical circuits and components except for the transformers used in the last two modules on the high voltage end of the string. The only difference in these transformers is the insulation rating between secondary and primary or ground of 11 *kv* peak instead of 6 *kv* peak as for the first four modules. This is necessary as all the transformers have an increasing potential differ-



TERMINAL CONNECTIONS ON TS-1 & TS-2 FOR 115,208,230 VAC INPUT

INPUT	STRAP
115 VAC	A to C, B to E, 2 to 3
208 VAC	B to D
230 VAC	B to C

Fig. 1—Circuit diagram of a 4.2 kv power supply using 6 inexpensive transformers.

Parts List

C1, 2, 3, 4—125 mf, 450 vdc electrolytics with phenol mounting plates and sleeves.
CR1, 2, 3, 4—RCA 1N1764 Silicon Diode.
R1, 2, 3, 4—100 K. 2 watt carbon.
R5—5 ohm 25 watts, Ohmite 0200A.
R6—75 ohm 50 watts, Ohmite 0564, adjustable.
RL1—DPST 115 vac relay, Guardian Electric 2210.
RL2—Potter Brumfield GC11A equipped with 115 vac reset coil.
TS1—Jones Terminal Strip 15-142.
TS2—Jones Terminal Strip 5-142.
T1 through T4, TIC type 295.
T5, 6—TIC type 305.
T1 through T6 available from Tel-Instrument Electronics Corp., 728 Garden St., Carlstadt, N.J.

ence between the secondary and primary, or core by a factor of 700 volts per module. Thus the first transformer has 700 volts on the secondary, the second has 1400 volts, the third 2100 volts, etc., on up to 4200 volts for the sixth transformer.

The transformers can be obtained from the *Tel-Instrument Electronics Corporation,* 728 Garden St. Carlstadt, New Jersey, and are their Type T-295 (4 required) and T-305 (2 required). The diodes, resistors and capacitors are standard jobber items. Any make of electrolytic capacitor having a 125 mf 450 *vdc* working rating with insulating sleeve will be satisfactory. Do not use any other value than 125 mf as it will change the circuit component ratings. The overload relay RL-2 is a Potter Brumfield type GC-11A equipped with a 115 *vac* reset coil. Be sure to specify the 115 *vac* reset coil when ordering because the same type number covers both the 6 *vac* and the 115 *vac* type. The 115 *vac* coil has a *dc* resistance of about 140 ohms.

Relay RL-2 is adjusted to trip at 50 mils nominal, therefore in order to use it in a 500 *ma* circuit the coil must be shunted by a resistor R6 which is a total of 75 ohms and adjustable to a lower value. In practice, if you expect to run 500 mils, you should adjust R6 so the trip coil will operate at about 600 mils. For 600 mils R6 will be about 63.5 ohms and will dissipate 19 watts, but under normal usage with a 500 mil load R6 will only dissipate 15 watts, therefore a 25 watt resistor is adequate.

For safety I used a 50 watt resistor.

The unit is intended for remote control operation by means of RL1 which operates on 115 *vac* through a toggle switch at the operating control position.

Provisions are also made for a remote 115 volt indicating lamp to indicate on-off operation. The overload relay RL2 is reset by means of a momentary contact push switch also located at the operating control position .The remote indicating lamp indicates if the overload relay is tripped. Needless to say, if the overload trips twice do not try to reset it but look for an overload either in the final amplifier or in the supply itself; usually it will be in the amplifier.

Power Input

Since the total power input to this unit at full load is 3 *kva* it is not recommended that you attempt to plug it into a standard 115 *vac* outlet. The transformers can be connected for 115, 208, or 230 volt operation. It is absolutely essential that you run a special heavy duty line from the

main distribution box and locate a manually operated disconnected switch and fuses at the operating position to serve as a main control switch. Most hams contemplating the use of this kind of power already have been through all this, and have a separate heavy duty 3 wire circuit from the entrance distribution box to the shack. At W1JM the power mains and main distribution box are in the shack. In fact the house was built that way on purpose, and separate circuit breakers are available with total wire length of only 10 ft to the rig. A private 25 *kva* pole transformer and 120 amp 3 wire feeders supply power to the house and the shack. So far we have observed no voltage change due to anything being turned on whether air conditioner, stoves, or the rig. The meters just sit there and stay put. Adequate copper saves many headaches.

To emphasize the precaution taken for grounding at W1JM you might be interested to know that 10 lengths of 2" wide .005" copper strip each 45 ft long are fanned out radially from one end of the building under the shack and buried under the concrete floor to make a FB ground system. Incidentally this ground is *NOT* tied directly to the usual entrance ground so we do not get 60 cycle ground current pickup.

Electrical Data

The electrical characteristics are as follows:

Input—Either 115 *v*, 208 *v* or 230 volt single phase, 60 *cps*. Also operates over the range of 50-400 *cps* with 3 KVA input.

Output—4,200 volts at 500 mils continuous duty.

Ripple—Nominal 1% *rms*.

Regulation—15% no load to full load, and no transients or "ringing" of output voltage due to sudden load changes.

The circuitry shown in fig. 1 is quite straightforward except for the six power modules. Each of these modules is a complete power unit delivering 700 volts at 500 mils. At the junction of the voltage doubler capacitors, 350 *vdc* may be obtained. It is possible, therefore, to obtain 350 volts for the screen and 4200 volts for the plate circuit. These power modules can also be rearranged in a series parallel arrangement to deliver 2100 volts at 1000 mils or 1400 volts at 1500 mils. If this is done, resistor R6, shunting the overload relay RL2, will have to be changed to trip at the appropriate current rating.

The voltage doubling circuit is conventional, however, it is important that the transformer, which is rated 291 *vac* and is specially designed for this application, be capable of supplying peak currents of 4.5 amps and 0.7 *rms* amps with good regulation. The secondary winding must also be adequately insulated from the primary and core to withstand at least 6300 volts peak for the first four modules and 11,000 volts for the other two. The use of capacitors alone in the filter circuit, instead of a choke and capacitor is the secret of the unit. By eliminating the choke we eliminated the "ringing" that is created by the inductance of the choke in combination with the capacitor.

Considerable difficulty was experienced with the silicon diodes due to misrepresentation of ratings by the manufacturers. Several different makes of diodes were tried and only the *RCA* type 1N1764 was found satisfactory. All other makes tested failed on the forward surge current test even though they claimed to withstand a surge of 30 amps for 4 milliseconds.

Since the maximum surge current through the diodes will occur only if the input voltage is applied at the peak of the *ac* cycle, it is possible that it will take a lot of input voltage switchings before a peak will be hit. It is therefore possible that some other makes of diodes may operate satisfactorily for a while, but will eventually break down. Some individuals might feel that the surge current problem can be licked by making R5 larger than 5 ohms. Ordinarily this is correct, but in order to get the performance with other operating conditions, the 5 ohm value is mandatory. Note that the total surge limiting resistance is R5 plus the internal impedance (not *dc* resistance) of the secondary winding. While a generally similar operation may be obtained by changing components to values and types other than those specified, I can only caution you against this attempt unless you really know your stuff and have adequate equipment to make the proper measurements. The unit may appear to be satisfactory, but after a while diodes will go, circuit breakers will trip, and you will begin cussing *me* out for getting you into your mess. I will stand behind this unit only if it is made exactly as described with no bright attempts at improvement or modification. Several capable engineers spent a lot of time arriving at this particular set of values and they learned the hard way, so be smart, do not change things.

At first glance it may appear that the use of electrolytic capacitors is improper in a 4200 volt circuit. Bear in mind, however, that the maximum voltage that can appear across the capacitor is only 435 volts under no load condition with a 10% high line voltage (i.e. 125 or 250 volts). A capacitor having a 450 *vdc* working voltage rating is adequate. The resistors R1 through R4 inclusive serve only as bleeder resistors for each capacitor and even if one opens nothing will happen as there are two in parallel at every location. In the event any of the silicon diodes fail, they short out. The line input fuse or circuit breaker will trip. Neither the fuse or breaker are shown on the schematic as it is felt that a power supply of this power capability will require a special line from the main distribution box and this line must be protected in accordance with Underwriter rules.

Further Construction Notes:

The unit shown in the photograph is built on a ¼" aluminum plate 17" x 17½" so that it can be mounted in standard relay racks by using

a supporting shelf or brackets under the unit. Most often the unit will probably set on the floor under the operating table. Four "Domes of Silence" (also known as gliders) are fastened under each corner so as to protect the floor from gouging by the nuts and bolt heads on the bottom of the base plate, and allows the unit to be shoved around easier. Since the unit weighs 150 pounds a little help from the gliders will be appreciated. A dust cover, not shown in the photograph is used to cover the entire unit for safety reasons. No safety interlock is shown on the schematic because in all probability it will be disabled the first time the cover is removed. The overall height of the unit with dust cover is 8½". Since a ¼" aluminum baseplate is not readily available, it might be more convenient to use a piece of 5 ply ¾" thick plywood. The base size of 17" x 17½" is not important and it could be larger.

The power transformers should be mounted by means of pieces of steel angle long enough to clamp three transformers together and then fasten them to the base. The electrolytic capacitors, silicon diodes, and resistors are mounted, as shown in the photo, on a phenolic board 8" x 13" x ⅛" thick. Do not try to use a metal mounting board as the potential difference between parts mounted on this plate will be as much as 4200 *vdc* and you will promptly blow up the unit. The electrolytic capacitors must be mounted with an insulating plate. The 8" x 13" mounting board is set up on ½" phenolic rods 5½" long drilled and tapped at both ends.

Care must be taken to be certain that none of the parts on the board come within ¾" of any grounded parts. If the wooden base plate is used be sure to bond all the cores of the transformers and connect them to a suitable ground.

If your wiring system does not have a separate ground circuit then you had better run a special ground wire if you expect to enjoy using this power supply. Please remember that a 4200 volt supply with 500 mils capability will kill you the first time. You will never get another chance, *BEWARE!* Ground your system thoroughly; you will live longer.

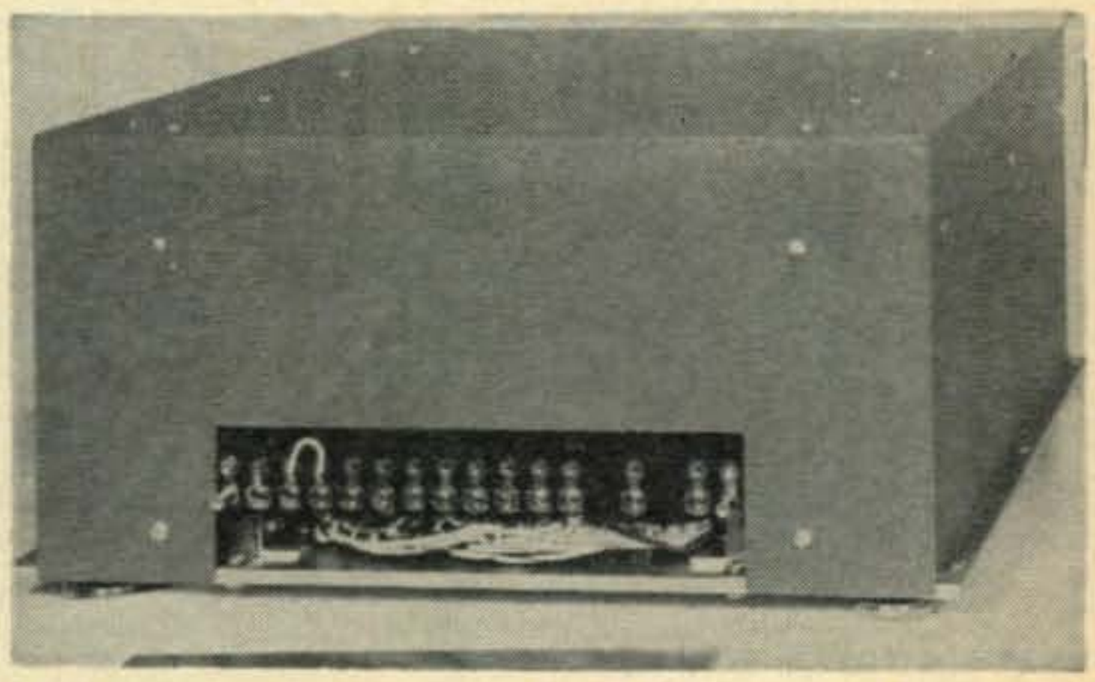
Since I had adequate machine shop facilities at my disposal there was no problem in drilling the large 1½" holes for the electrolytic capacitors; however, if you have access to a drill press and a flycutter this should be no problem. An alternate method is to drill five ⅜" holes to clear the capacitor mounting lugs and terminals and two 11/64" holes for the mounting screws. Since there are 24 capacitors you will have to drill 120 holes plus the mounting holes and other holes required to mount R5 and the diode terminals. While I used turret lugs spun into the mounting board it may be more convenient to use terminals such as *Cinch* 51-F.

Terminals and Stand Offs

Output and input voltage terminals are provided by means of two *Jones* barrier strips, Type 15-142Y and 5-142. If you use the Jones strip for the 4200 volt connection be sure to mount the strip on angles to keep it at least ¾" above the base. Do not use the terminals on either side of the 4200 volt terminal, and remove the metal inserts of the unused terminals. You can also use a *Millen* 37001 terminal and mount it on a bakelite sub panel. The 37001 has a tendency to arc over from the center conductor to the nearest mounting screw when used with over 3000 volts. The good book says the spacing should be adequate, but take it from me it is not. I have had plenty of trouble due to this condition, not only with the *Millen* 37001 but also with the commonly used skirted ceramic standoffs. Many grades of ceramics look OK but fail due to moisture absorption and corona which sooner or later causes a breakdown right through the skirt of the insulator. I had so much trouble from these that I had to make my own stand off insulators out of Resolite rod. So don't say I did not warn you if you have arc-overs. Maintain at least ¾" spacing between parts at 4200 volts and ground, or have a good grade of phenolic material between the terminal and ground.

Cover

The cover I used was made of solid .032 sheet steel so as to keep the dust off the capacitor mounting board. It may be simpler to make it out of perforated aluminum such as is available from *Reynolds Aluminum Company* in their



"do-it-yourself" kits and sold by many hardware stores. A pair of shears, ruler, and some elbow grease can produce an acceptable cover. Then place a piece of cardboard over the top to keep dust and dirt from falling onto the capacitor terminals. One trick I have used to bend 1/32" thick aluminum is to cut two pieces of ¾" plywood 2" wide the length of the piece to be bent, then clamp the sheet between the plywood pieces by means of a few carriage bolts thru the plywood and the aluminum, and use a hammer or wooden mallet to bend the metal. You end up with a few extra holes but at least you do get a straight bend. Make the longest bend first then cut the plywood pieces for the proper length to bend the shorter side.

If there are any questions, address them to the writer at the W2AHU QTH if you expect a reply before next summer. ■

Thin Ferromagnetic Film Balanced Modulators

R. L. Samuels and A. A. Read
Electrical Engineering Department and
Engineering Experiment Station
Iowa State University of
Science and Technology
Ames, Iowa

Completely passive balanced modulator circuits are proposed using thin single domain permalloy film. A carrier winding and an output winding are wound around the film. The carrier winding is wound with its axis parallel to the film magnetization rest direction. The output winding is wound perpendicular to the carrier winding. A modulation winding may be added in parallel with the output winding or the output winding itself may be used as the modulation winding. The modulation signal rotates the magnetization to provide a coupling between the carrier and the output windings proportional to signal amplitude. This produces suppressed carrier amplitude modulation. Carrier frequencies from vlf *through the lower* uhf *region and modulation frequencies* dc *through video appear feasible.*

Sinusoidal frequencies from 20 cps *to 20* kc *and squarewave frequencies up to 100* kc *were used to modulate a 4* mc *carrier frequency. Carrier feedthrough of 2.5 millivolts peak for zero modulation compared to 400 millivolts peak with modulation was measured. Carrier feedthrough measurement with modulation could not be made with the equipment available but there is ample reason to believe that this can be kept very low. It is proposed that a balanced modulator can be made using sandwich construction and potting techniques. Such a unit should be almost completely immune to the effects of a wide range of mechanical and thermal environments.*

Introduction

The recent development of the technique for vacuum deposition of single domain thin films of ferromagnetic materials such as 80-20 permalloy has led to the application of these films to the construction of low cost inductors whose self inductance can be varied parametrically at frequencies anywhere from *dc* up to several hundred megacycles per second. The availability of such inductors suggests a number of interesting possibilities for practical devices of which the thin film suppressed-carrier double-sideband modulator is an example.

The specific films used in the investigations reported here were of 80-20 permalloy, vacuum deposited in the presence of an external magnetic field, to a thickness of 2000 angstroms (2×10^{-5} centimeters). These films were very thin circular discs with diameters of about 8 millimeters. A film so deposited has a low anisotropy in the plane of the film and a very large demagnetizing factor for rotation out of the plane of the film. Films of this type are also essentially single magnetic domain structures. A discussion of domain theory in general or even of domain theory relative to thin films is beyond the scope of this article. For detailed discussions on magnetic domain theory the reader is referred to other publications[1-2].

It is sufficient here to say that a *domain* possesses a saturation magnetization vector M per unit volume. This represents the intrinsic magnetic flux density of the material. The magnitude of M for 80-20 permalloy films is about 0.8 webers per square meter. When there are no external magnetic fields, the vector M lies in the plane of the film in a direction called the easy or rest direction. The direction in the plane of the film but normal to the easy direction is called the hard or transverse direction.

Figure 1 (A) shows a coordinate system for a single domain thin film. Application of the external fields h_R and h_T along the rest and transverse directions respectively will cause the magnetization vector M to rotate through the angles $\emptyset$ and ψ from its rest position. The equation of motion for M is very similar to that of a damped gyroscope. If h_R is held constant and h_T varied sinusoidally with time, the tip of the vector M will precess in such a manner that its motion will trace out a path that is essentially a very flat ellipse. The large demagnetizing fields normal to the plane of the film very effectively constrain the angle ψ and keep it from becoming very large. But the low anisotropy of the film provides relatively small constraining forces in the plane of the film so that the angle $\emptyset$ can become quite large. For most practical purposes then, M can be considered as simply moving back and forth in the plane of the film. If both h_R and h_T vary rapidly with time, the motion of M can become quite a complicated Lissajous

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[1] C. Kittel and J. K. Galt, "Ferromagnetic Domain Theory," In F. Seit and D. Turnbull, eds. *Solid State Physics*, Academic Press, New York, N. Y., Vol. 3, pp. 437-557; 1955.

[2] A. J. Dekker, *Solid State Physics*, Prentice-Hall, Inc., Englewood Cliffs, N. J.; 1957.

type pattern, but its motion still remains essentially in the plane of the film. For practical considerations, rotation out of the plane of the film can be neglected and quasi-static conditions assumed for frequencies below *vhf* at least. Quasi-static operational conditions are assumed in this paper.

The Balanced Modulator Circuit

Suppose a pair of mutually perpendicular windings are wound around the film with an alignment as shown schematically in fig. 1 (B) so that the axis of one winding, hereafter called the carrier winding, is parallel to the rest direction of the film while the axis of the second winding, hereafter called the output winding, lies parallel to the transverse direction of the film. A modulation winding can be added in parallel with the output winding, or the output winding itself can be used as the modulation winding. It is to be noted that because of the mutually perpendicular orientation of the windings, no voltage is induced in the output winding if no currents flow in either the modulation or output windings.

A *dc* modulation input is somewhat easier to visualize than an *ac* input. At the same time it

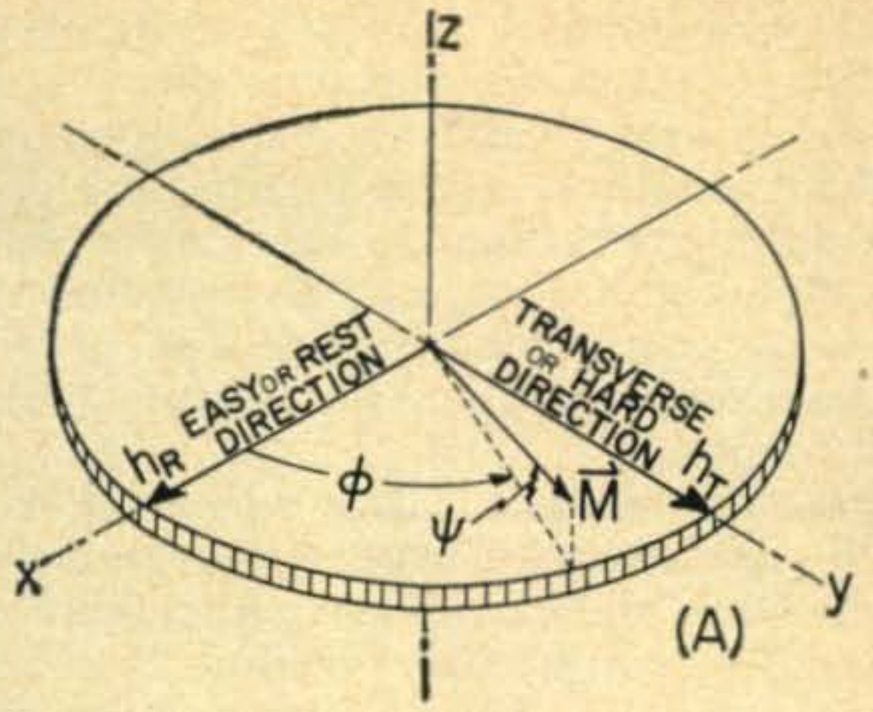


Fig. 1—(A) Single magnetic domain thin film with applied fields.
(B) Schematic representation of a thin film inductor.

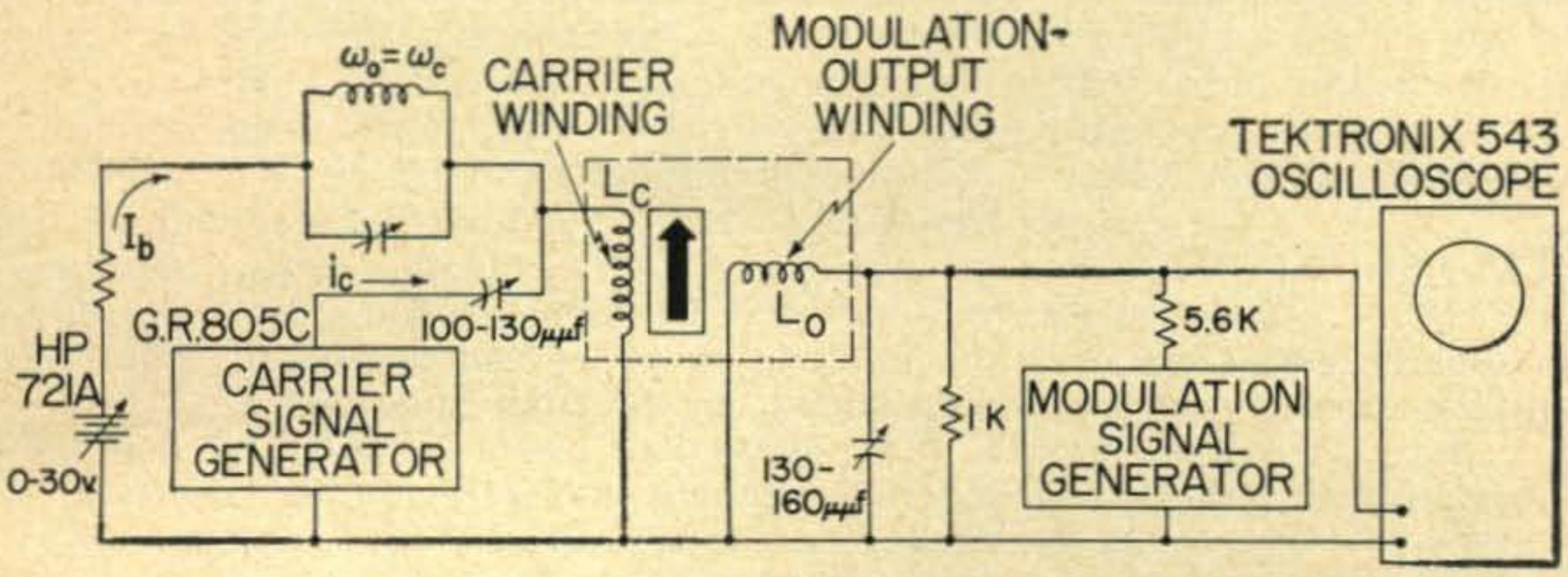


Fig. 2—The experimental thin film balanced modulator circuit.

allows a simple qualitative description to be given which provides a good introduction to the balanced modulator operation. Consider fig. 1. Suppose a *dc* bias current I_b and a single frequency carrier current i_c at an angular frequency of ω_c flows in the carrier winding and that a *dc* current flows in a separate modulation winding not shown in fig. 1 (B) but in parallel with the output winding. This current establishes a magnetic field in the transverse direction producing a torque on the magnetization vector M and causing it to rotate through an angle Ø. This establishes a flux linkage in the output winding. Once M is rotated away from its rest position, the fields established by the *ac* carrier current in the carrier winding exert further forces on M. These alternating forces cause the vector M to be rocked back and forth around some equilibrium value of Ø, constantly changing the magnetic flux linking the output winding. This induces a voltage in the output winding at the frequency of the carrier and of an amplitude determined largely by the value of the equilibrium angle of rotation established by the amplitude of the *dc* current. Some nonlinearity with

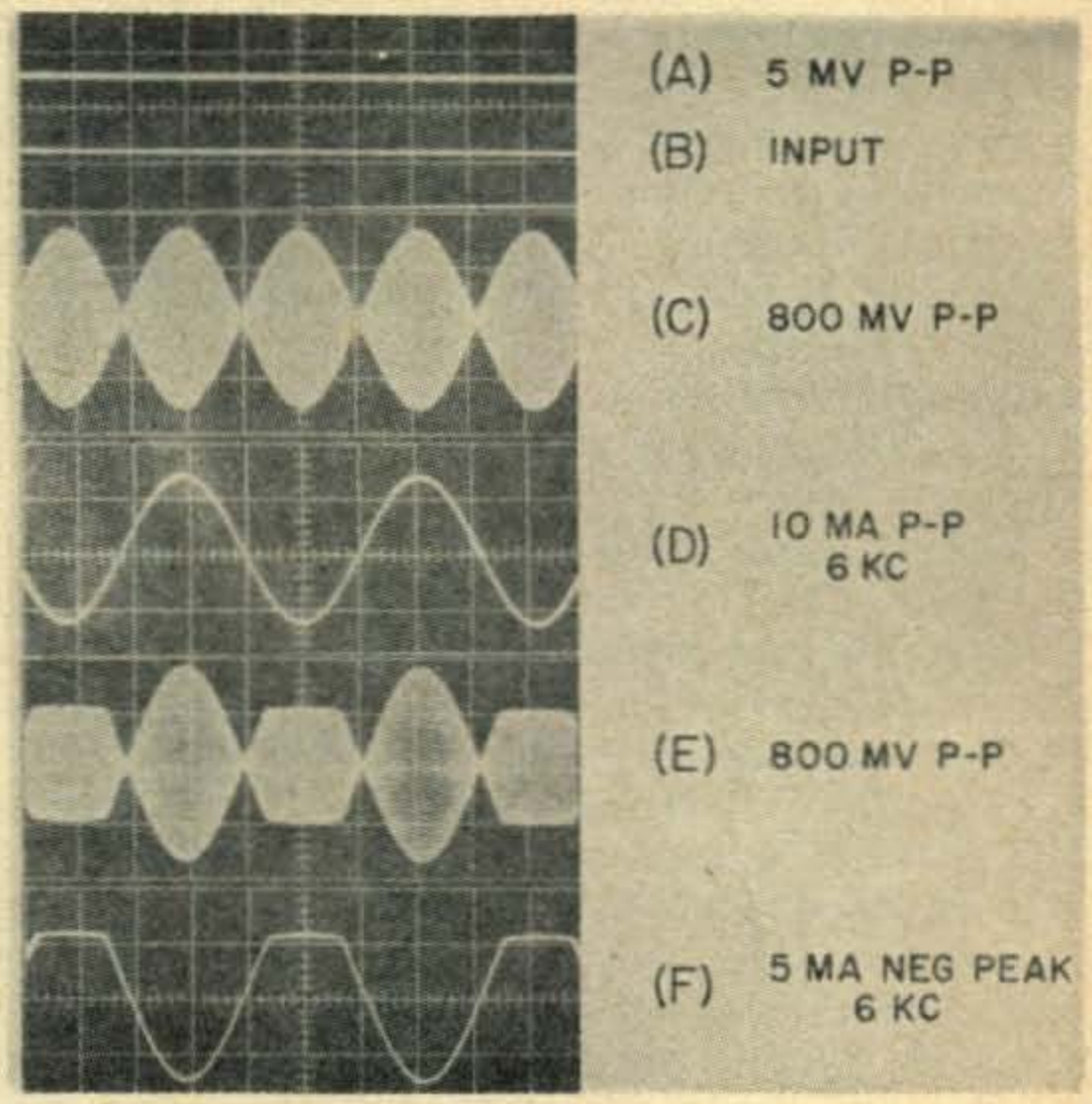


Fig. 3—Examples of modulation input and modulator output waveforms.

respect to modulation current is to be expected since this is a rotational phenomenon. This, however, can be kept small if the maximum angle of Ø is kept small. A variable capacitor can be placed across the terminals of the output winding and the output circuit tuned to resonance. This permits at least partial suppression of carrier harmonics and increases the useful amplitude of the output.

A time varying modulation current slowly rotates M back and forth around the rest direction position while the carrier current rapidly rocks M around its equilibrium position. It is easy to see from this very qualitative description how a voltage such as the one shown in fig. 3 (C) for an actual experimental model can result. This is suppressed carrier double sideband modulation.

One of the advantages of permalloy films for application in balanced modulators is their relatively stable characteristics as a function of temperature. Although this has not been explored in great detail, there is no reason to suppose that a modulator could not be built having characteristics with negligible temperature coefficients, particularly with respect to carrier feedthrough, over the temperature range of at least from −100 to +100 degrees Centigrade. Furthermore the frequency characteristics of permalloy are such that one should be able to build modulators using permalloy films that operate with carrier frequencies from a few hundred kilocycles to several hundred megacycles.

Experimental Verification

A ferromagnetic film research group has recently been established at Iowa State University. Equipment is currently being procured to get the program going. All experimental work to date has been done with "potluck" films obtained from other organizations. Since this leads to obvious non-optimum although workable systems, the authors did not attempt any optimumization but rather limited their experimental investigations to the verification of the results predicted in the preceding section and to obtaining some notion of what characteristics one might reasonably expect from a system of much more optimum design. The experimental section of this report then has more the nature of a progress report than of a final report.

Figure 2 shows the circuit used for this investigation. A single winding was used both as the modulation and as the output winding. The carrier frequency was kept constant at 4 megacycles per second. Figure 3 shows the output voltage and modulation current waveforms for three different modulation inputs. Figure 3 (A) shows a 5 millivolt peak-to-peak carrier feedthrough with zero modulation as shown by the straight line trace of fig. 3 (B). Figures 3 (C) and 3 (D) show an 0.8 volt peak-to-peak output for a 10 milliampere peak-to-peak modulation signal current. For illustrative purposes, a sine wave was externally clipped and applied as modulation to give the results shown in figs. 3 (E) and 3 (F). The modulation frequency shown was 6000 cycles per second; the circuit response was flat from 20 to 20,000 *cps*.

Figures 4 (A) and 4 (B) show the output and modulation waveforms obtained when the modulation input was a 20 kilocycle per second square wave with its base clamped to ground. The output waveform was observed across a modulation-output winding that was very loosely wound permitting the film to be rotated independently of the other windings. This permitted observations of the effects of the alignment of the film with respect to the carrier winding. Because of the high air inductance of this winding relative to that due to the film, the response of this system was badly deteriorated at square wave frequencies in excess of 50 *kc*.

A second modulator was constructed with its modulation-output winding tightly and rigidly wound around a sandwich of two films cemented together. Since the exact rest direction of the film was difficult to determine, the axis of this winding was not aligned exactly normal to the film's rest direction. Figure 4 (C) shows the response of this modulator to a 100 *kc* base-clamped square wave as shown in fig. 4 (D). The greater volume of magnetic material and the increased coupling between the film and the output winding, resulted in a three-fold increase in output voltage of this second modulator for the same carrier winding and current and for the same amplitude of modulation signal. From figs. 5 (A) and 5 (B), it may be seen that when the position of the modulation-output winding was adjusted for equal spacing of the nulls, the modulation peaks had alternately different amplitudes. On the other hand, figs. 5 (C) and 5 (D) show that when the winding and an external magnetic bias were adjusted to produce equal modulation peaks, the nulls were no longer evenly spaced. This is a consequence of the lack of symmetry assumed previously and results in carrier feedthrough. The peak-to-peak output voltages in fig. 5 were 2.4 volts for an input of about 8 milliampere peak-to-peak.

The linearity of the first modulator was checked by an oscillographic technique. The typical "bowtie" pattern and the modulation signal used to check the linearity are shown in figs. 6 (A) and 6 (B) respectively. It should be noted that the distortion of the modulation signal results in slight horizontal unbalance of the "bowtie" diagram. The horizontal and vertical scales in fig. 6 (A) are 4 milliamperes per division and 0.2 volt per division respectively.

Measurement of the temperature characteristics proved quite difficult. The mechanical construction of the first model was such that alignment in an enclosed oven to a degree comparable to fig. 3 (A) was impossible. However, with several millivolts carrier feedthrough, due to this misalignment, an increase in temperature of 100° C resulted in an increase in carrier feedthrough of less than 50 percent. This we attribute as being largely due to the change in the anisotropy constant of the film. Although these results

are inconclusive, there is still no reason to suspect that any increase would have been observed for a properly aligned system. Further investigation of this must await construction of a circuit of more optimum configuration.

Discussion

The experimental results of the section Experimental Verifications generally verifies the theoretical expectations of the Balanced Modulator section. One of the most difficult problems experienced was that of properly aligning the two windings and the film. The problem of alignment can be attacked in two ways. It is possible to evaporate films that have a much smaller anisotropy than the films used in this experiment. This would of itself make the system much less sensitive to alignment although some of the problem would still remain since, in the configuration of fig. 1 (B), the film is not readily accessible.

Another attack on the alignment problem is to use a sandwich technique. In addition, low anisotropy films could also be used advantageously here. One of the windings could be etched on one side of a thin etched-circuit board and the other etched mutually perpendicular on the opposite side. The arrangement shown has a zero mutual inductance between the output and the carrier windings in the absence of any films. Capacitive coupling can be minimized by connecting the center tap on one or both windings to the ground plane of the overall system.

Suppose that eight films are evaporated on a common substrate with their easy directions parallel to each other and to the center line of the output winding. Assume these eight films are mounted film side down nearest the etched wiring with only a thin insulation separating the winding and the film and that eight more films are similarly placed on the under side. As the modulation current varies, the magnetization vector will rotate. The system will function exactly as described previously for fig. 1 (B). Since the two windings are mutually perpendicular to each other and fixed, the alignment procedure reduces to one where the films alone are moved. Once alignment is achieved, this sandwich can be potted to make the alignment permanent. To provide shielding against stray magnetic fields the sandwich should be magnetically shielded by a high permeability material.

Since the reason for the alignment was to reduce carrier feedthrough and inasmuch as it is all determined by a physical orientation which can be expected to retain its placement even against rather severe mechanical and thermal conditions, a modulator of this type promises to have many advantages not presently available in systems using other modulation means such as diodes or tubes. One can easily visualize that such a modulator with shields but minus tuning capacitors could be constructed no larger than a book of matches. As soon as facilities permit, such a modulator will be built and tested. With

[*Continued on page 124*]

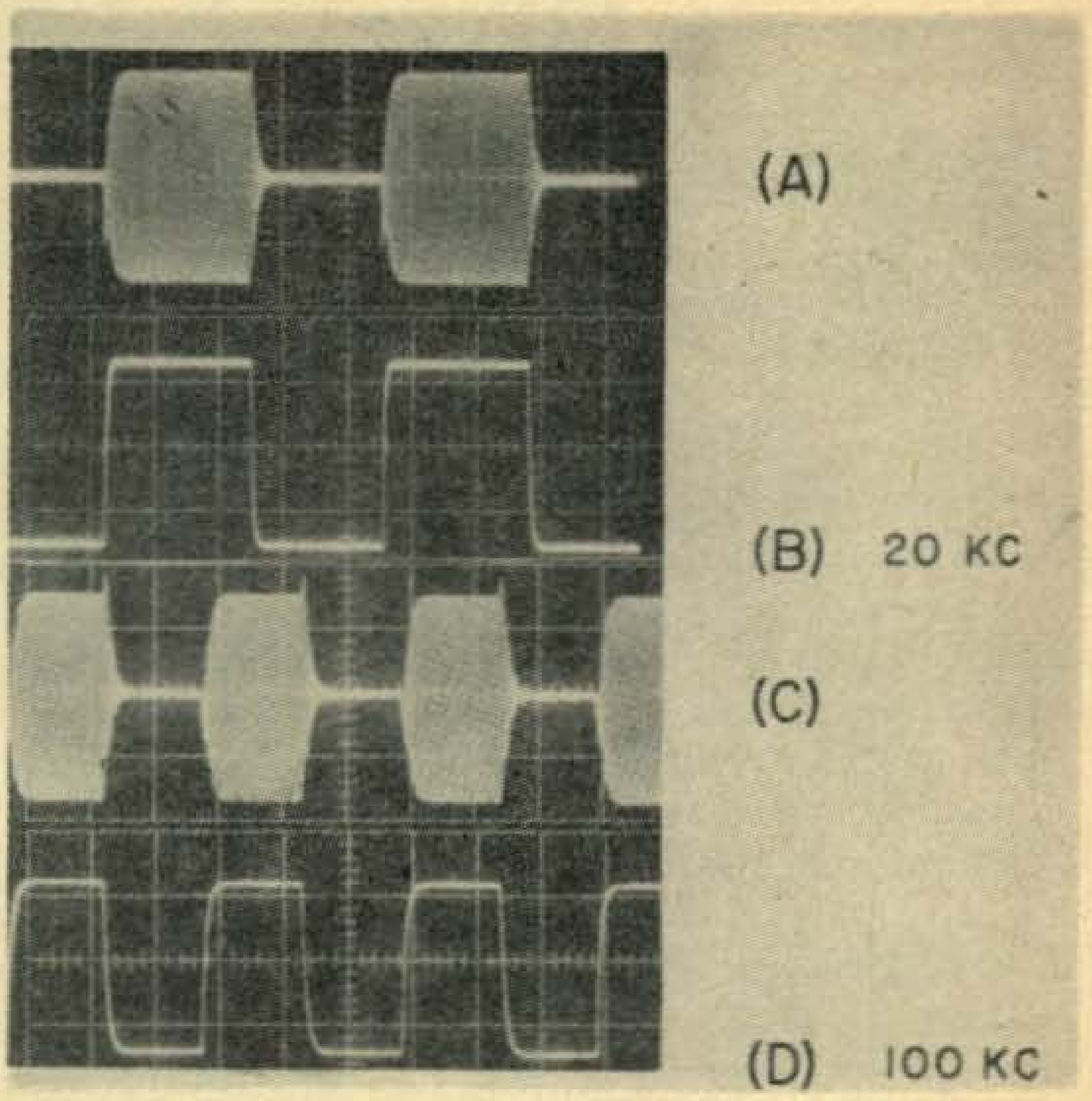


Fig. 4 — Modulator response to clamped square wave modulation signals.

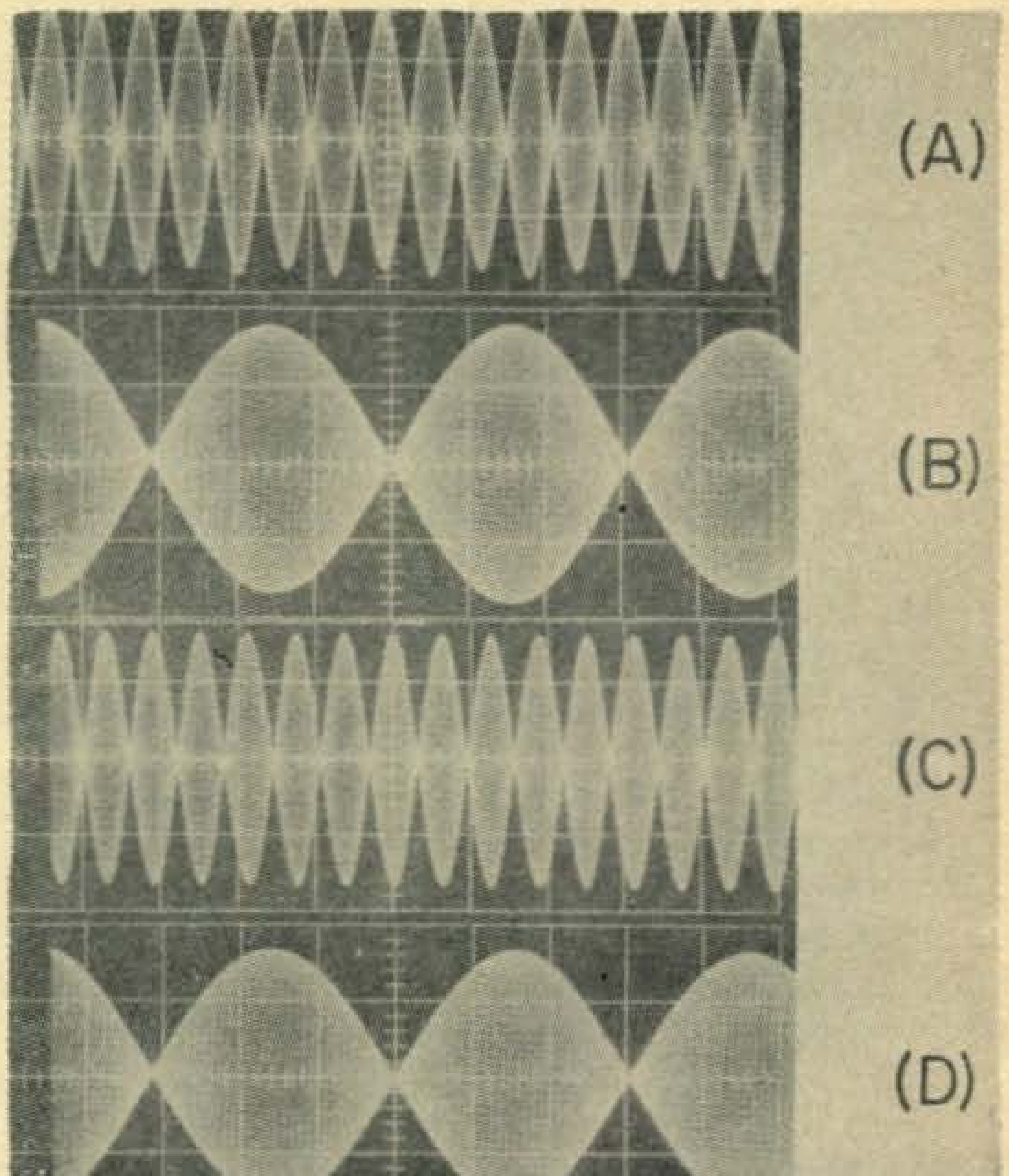


Fig. 5—Modulator output with film incorrectly aligned.

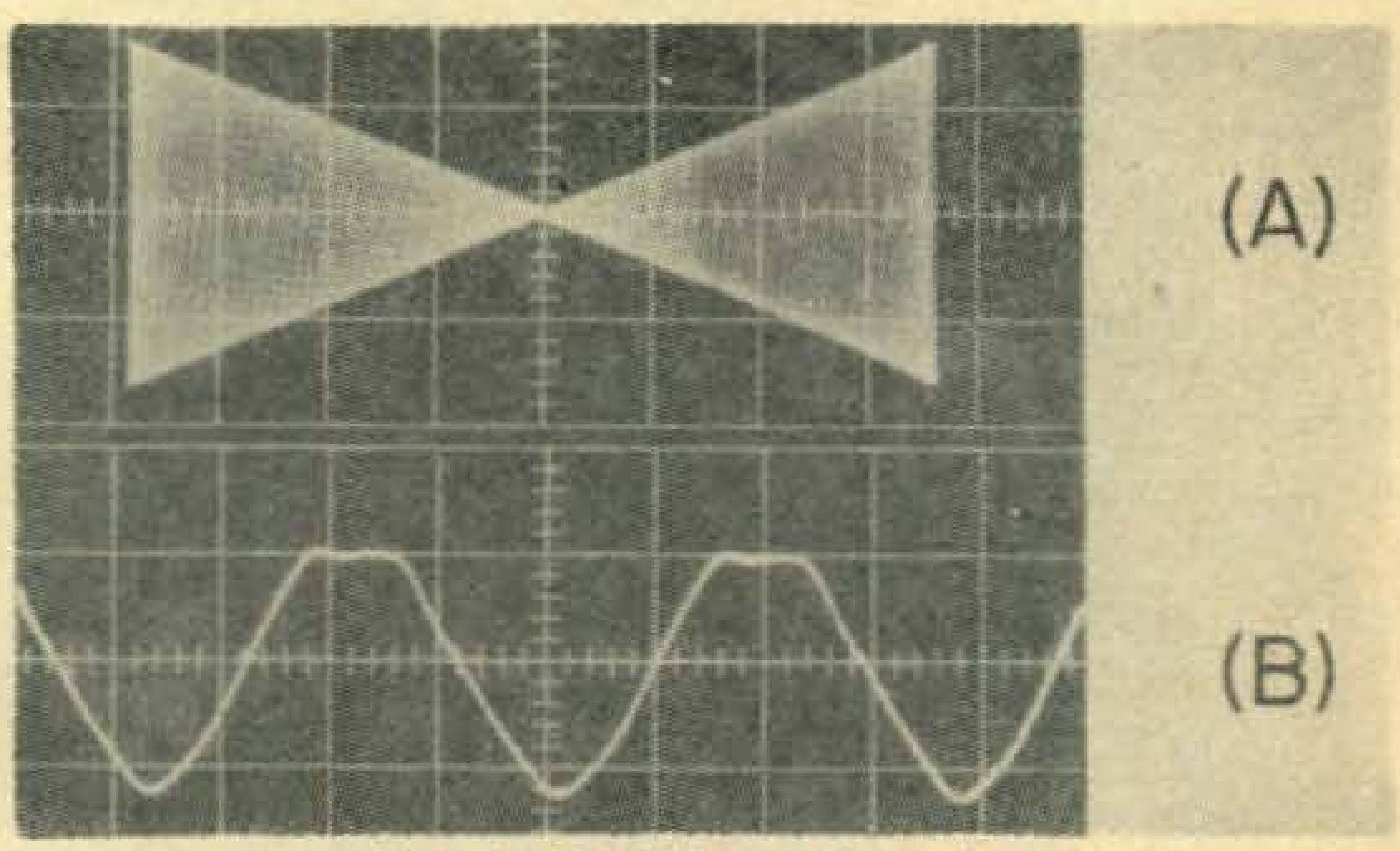


Fig. 6—Modulator linearity.

Results of the CQ World Wide CW DX Contest for 1959

Frank Anzalone, W1WY

Those horrible conditions everybody was moaning about during the CW weekend of our World Wide DX Contest certainly did not exist in the northern Africa area. What better proof than CN8JX's 1277 contacts plus a healthy multiplier for a grand total of 1,156,232 points, the highest score of any category in the contest. No matter what his locational advantage, that's a lot of brass pounding in a 48 hour period. That's a record that is going to last for a long time and makes Maj. Glenn Luse the Champ of all champions. Congratulations Glenn, too bad the rules do not permit you to win the W9IOP Trophy a second time. However we will have a suitably engraved plate to add to the cup you won last year.

Runner-up and winner of the Larry LeKashman Trophy is 7G1A, who is also located in the favored area. With the highest number of QSOs turned in by any station, 1390, and a score of 716,220 points, Josef Plzak made an excellent showing, but he lacked the multiplier to put him at the top. Josef is OK1PD on special duty in the Republic of Guinea.

In the third spot is Micky Monastirsky, 4X4-KK with a score that normally would have been good enough to take top honors.

The rest of the Top Ten spots were dominated by Europeans with the exception of W3GRF and JA1VX, a couple of old pros that can always be found in the top grouping.

The 28 *mc* band was not very productive and consequently the all band multipliers suffered accordingly and the single band scores were correspondingly lower. The US/European path was closed down tight on the first day but fortunately opened up for a few hours on Sunday. Here again it was another African station, OQ5-IG, that took top honors. Evidently that part of the globe was least effected by the "black-outs" on the higher bands.

Maurice Duke, VS6BJ. A nice catch in any contest.

The conditions on 21 *mc* were somewhat better as indicated by the size of the scores. High on the totem pole is Ed Goodhue, KH6DLF, who is none other than ex-KL7PIV. Ed found the pickings from Hawaii much better than his previous northern location (Alaska), and if there had been a few good openings to Europe he would have probably run up a real score. Not that his 156,658 points, second highest for a single band, is to be sneezed at.

However it was the old standby, the 20 meter band, that came into its own. It was here that the all-banders piled up their points and multipliers. And once again it was 14 *mc* that produced the highest score on a single band. This year it was Luis Desmaras of CE3AG fame. To Luis goes the John Ryan, W7KVU Trophy, which means a double for the boys of Chile, since CE3DY copped the Single Band Phone Trophy. Heretofore Luis has always been in the

Herman Samson, DJ2BW, 14 mc winner for Germany.

all band competition, but being handicapped on the lower frequencies due to his location, he played it smart and decided on a single band effort this year. A score of 238,832 is hard to beat on any band. Nice going Luis.

The competition for high score on 40 was strictly a W/K affair, the four highest scores coming from the US. The anticipated battle between two old competitors W3BVN and W8FGX was a close one. However it was a dark horse, K2DGT, Bob Martinez, that picked up all the marbles. It takes a lot of doing to make 338 contacts in 78 countries on 7 *mc*. Bob ran a full gallon to a full sized 3 EL beam, and this

monster was mounted on a 100 ft tower. Wow! How could he miss?

The 80 meter activity was confined mostly to Europe although quite a bit of it got across to the North American continent to the delight of the all band multiplier seekers and W1BU in particular. High score of 16,023 points and 309 QSOs was made by OK1AWJ. This we believe is a record for 3.5 *mc*. Actually the DX stations would do much better if they spread out a bit and did not bunch together on the low end of 80.

Activity on the Top Band was strictly local, although W1BB and a few others made a futile effort to get across the pond. Over in Europe DL1FF put on quite a show and covered the continent like a blanket. Armin's 95 QSOs is

"Only 26 more minutes to go". K3DKD, one of the operators at W3AOH.

the highest ever made on 160 in our contest.

We often wonder why stations, especially in countries with only a few entries, don't take more advantage of the single band feature of our contest. As an example, there were only 4 entries from Southern Rhodesia, but each one took a separate band and each one was a certificate winner.

The multi-operator single transmitter group made a good showing, but this type of operating seemed more popular with the club stations in Europe. However it was a couple of sharp operators over here that made high score. W1JYH and W1BIH teamed up at the latter's station and handily won the new Barry Briskman K2IEG Trophy. (A new award made necessary by the new classification of the Multi-operator division.) So to John and Roger goes the distinction of winning the only award for the United States.

In second place is Vic Clark, W4KFC, and a couple of teen agers, K4CAX and K4OKZ. Looks like Vic is building for the future.

The rest of the top spots were taken over by Europeans with DM3BL leading the pack.

Over in the colossus of the multi-operators it was a battle between two old competitors, DJ3JZ and W3AOH, with only 60,000 points separating the two and that's not much when your score runs over a million. Both had an 8 man crew and as many transmitters going as conditions permitted. You will note that the DJ boys made their score by a larger number of

The crew at W6RW. L to R—K6UYC, W6RW, W6YMD, K6EWL, K6OXU and W6KFV.

QSOs while Tony Susen and his gang built up a big multiplier. The results were opposite to those in the single transmitter division, so its the old question, which is the most profitable, run up as many contacts as possible or concentrate on a multiplier? So to Hardi Ludwig and his crew goes the "Buzz" Reeves, K2GL Trophy. Nice going fellows, you finally made it after years of trying.

Mention must also be made of the club effort at UB5KBB; the 1463 QSOs made by the boys was the highest in the contest.

The six man crew at W6RW just could not get going, conditions on the West Coast being what they were.

A total of 837 logs were received from 98 different countries and 301 certificates will soon be on their way to deserving winners. This is a good hundred logs less than last year although the country total is 6 higher. However, considering the miserable week end we didn't do too badly.

Outside this country the best showing was made by the boys from Czechoslovakia with 78 entries. A big surprise was the 63 logs received from Japan. Disappointing were the returns from Central and South America, but the biggest let-down was the meager 7 logs from Australia. All those certificates, a minimum of 6 for each district in the Single Operator division, going unclaimed.

Don't go lifting your eyebrows when you note the standings in the Club listings. That's right, the German DX Team, a newly formed DX club within the DARC is the winner of the CQ Plaque. The overseas boys are wiseing up so local clubs had better look to their laurels.

We extend our grateful appreciation to our new Editor, Barry Briskman, for taking us off the hook and donating the K2IEG Trophy for the new single transmitter classification in the mult-operator division.

Also in order are your thanks and appreciation to Andy Malashuk, W1GYE, "Mac" McIntire, W2BO and Ben Lazarus, W2JB, the old reliables who did all the work checking and processing the logs and compiling the results of the 1959 contest.

73 for this time, Frank, W1WY

Continental Leaders
Single Band

28 MC

OQ5IG - 69,363
JA2XW - 44,286
W3LSG - 32,390
EA3IH - 25,014
CX2BT - 15,015

21 MC

KH6DLF - 156,658
JA3IS - 126,168
DL1VR - 111,706
FA8RJ - 95,661
W8UPN - 74,304
ZP5JP - 21,482

14 MC

CE3AG - 238,832
OK3MM - 143,561
W8QFR - 65,010
VQ3CF - 64,477
JA1BNK - 47,964
KH6DMP - 41,360

7 MC

K2DGT - 108,774
VK3YD - 22,372
YU2UE - 20,532
UA9DN - 10,608

1.8 MC

DL1FF - 1,235

3.5 MC

OK1AWJ - 16,023
UA9DA - 5,976
W1BU - 4,371

Top Ten
Single Operator
All Band

CN8JX - 1,156,232

7G1A - 716,220
4X4KK - 664,644
UB5WF - 574,488
G3FPQ - 507,552
W3GRF - 388,010
JA1VX - 383,732
UB5FJ - 374,540
PAØRE - 337,410
OK1XQ - 337,334

Top Five
Multi-Operator
Single Transmitter
All Band

W1BIH - 527,945

W4KFC - 454,212
DM3BL - 300,900
LZ1KBA - 279,276
G2BQC - 274,670

Top Five
Multi-Operator
Multi-Transmitter
All Band

DJ3JZ - 1,091,832

W3AOH - 1,031,360
UB5KBB - 938,245
W6RW - 538,935
OH1AA - 505,630

The following scores were inadvertently left out of the Phone results last month.

W3GRF	**A**	**159,950**	**173**	**63**	**152**	**D**
	(W3FYS - W6HOH)					
JA3EK	**28**	**87,220**	**343**	**32**	**57**	**B**
DL7BA	**21**	**67,210**	**222**	**34**	**76**	**B**

Number groups after call letters denote following: Band, Final score, number of QSOs, Zones and countries. Letters designate power used. A—Up to 35 watts; B—Up to 150 watts; C—Up to 500 watts and D—Over 500 watts. WINNERS ARE IN BOLD-FACE TYPE.

SINGLE OPERATOR NORTH AMERICA
United States

W1FZ	**A**	**87,792**	**180**	**66**	**111**	**D**
W1GYE	"	37,994	110	46	75	C
W1F1J	"	2,709	26	20	23	—
K1JKA	"	875	18	13	12	C
W1WY	**28**	**24,382**	**129**	**23**	**50**	**D**
W1LQQ	"	3,198	30	18	23	B
W1IUU	**21**	**41,412**	**178**	**26**	**61**	**D**
W1CTW	"	6,975	53	15	30	—
K1HRM	"	1,680	25	13	15	B
K1MLI	**14**	**39,449**	**141**	**33**	**70**	**D**
W1RB	"	12,600	65	28	47	—
W1NLM	"	12,375	63	29	46	B
W1EZD	"	5,311	41	17	30	B
W1UQP	"	2,340	32	13	13	C
K1DXW	"	1,035	15	10	13	D
W1BU	**3.5**	**4,371**	**57**	**11**	**20**	**D**
W1ZBT	"	2,060	49	6	14	D
W1BB	1.8	16	10	2	2	C
W2AGW	**A**	**315,900**	**432**	**75**	**185**	**D**
W2EQS	"	**234,900**	**347**	**96**	**174**	**D**
K2DCA	"	**227,460**	**319**	**90**	**165**	**D**
W2GUM	"	200,128	306	87	149	D
W2JVU	A	193,908	307	79	147	D
W2BOK	"	131,350	257	59	126	B
K2BZT	"	75,046	182	58	99	C
W2DEW	"	61,290	166	47	88	C
W2AQT	"	58,696	132	78	106	C
W2TQC	"	45,360	119	50	90	C
W2YTH	"	29,082	96	42	69	D
K2GHM	"	27,200	97	42	58	D
W2QJM	"	24,640	90	50	60	C
W2DOD	"	23,400	129	55	89	C
W2CDP	"	18,096	78	28	59	D
W2AZS	"	14,065	73	27	41	D
W2FCQ	"	13,904	68	31	48	D
W2BO	"	13,175	60	35	50	C
W2QKJ	"	9,556	55	19	45	—
W2CGJ	"	6,161	44	25	36	C
W2QDY	"	6,032	40	21	31	B
K2SBW	"	1,482	31	12	14	B
W2GJD	**28**	**30,160**	**135**	**24**	**56**	**D**
K2YGN	"	5,875	52	19	28	B
W2CYS	**21**	**58,176**	**221**	**28**	**68**	**D**
K2GUN	"	49,290	189	28	65	D
W2GZZ	"	30,324	110	26	50	D
K2JGG	**14**	**61,600**	**208**	**35**	**75**	**D**
W2PCJ	"	52,122	157	34	85	—
W2TVR	"	40,560	127	35	85	D
W2CWK	"	22,160	101	28	52	B
W2JB	"	3,456	36	13	23	C
W2DTL	"	1,650	21	19	55	B
K2QHL	"	1,296	19	13	14	C
K2DGT	**7**	**108,774**	**335**	**31**	**78**	**—**
W3GRF	**A**	**388,010**	**489**	**106**	**216**	**D**
W3MFJ	"	**176,120**	**276**	**84**	**150**	**D**
W3KA	"	114,003	175	53	106	C
W3ZAO	"	83,124	182	65	116	—
W3DBX	"	67,694	163	54	127	C
W3MSR	"	52,852	137	61	85	D
K3CIO	"	23,407	86	41	56	D
W3GHD	"	13,680	59	43	47	C
W1KGH/3	"	9,845	70	22	33	C
W3AYD	"	5,459	39	23	30	C
W3SOH	"	4,005	39	18	27	B
W3NHA	"	2,688	30	13	19	—
W3LSG	**28**	**32,390**	**150**	**24**	**55**	**D**
W3AYS	"	21,216	97	25	53	—
W3QQL	28	5,192	40	12	32	D
W3KFQ	**21**	**83,512**	**273**	**30**	**74**	**D**
W3ADZ	**14**	**20,570**	**92**	**29**	**56**	**D**
W3BVN	**7**	**59,220**	**250**	**24**	**60**	**D**
W3EIS	3.5	561	16	7	10	C
W4KXV	**A**	**217,800**	**315**	**101**	**163**	**D**
W4AZK	"	136,104	238	77	137	D
W4PNK	"	50,148	146	50	76	D
W4JAT	"	46,169	128	55	82	D
K4OMR	"	42,280	115	53	87	D
K4MXF	"	36,340	112	42	73	D
W4OMW	"	7,373	60	35	38	C
W4NYF	"	6,000	37	28	32	D
K4GIB	**21**	**20,713**	**99**	**26**	**51**	**C**
K4RID	**14**	**46,680**	**143**	**35**	**85**	**D**
K4LGI	"	21,976	97	26	56	C
W4IEH	"	17,938	51	29	33	D
W4DS	"	1,728	20	17	19	D
W4KAC	**3.5**	**779**	**30**	**7**	**12**	**D**
W5BRR	**A**	**75,328**	**187**	**75**	**101**	**D**
W5ZD	A	55,200	154	59	91	D
K5JZY	"	47,885	137	71	86	C
W5CK	"	39,243	112	60	67	C
W5LGG	**28**	**24,424**	**136**	**24**	**47**	**B**
K5UYF	"	5,550	59	17	20	C
K5IIN	**21**	**25,666**	**124**	**27**	**55**	**D**
K5JEH	"	9,222	70	22	31	C
K5DEG	"	4,860	45	18	27	B
W5KC	**14**	**35,256**	**134**	**34**	**70**	**D**
W5NOP	"	18,778	84	30	52	D
W5ZSX	"	16,878	70	27	43	C
W6CLL/5	"	10,472	59	26	42	B
K5KBH	7	638	19	10	12	D
W6TT	**A**	**223,880**	**360**	**97**	**135**	**D**
K6VTQ	**A**	**212,670**	**315**	**100**	**155**	**D**
W6IBD	"	192,885	318	96	135	D
W6UF	"	128,800	283	63	97	D
W6BYH	"	69,384	179	62	85	D
K6ANP	"	29,493	107	54	59	D
W6ID	"	23,002	87	44	62	D
W6BJH	"	16,948	85	32	44	C
K6IEC	"	15,691	78	32	39	B
W6QDE	"	13,869	73	27	42	D
W6BIL	A	9,536	59	28	36	D
W6UFJ	"	2,144	40	17	15	B
W6EJA	"	1,426	22	11	12	C
W6RMT	"	374	12	9	8	B
W6PQW	**28**	**18,360**	**116**	**24**	**36**	**B**
W6TXL	"	8,415	70	17	28	D
K6ICS	"	144	10	5	3	B
WA6HQR	**21**	**19,530**	**109**	**26**	**44**	**D**
W6BSY	"	16,730	93	27	43	D
W6VER	"	10,890	66	24	31	—
K6DCE	::	7,992	66	22	30	D
W6FOZ	**14**	**56,880**	**187**	**37**	**67**	**—**
W6EFV	"	34,290	137	27	63	D
W6SIA	"	26,796	118	30	54	D
W6CUQ	"	17,550	90	29	46	D
K6OCX	"	13,053	93	24	33	C
W6NKR	"	9,381	55	22	37	D
WA6BWS	"	2,760	29	18	22	D
K6UFX	"	2,268	34	14	13	D
K6ZMB	"	494	10	9	10	D
W6VSS	**7**	**24,180**	**144**	**26**	**39**	**D**
K6QKR	"	350	12	7	7	B
W7VY	**A**	**227,448**	**379**	**88**	**128**	**D**
W7BUL	A	16,644	101	38	38	C
W7VIU	"	6,668	53	25	28	D
K7APJ	"	6,322	55	28	30	B
K7KGP	"	1,219	23	11	12	A
W7AHX	**21**	**5,207**	**46**	**18**	**23**	**C**
K7AOZ	"	4,323	68	15	18	D
K7BWH	"	2,950	38	13	18	C
W7GUI	**14**	**59,955**	**195**	**35**	**70**	**C**
W7CAB	"	11,804	83	19	33	C
W7ZVY	"	648	14	9	9	B
W7JLU	**7**	**12,116**	**111**	**23**	**29**	**C**
W8JIN	**A**	**326,400**	**387**	**115**	**205**	**D**
W8EV	"	159,354	257	88	146	C
W8RQ	"	83,224	166	79	123	C
W8TTN	"	36,957	123	50	77	D
W8MQR	"	14,040	72	34	44	D
W8SS	"	8,892	54	39	39	B
W8BMX	"	2,891	31	23	26	B
W8MCC	"	2,812	50	16	21	—
W8KC	"	2,230	27	11	18	C
K8HTM	**28**	**1,053**	**20**	**13**	**14**	**B**
W8UPN	**21**	**74,304**	**259**	**33**	**75**	**D**
W8BHW	21	36,312	129	33	69	D
W8QFR	**14**	**65,010**	**213**	**35**	**75**	**D**
W8WBV	"	50,960	173	34	70	D
W8FGX	**7**	**57,567**	**226**	**28**	**65**	**D**
W9HUZ	**A**	**181,304**	**261**	**100**	**162**	**D**
W9IRH	"	165,000	284	99	151	D

W9ERU	"	141,382	239	86	137	D
W9IVZ	"	53,664	142	66	90	B
W9RQM	"	35,052	103	54	73	C
W9YAE	"	11,544	52	39	35	B
W9CLH	"	2,067	27	19	20	B
K9PPX	"	1,666	22	15	19	D
W9ZTD	28	12,760	84	19	39	D
W9JUV	21	31,416	137	28	60	D
W9WIO	"	12,326	52	42	26	D
W9NH	"	12,152	72	22	40	C
K9MDH	"	2,560	36	13	22	C
K9CUY	14	16,709	85	28	49	D
W9RKP	"	1,000	18	11	14	—
W9PNE	3.5	336	19	7	7	C
KØBIT	A	87,042	196	69	94	D
WØBTD	A	60,192	140	68	103	B
WØMCX	"	27,104	103	48	64	C
WØDAE	"	10,062	105	55	74	D
KØOVR	"	8,260	46	27	43	C
WØDVZ	"	7,482	47	24	34	D
KØRZC	"	1,188	17	16	17	B
WØVXO	28	16,776	86	26	45	—
KØLFY	21	27,540	134	29	56	B
WØSVC	14	26,980	110	33	62	D

Alaska

KL7CDF	A	208,224	809	53	91	D
KL7CZ/KL7	"	2,805	52	17	16	B
KL7FAK	14	22,002	195	18	39	D

Bermuda

VP9BO	7	7,112	213	9	19	C

Canada

VE1YB	A	2,691	40	19	20	C
VE1DB	"	2,112	37	15	17	—
VE1EK	21	5,256	71	12	24	B
VE2WA	A	25,758	106	45	61	—
VE2BK	A	11,005	55	26	45	B
VE3ES	A	36,400	138	50	80	B
WØAIH/VE3	"	9,348	61	37	39	C
VE3DDU	"	868	18	13	15	—
VE3JZ	14	25,830	226	22	41	C
VE3ATZ	"	920	31	10	10	B
VE6VO	A	1,628	43	10	12	—
VE7SB	14	16,900	107	24	41	D
VE8NH	14	30,674	404	17	32	D
VE8DX	"	7,975	201	16	13	C
VO2NA	A	26,180	262	30	47	C

Canal Zone

KZ5LC	A	36,359	186	43	60	C
KZ5TD	28	10,959	211	15	24	B

Costa Rica

TI2CAH	A	178,080	1036	57	83	B

Greenland

KG1AQ	A	75,870	631	33	57	C
OX3NK	A	5,518	157	14	17	—

Puerto Rico

KP4AOO	A	66,864	454	45	67	B
KP4ARR	"	28,768	712	26	36	C
KP4KD	21	51,100	139	57	89	B
KP4YT	14	9,610	55	22	40	C

Trinidad

VP4LA	A	27,073	291	16	15	A
VP4WI	14	43,947	263	19	38	A

St. Pierre-Miquelon

FP8AP	A	1,651	125	7	6	—

AFRICA

Algeria

FA9UO	A	195,168	433	45	107	B
FA8RJ	21	95,661	400	25	56	A

Belgium Congo

OQ5IG	28	69,363	356	20	43	B

Canary Islands

EA8CG	A	50,720	214	31	49	B

Cape Verde Islands

CR4AX	14	20,720	198	14	21	B

French Equatorial Africa

FQ8AF	A	125,178	460	37	56	A
FQ8HA	28	56,700	319	17	43	B

Guinea, Rep. of

7GIA	A	716,220	1390	56	117	—

Kerguelen Islands

FB8XX	14	2,424	35	13	11	—

Libya

5A3TR	A	125,710	332	37	93	B

Liberia

EL4A	A	148,830	605	32	50	—

Morocco

CN8JX	A	1,156,232	1277	94	214	B
CN8DJ	"	124,740	380	38	72	B

Mozambique

CR7IZ	A	84,672	298	39	59	B

Rhodesia, No.

VQ2W	14	59,904	322	23	41	A
VQ2JG	"	684	26	7	12	A

Rhodesia, So.

ZE8JG	A	143,070	512	40	55	B
ZE3JJ	28	18,847	145	13	34	A
ZE8JJ	21	88,995	361	28	57	A
ZE8JO	14	9,847	94	17	26	A

South Africa

ZS6IW	A	265,544	596	56	96	B
ZS2HI	"	210,860	554	53	77	—
ZS2U	"	7,980	74	16	22	—
ZS1O	"	5,830	90	9	13	B
ZS6MP	21	51,030	252	26	44	A
ZS6AJQ	14	51,328	273	25	39	B

Spanish Guinea

EAØAB	14	960	32	6	4	C

Sudan

ST2AR	A	253,356	510	56	116	B

Swaziland

ZS7M	A	29,840	217	20	20	A

Tanganyika

VQ3CF	14	64,477	364	24	37	B

ASIA

Aden

VS9AZ	14	43,428	114	21	45	B

Burma

XZ2TH	A	137,100	364	61	89	B

Georgia—USSR

UF6FB	A	62,790	224	35	70	B

Hong Kong

VS6BJ	A	14,330	79	32	46	B

India

VU2RM	A	139,568	302	69	107	A
VU2BK	"	66,550	219	36	74	A
VU2MD	"	10,728	66	29	43	A
VU2CK	14	17,490	151	20	33	B

Israel

4X4KK	A	664,644	791	89	202	C
4X4DH	21	102,330	393	26	64	B

Japan

JA1VX	A	383,732	661	76	118	D
JA7AD	"	91,800	327	42	58	B
JA8AA	"	40,176	187	40	41	C
JA1EC	"	36,652	145	46	52	B
JA5AF	"	19,458	82	41	53	A
JA2JW	"	15,246	76	38	39	B
JA6PA	"	13,394	70	33	41	B
JA1BTH	"	12,096	103	20	22	A
JA1AS	"	9,222	71	24	29	B
JA1LN	"	7,850	62	25	25	A
JA5HD	"	5,120	51	19	21	B
JA1BF	"	4,784	45	22	24	A
JAØAQ	"	2,808	27	18	21	B
JA1ACA	"	2,635	31	16	15	A
JA7XF	"	2,538	42	13	14	A
JA9IV	"	208	8	7	6	A
JA2XW	28	44,286	236	26	40	B
JA1BK	28	26,208	153	26	37	B
JA1BWA	"	17,710	120	24	31	A
JA1BLV	"	11,610	95	22	23	B
JA3EK	"	10,902	91	21	25	B
JA1BLZ	"	7,585	70	21	20	A
JA1AKH	"	5,330	50	20	21	A
JA9BE	"	4,950	64	15	15	B
JA1BEZ	"	4,625	65	12	13	B
JA3RQ	"	3,720	36	18	22	B
JA1BLC	"	3,564	46	12	15	B
JA1BKV	"	3,450	56	13	10	A
JA1BUN	"	2,604	45	11	10	A
JA3AIQ	"	1,053	21	14	13	A
JA1AAT	"	126	7	4	2	B
JA1AIU	"	105	5	3	4	A
JA1EL	"	75	6	3	2	A
JA3IS	21	126,168	519	31	53	C
JA3GM	"	61,566	343	26	36	B
JA3UI	"	46,080	228	27	45	B
JA3AA	"	34,282	204	26	35	B
JA3JM	"	29,618	180	23	36	A
JA5FQ	"	24,360	174	24	32	B
JA1BNK	14	47,964	226	31	53	C
JA2DN	14	45,975	221	29	46	C
JA3FT	"	28,320	190	24	36	B
JA1CJN	"	19,300	140	19	31	A
JAØAC	"	18,709	131	22	31	B
JA8GR	"	11,655	109	18	27	A
JA1AB	"	3,772	38	19	27	B
JA3ZP	"	1,900	35	11	14	A
JA2WB	"	1,092	21	10	11	A
JA2GX	"	910	16	12	14	A
JA9KJ	"	880	19	9	11	A
JA2DO	"	418	7	5	17	A
JA7KY	"	340	10	8	9	A
JA8LN	7	4,536	53	16	20	A
JA1CVV	"	1,260	28	9	11	A
JA1BTG	"	910	65	8	6	A
JA8CH	"	871	25	6	7	A
JA1LR	"	690	14	11	12	A
JA1LZ	"	560	40	7	7	A
JA8FC	"	408	13	7	10	A
JA1CXW	"	72	18	2	2	A
JA6AKV	"	36	3	3	3	A
JA1YL	3.5	90	10	3	2	B

Lebanon

OD5LX	A	194,996	411	51	113	B

Macau

CR9AH	14	27,945	208	22	23	D

Malaya

VS1EA	A	13,244	94	34	43	A

Oman, Sultanate of

VS9OM	21	97,188	380	27	64	B

Ryukyu Island

KR6JM	A	53,156	178	56	81	C

Taiwan

BV1USB	A	64,064	266	48	64	B

USSR—Asiatic

UA9DM	14	13,965	111	15	34	A
UA9DN	7	10,608	80	11	41	A
UA9DA	3.5	5,976	61	9	27	A

EUROPE

Aland Is.

OHØNC	A	119,125	413	50	125	B

Austria

OE1RZ	A	265,256	432	92	192	C
OE3WB	21	2,923	53	13	24	A

Azores

CT2AI	A	52,539	277	26	57	—

Belgium

ON4LX	A	79,050	240	56	94	B
ON4AC	"	41,154	114	7	13	B

Bulgaria

LZ2AW	A	9,300	95	17	45	A
LZ1WD	28	24,118	235	19	43	B
LZ1AG	14	32,144	243	20	62	A
LZ1UA	"	7,406	92	15	31	A
LZ2KLR	"	4,284	126	14	45	A
LZ1KDA	"	1,426	60	5	18	—
LZ1KDG	7	3,706	108	8	26	A
LZ2EK	"	2,970	52	8	22	A
LZ1DA	"	583	33	5	14	B
LZ1KCP	"	340	18	5	12	A
LZ2KHM	"	84	12	2	5	A

Channel Islands

GC2FZC	A	16,298	140	19	39	B
GC3HFE	"	7,395	98	15	36	A

Czechoslovakia

OK1XQ	A	337,334	537	77	225	B
OK1MG	A	263,266	539	80	198	C
OK2NN	A	151,044	545	35	60	A
OK3OM	"	83,916	400	41	107	A
OK2QR	"	67,210	406	38	105	A
OK1WR	"	32,881	169	37	94	A
OK1OH	"	23,496	241	20	68	A
OK3KIC	"	18,761	230	19	54	A
OK1VE	"	16,692	184	20	58	B
OK1KSO	"	16,576	148	20	54	A
OK1RX	"	9,849	216	13	36	B
OK1AEH	"	7,009	80	15	28	B
OK2UD	"	6,720	105	13	51	B
OK1KDC	"	6,000	74	18	42	A
OK1SV	"	5,922	44	22	25	C
OK2KGE	"	5,760	93	10	38	A
OK2KJ	"	5,670	115	13	32	B
OK1KKU	"	4,410	101	8	34	A
OK1KIY	"	2,769	71	8	31	A
OK2OV	"	2,278	29	16	18	A
OK1LY	"	2,277	45	12	21	—
OK1UQ	"	1,085	33	8	23	B
OK3UH	"	550	23	7	15	A
OK1TL	28	1,040	20	9	17	A
OK3EA	21	60,480	320	28	62	C
OK1BMW	"	23,700	144	26	49	A
OK3KGI	"	3,024	56	7	17	A
OK2KS	"	1,919	49	7	12	A
OK3MM	14	143,130	561	36	94	C
OK3DG	14	59,040	421	24	56	C
OK1ZL	14	53,770	332	25	70	C
OK3KFE	"	35,200	263	27	61	A
OK3UI	"	30,668	307	18	50	A
OK1JX	"	27,115	186	25	60	C
OK2KFP	"	26,026	230	24	53	A
OK3KGW	"	16,245	189	17	40	A
OK1LM	"	12,213	97	20	49	B
OK1FV	"	11,336	141	15	37	A
OK1FT	"	10,036	124	14	38	A
OK1AHN	"	7,828	133	11	27	A
OK1BI	"	7,506	66	18	36	B
OK1FZ	"	6,279	93	13	26	A
OK1WD	"	5,100	58	13	38	A
OK1PC	"	2,156	61	8	20	C
OK2UX	"	2,146	58	15	22	A
OK3EK	7	18,525	268	11	46	B
OK1KPA	"	13,442	246	9	38	B
OK1AMS	"	5,863	105	7	34	B
OK2KGZ	"	1,081	46	5	18	A
OK3KSI	"	420	26	6	9	A
OK1KOB	"	312	26	3	9	A
OK1AWJ	3.5	16,023	309	10	39	B
OK1NR	3.5	8,920	149	7	35	B
OK3IR	"	4,995	131	5	32	A
OK2KFK	"	4,768	155	5	27	A
OK1GS	"	3,800	200	4	25	A
OK3KJH	"	3,420	124	5	25	A
OK1ABP	"	2,580	100	5	25	A
OK1EG	"	2,001	84	4	19	A
OK2YU	"	1,700	83	4	21	B
OK1DC	"	1,600	69	4	21	A
OK1AVD	"	1,296	57	5	19	A
OK1NW	"	1,197	71	3	16	A
OK1KFB	"	840	39	5	16	A
OK1ACF	"	667	27	5	18	A
OK2LN	"	425	27	4	13	A
OK2KU	"	195	11	4	9	A
OK1VG	1.8	72	12	3	5	A

Denmark

OZ4RT	A	34,181	183	37	96	B
OZ7BW	"	8,580	104	19	46	B
OZ3SN	"	7,020	92	13	23	B
OZ7AX	"	1,518	31	13	20	A
OZ2NU	"	1,500	40	11	19	A
OZ7BG	21	9,381	77	18	35	—
OZ2NU	7	12,850	253	10	40	B

England

G3FPQ	A	507,552	662	96	215	B
G2DC	"	299,574	506	77	190	B
G4CP	"	260,010	563	76	194	B
G2AJB	"	43,210	212	41	104	B
G3NFT	"	41,280	221	27	59	A
G3LCH	"	32,806	182	27	67	A
G3ISX	"	14,160	102	26	54	B
G3MWZ	"	1,950	41	10	29	A
G3EUE	28	1,533	35	7	14	A
G3WP	"	1,242	25	8	19	B
G3EYN	21	38,702	217	24	50	B
G3KYF	"	744	17	10	14	B
G3FTQ	14	10,608	127	15	37	B
G3BIK	"	9,450	91	14	36	B
G8DI	7	8,756	201	8	36	B
G5MP	3.5	6,840	148	8	30	B

Finland

OH2LA	A	89,200	277	53	147	C
OH8PX	A	81,340	314	43	95	C
OH2YV	"	62,350	186	54	161	C
OH5RZ	"	54,252	324	34	98	C
OH2KQ	"	48,127	200	45	104	C
OH7NW	"	32,436	176	34	72	A
OH9AA	"	14,105	95	29	62	—
OH2FS	"	11,154	119	18	60	A
OH6RC	"	10,208	84	25	63	A
OH2RU	"	1,748	43	12	26	A
OH5NB	"	855	45	6	13	—
OH2RD	"	494	17	11	15	A
OH2DN	"	48	6	3	5	A
OH3NY	28	11,058	101	16	41	B
OH5OU	"	2,952	64	9	27	A
OH3TE	21	32,227	216	23	44	A
OH3TY	"	18,104	156	25	48	B
OH8QA	"	8,442	85	21	42	A
OH7NL	"	5,292	113	10	26	—
OH3TH	14	66,054	365	30	71	B
OH3RS	"	19,040	129	18	52	B
OH5NJ	"	15,691	121	22	49	A
OH3RU	"	10,105	156	13	34	A
OH3NJ	"	8,874	95	14	37	B
OH8OS	"	3,712	103	9	23	B
OH4OQ	"	3,074	88	11	18	A
OH1SN	"	2,905	43	13	22	B
OH7NF	7	17,640	249	15	41	B
OH3TQ	"	6,837	154	8	35	C
OH2HK	3.5	2,555	68	5	30	B
OH1NE	"	608	31	4	15	A

France

F3AT	A	85,805	301	47	84	—
F8TM	"	47,957	223	36	83	B
F9BB	"	43,569	186	29	74	B
F9WK	"	32,712	184	32	62	A
F8JD	"	26,058	124	35	51	—
F2SQ	"	13,488	127	18	30	A
F9OQ	"	11,220	117	17	17	A
F8MI	"	5,406	79	13	21	A
F8VO	21	3,432	41	13	20	—
F2XX	14	4,865	121	8	27	A

Germany

DL7AA	A	250,020	381	94	176	B
DJ3KR	A	185,976	425	74	172	C
DL7DF	A	171,684	325	79	172	C
DJ4DN	A	114,660	299	60	122	C
DL9KRP	A	84,774	249	51	91	B
DJ2HC	"	78,486	204	67	145	C
DL3JJ	"	78,150	206	58	92	—
DL7BQ	"	62,424	248	42	94	—
DL3BK	"	45,018	144	51	72	B
DJ2XP	"	36,180	192	38	97	A
DL1IA	"	33,800	126	51	79	B
DJ4FZ	"	30,480	171	40	87	B
DL1LZ	"	27,224	151	27	55	B
DL9JJ	"	25,300	164	33	82	C
DL3DD	"	24,089	120	27	82	B
DL4ME	"	22,440	133	26	76	B
DJ2IV	"	20,790	116	36	69	A
DJ4EJ	"	18,988	114	32	62	B
DJ2JI	"	17,424	138	19	47	B
DL7CF	"	13,246	120	19	55	B
DJ3BB	"	12,792	83	32	72	B
DJ2SL	"	11,904	91	34	59	B
DJ2IR	"	11,592	79	27	42	B
DL1ES	"	10,168	88	24	58	B
DJ4VO	"	8,662	120	21	40	A
DM2AEC	"	8,532	93	21	33	—
DL9KP	"	7,748	61	25	27	B
DJ2AV	"	7,128	75	18	48	B
DJ1UE	"	6,708	71	22	56	B
DL7AU	"	5,859	55	25	38	—
DL3DQ	"	3,886	64	16	42	A
DM2ACG	"	1,664	36	12	20	—
DM2ATL	"	150	8	7	8	—
DM3WCN	"	112	9	3	5	—
DL6EN	28	23,289	132	25	41	B
DJ4XQ	"	6,348	60	17	29	B
DL6DF	"	5,084	55	16	25	B
DLIVR	21	111,706	430	32	69	C
DL7BA	"	92,456	320	32	72	C
DL7CW	"	66,108	293	27	57	C
DJ2UT	"	22,617	158	19	44	B
DJ2KS	"	16,008	104	24	45	B
DL1LL	"	3,060	33	17	19	B
DJ2BW	14	106,488	353	33	83	C
DJ2PJ	"	25,612	240	23	53	B
DJ2IB	"	25,326	157	13	41	C
DJ4SO	"	8,840	115	14	38	B
DL1XS	"	8,476	101	12	40	—
DJ3HD	"	5,040	69	13	29	B
DJ4KU	"	3,234	41	15	27	B
DJ3OE	"	2,790	72	8	23	C
DL1JW	7	3,108	52	9	28	B
DJ5IO	"	640	34	4	16	A
DJ3WEA	3.5	5,354	143	6	31	C
DLIFF	1.8	1,235	95	3	10	A

Greece

SVØWI	A	84,224	494	29	83	C

Hungary

HAØHN	A	19,032	292	21	57	B
HA5BT	"	7,752	109	16	35	A
HA1SP	"	7,006	115	16	46	A
HA5FO	"	1,769	42	9	19	A
HA8WW	"	1,204	43	7	21	A
HA5BI	28	6,256	79	16	30	A
HA5BF	14	1,856	40	9	20	A
HA9KOV	3.5	2,392	92	4	22	A

Iceland

TF3AB	A	82,390	361	30	77	B

Italy

IIDFB	A	16,568	150	20	56	B
IIREK	28	11,058	103	15	42	B
IIOJ	21	48,174	351	22	52	B
IIZCN	"	12,397	146	10	27	B
IIABB	14	1,458	48	7	20	—
IICHJ	7	792	27	7	17	A

Jan Mayen

LA3SG/P	14	26,703	299	13	21	A

North Ireland

GI3IVJ	A	66,375	273	43	134	B

Norway

LA6U	A	52,029	194	35	106	—
LA2OG	"	9,940	95	21	50	B
LA9KF	"	4,472	84	13	30	A
LA7X	"	1,653	29	13	16	—
LA7LC	14	8,624	109	16	28	B
LA4RG	"	1,674	42	11	20	A
LA6CF	7	2,415	57	8	27	A

Netherlands

PAØRE	A	337,410	509	91	235	D
PAØTAU	"	320,229	550	82	191	—
PAØLOU	"	201,708	408	73	161	B
PAØPN	"	42,036	189	37	76	B
PAØYN	"	31,314	154	33	69	B
PAØWTJ	"	25,960	161	31	87	B
PAØUZ	"	11,928	78	31	53	A
PAØSNG	28	6,956	75	17	30	A
PAØNW	"	1,072	37	10	16	B
PAØHOR	21	26,268	150	24	42	A
PAØNIR	14	4,884	86	13	31	—
PAØWAC	"	440	20	12	10	—
PAØAMC	"	198	11	5	4	A
PAØNIC	7	8,280	154	10	35	B
PAØVB	3.5	10,028	197	8	38	B
PAØLV	"	6,372	180	6	30	B
PAØTA	"	4,144	114	5	32	B

Poland

SP8MJ	A	25,200	187	26	74	B
SP3KBJ	"	17,499	240	16	41	—
SP6DB	"	14,706	153	23	63	B
SP9DT	"	11,977	99	21	38	B
SP8ZY	"	2,622	66	12	26	—
SP4MU	"	875	40	8	17	A
SP7QO	"	110	11	4	7	A
SP2DX	28	17,009	106	24	49	C
SP6LB	"	5,002	53	14	27	B
SP2GS	"	3,696	50	16	26	B
SP6XA	"	3,036	45	13	32	A
SP7AZ	21	16,058	135	19	43	B
SP6WM	"	11,554	103	18	35	A
SP8HR	"	6,380	125	15	29	A
SP9KJ	"	690	14	10	13	—
SP1JV	14	52,250	270	30	80	—
SP4JF	"	37,206	305	22	56	B
SP8AG	"	34,875	292	19	56	B
SP6BZ	"	14,734	235	11	42	B
SP6OQ	"	510	19	5	12	B
SP1AAY	14	360	20	4	11	A
SP8HU	7	20,313	280	13	48	—
SP5ZA	"	9,120	240	6	32	B
SP5HS	"	9,100	147	12	40	C
SP6PT	"	4,836	121	8	31	A
SP3HD	"	5,655	139	6	33	C
SP1ADM	"	4,587	131	8	25	—
SP2PI	"	3,276	88	6	30	—
SP2OY	"	800	41	4	16	—
SP8ZR	"	798	42	4	15	B
SP6UK	3.5	1,000	50	4	16	A
SP2IU	"	406	29	3	11	—

Portugal

CT1DJ	A	30,012	202	26	56	C

Roumania

YO3IA	14	6,440	114	13	33	A
YO3AC	7	11,076	183	12	40	A

Scotland

GM3EOJ	A	122,061	292	59	124	B

Sicily

IT1TAI	A	311,898	680	70	159	B
IT1AGA	7	13,502	194	11	32	B

Spain

EA4GA	A	108,072	466	39	119	C
EA3CY	"	13,760	128	16	24	C
EA1CS	"	196	12	4	10	A
EA3IH	28	25,014	195	19	47	A
EA3GF	14	20,748	208	14	28	B
EA5FU	"	14,985	111	15	30	A

Sweden

SM5CCE	A	178,940	504	65	165	C
SM5AJR	"	35,796	206	36	78	B
SM4AEQ	"	22,528	132	32	56	C
SM7EH	"	20,274	163	28	81	B
SM6VY	"	9,546	71	26	48	A
SM7CNA	"	7,220	67	26	50	—
SM7BWZ	"	6,039	69	20	41	B
SM2CSA	"	2,352	39	14	28	—
SM3AKM	28	10,695	75	22	47	B
SM7ID	"	8,874	80	19	39	B
SM3AST	"	289	11	6	11	B
SM5KV	21	31,680	229	25	63	A
SM5AJU	"	23,175	161	22	53	B
SM5BFE	"	18,602	130	22	49	C
SM7TV	"	3,690	63	13	28	B
SM3AD	"	3,168	65	11	25	—
SM7BVO	21	1,200	32	6	10	B
SM7AFK	"	616	18	8	19	B
SM2BQE	14	26,100	162	23	37	B
SM5ATK	14	17,355	153	22	43	C
SM5AHJ	"	15,336	129	20	51	B
SM5BFJ	"	14,160	161	19	41	—
SM5AHL	"	14,049	167	19	44	C
SM7TQ	"	11,895	129	16	45	C
SM7AFA	"	5,376	54	17	39	—
SM7AIL	"	3,294	110	6	21	—
SM5BRS	"	3,010	71	9	26	B
SM5BAS	"	2,176	64	10	24	B
SM6CJI	"	1,776	50	9	15	C
SM6AUZ	"	924	41	6	15	A
SM7AAQ	"	510	35	3	12	—
SM3AGD	7	19,980	210	14	46	C
SM3VE	"	15,904	259	11	45	B
SM5CAK	"	9,522	183	8	38	—
SM5BLA	"	7,339	129	9	32	A
SM6BWQ	"	4,180	92	8	30	A
SM3BEI	"	3,900	89	8	31	A
SL6CV	"	2,072	73	5	23	B
SM5BKO	"	1,602	39	8	26	A

Switzerland

HB9KO	28	5,772	45	18	34	B
HB9DX	21	38,480	241	24	50	A
HB9EQ	7	11,000	183	9	41	A
HB9QA	3.5	5,202	145	6	28	A

Wales

GW3JI	A	175,406	519	53	134	B
GW2DUR	14	12,864	210	10	22	B

Yugoslavia

YU3OV	A	81,389	280	51	100	A
YU1YE	"	40,330	291	26	83	—
YU1AG	14	42,075	315	24	61	B
YU2UE	7	20,532	271	12	47	B

U.S.S.R.

European

UA4HP	A	47,520	210	38	94	C
UA6KAA	"	27,820	146	32	75	C
UA3KND	"	12,118	122	22	51	C
UA3YI	14	26,600	248	22	54	—
UA3GI	"	1,118	33	9	17	—
UA3XN	7	16,740	269	12	42	B
UA3YF	"	135	7	3	6	C

Ukraine

UB5WF	A	574,488	908	90	226	C
UB5FJ	A	374,540	817	81	226	—
UB5EF	"	65,688	319	39	122	C
UB5GQ	"	1,947	63	7	26	—

Moldavia

UO5AA	A	127,176	517	45	123	B
UO5KAN	"	10,293	145	20	53	—

Latvia

UQ2AS	A	109,440	456	44	148	C

Estonia

UR2AO	A	178,488	554	54	147	B
UR2BU	28	5,719	82	14	29	B
UR2AT	14	12,036	182	15	36	B
UR2DX	7	7,254	170	9	30	B

SOUTH AMERICA

Argentina

LU5DDF	A	123,216	422	46	56	B
LU5AQ	"	113,827	416	40	61	C
LU4DMG	28	882	21	8	6	—

Bolivia

CP3CD	14	1,936	47	9	7	B

Brazil

PY1ADA	A	224,346	548	54	85	C
PY2AJK	A	208,845	533	51	84	C
PY2BYR	"	63,341	416	35	62	—
PY3QX	"	13,072	117	21	17	—
PY4BR	"	1,540	19	14	14	—
PY2BJO	28	420	28	3	2	B
PY4OD	14	182,040	559	32	79	B
PY4AO	"	56,523	237	27	56	C
PY7AEW	"	5,508	111	8	9	—
PY1DH	"	2,000	33	11	14	—

Chile

CE2AT	A	22,880	185	18	26	—
CE3LV	21	9,503	244	7	6	B
CE3AG	14	238,832	676	34	84	D
CE1AD	"	1,464	63	5	3	—

Colombia

HK3TK	A	34,008	220	21	31	—

Paraguay

ZP5JP	21	21,482	159	21	25	—

Peru

OA4FA	A	100,928	412	36	47	C
OA4FM	"	62,832	318	31	37	C
OA4HK	21	4,332	78	9	10	C

Uruguay

CX2BT	28	15,015	241	12	9	A

Venezuela

YV5AK	14	24,150	162	17	33	B

OCEANIA

Australia

VK2GW	A	223,027	521	62	89	B
VK2PV	"	79,254	239	46	73	B
VK3YD	7	22,372	167	21	26	B
VK3XB	"	2,505	62	8	7	B
VK4XW	7	2,507	46	9	8	A
VK6SM	A	57,564	174	49	68	B
VK7SM	"	21,609	130	31	32	A

Fiji Islands

VR2DK	14	24,610	202	20	26	B

Hawaiian Is.

KH6CJJ	AB	135,720	465	47	57	C
KH6DJP	"	4,200	50	16	12	—
KH6DGL	"	3,630	115	7	8	D
KH6DLF	21	156,658	720	31	43	D
KH6DMP	14	41,360	308	21	26	B
KH6COV	"	33,369	237	23	26	B
KH6BXU	"	21,450	120	28	47	—
KH6DMO	"	15,580	137	20	21	B

Mariana Is.

W5EZB/KG6	A	52,200	239	32	40	B

Marshall Is.

KX6CO	A	170,205	534	45	60	D

Neth. New Guinea

JZØDA	A	14,518	108	29	32	—

New Zealand

ZL1AJU	A	249,550	501	72	103	—
ZL1NG	A	209,188	584	53	71	B
ZL1MQ	"	132,192	445	51	51	B
ZL2AWJ	"	109,230	345	49	61	—
ZL1AFW	"	49,282	213	38	44	B
ZL1AMM	"	33,768	168	29	38	—
ZL4LB	"	32,224	213	25	28	B
ZL3IS	"	8,448	128	11	11	—

Papua Territory

VK9XK	A	140,624	384	57	79	B

Philippine Is.

DU7SV	A	33,744	323	17	20	—

Wake Is.

K6QPK/KW6	A	11,844	97	23	24	B

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

United States

W1BIH	A	527,945	573	104	227	D
(W1BIH—W1JYH)						
W2HTI	A	248,024	311	104	197	D
(W2HTI & K2GMO)						
K2SUX	A	123,210	236	66	119	D
(K2SUX & W2HZY)						
W3FYS	A	232,416	299	98	190	D
(W3FYS—W6HOH/3)						
W3DAO	14	17,834	98	26	48	C
(W3DAO—W3BYX)						
W4KFC	A	454,212	489	115	226	C
(W4KFC—K4CAX—K4OKZ)						
W5AZB	14	46,440	161	33	75	D
(W5AZB—W5OSW—K5KWC)						
K6EYR	A	54,991	175	55	72	D
(K6EYR—K6KDE—K6HMO—K6QIP)						
K6DDO	21	21,672	113	27	45	D
(K6DDO—K6CEO)						
W7TML	A	104,208	248	69	98	—
(W7TML—W7WJB)						

Canada

VE3UOT A 102,289 339 72 115 D
(VE2NI—VE3BOH)

VE4JB 14 5,508 77 15 21 C
(VE4JB—VE4MF)

EUROPE

Bulgaria

LZ1KBA A 279,276 747 61 161 D
(LZ1BZ—LZ1AH—LZ1AF—DOBY)

LZ2KBA A 32,274 224 27 72 A
(2 OPRS.—Club Station)

LZ1KRB A 27,864 229 20 66 A
(3 OPRS.—Club Station)

LZ2KKZ A 27,648 223 24 72 A
(LZ2KKZ—RATCEV)

LZ1KBL A 23,970 220 20 65 A
(IVAN—TODOR)

LZ1KGZ A 15,330 179 16 57 A
(PETER—GROZ—KOSTA)

LZ1KSZ 14 141,372 548 33 93 B
(ONYK—VLAD—SLAV)

LZ1KPZ 14 55,447 375 25 64 A
(VASIL—SPAR—ANGEL)

LZ2KAD 14 10,035 165 14 31 A
(KOLEY—DIMITROJ—NENOV)

LZ1KFB 14 7,875 126 16 29 A
(4 OPRS.—Club Station)

Czechoslovakia

OK3KAB A 99,072 297 56 116 A
(OK3CAX—OK3-6168)

OK1KKJ A 96,268 400 43 121 B
(OK1MP—OK1MS—OK1KB)

OK1KKH A 85,383 282 52 127 B
(2 OPRS.—Club Station)

OK1KHK A 17,385 171 27 61 A
(2 OPRS.—Club Station)

OK1KVV 14 76,612 386 32 75 C
(OK1FO—OK1DE—OK1—197)

OK2KBR 14 71,003 385 29 72 A
(FRANTA—DUSAN—FRANTA)

OK1KTI 14 40,940 275 26 63 —
(OK1GT—OK1EV)

OK1KKR 3.5 16,464 309 9 40 B
(2 OPRS.—Club Station)

Denmark

OZ7EX A 31,047 153 40 91 B
(OZ7EX—OZ7OF)

England

G2BQC A 274,670 568 71 171 B
(G2BQC—VK5NO)

G3FUR 14 107,226 392 35 91 B
(G3FUR—G3KHZ)

Finland

OH5AC A 169,506 473 60 159 B
(OH5QN—OH5RO—OH5SK)

OH6AA A 21,489 187 25 62 A
(OH6QP—OH6TJ—OH6PJ—OH6PW)

Germany

DM3BL A 300,900 970 66 170 —
(DM3VBL—DM3WBL—DM3XBL—DM3UBL—DM3BL)

DL9RF A 77,616 273 55 99 B
(DL9RP—DL9GH—DJ3YU—DJ4RZ)

Hungary

HA1KSA A 151,506 539 45 126 B
(4 OPRS.—Club Station)

HA5KFR A 105,353 769 42 95 B
(3 OPRS.—Club Station)

HA8KCU A 24,656 203 31 61 A
(2 OPRS.—Club Station)

HA5KBP 7 30,857 433 12 47 C
(3 OPRS.—Club Station)

HA7KPF 3.5 540 39 4 11 A
(2 OPRS.—Club Station)

Netherlands

PI1MID A 56,287 221 38 81 —
(4 OPRS.—School)

Norway

LA5UF A 135,771 526 48 119 B
LA7EF—LA6GF—LA5OG—LA5UF)

Poland

SP5PRG A 225,225 587 70 155 C
(SP5BR—SP5ZZ)

SP8KAF 21 13,303 147 15 38 B
(SP8CP—Bartnik)

SP2KAC 14 30,590 296 21 49 C
(SP2087—SP8HV)

SP3KAU 14 21,978 210 18 56 B
(3 OPRS.—Club Station)

SP8KAR 7 1,416 60 6 18 B
(SP8-6001—SP8029)

Sweden

SM6VR A 147,072 466 57 135 C
(SM6VR—SM6APH—SM6BSK—SM6VQ)

Yugoslavia

YU3ABC A 39,256 276 25 69 A
(YU3WF—YU3NP—YU3KI)

U.S.S.R.

UA4KHA A 101,088 266 63 145 C
(LEO—VASIL)

UA4KHR A 87,042 333 46 117 C
(YURI—RUDI—ALEX)

UA3KWA A 21,420 201 26 58 B
(EUGEN—NICK)

Estonia

UR2KAE A 34,230 247 29 76 C
(3 OPRS.—Club Station)

UR2KAT A 8,379 142 11 46 —
(JURI—ENDEL—ULO)

MULTI-OPERATOR MULTI-TRANSMITTER

NORTH AMERICA

W1WAI A 494,914 583 185 217 D
(W1WAI—W1WAJ—W1DDF—W1HXW)

W2BXA A 482,966 552 100 219 D
(W2DEC—W2BXA)

W3AOH A 1,031,360 825 138 302 D
(W3AOH—W3LMM—W3MVQ—W3WGH—K3DKD)

W3WV A 205,552 326 86 146 D
(W3WV—W3PZW—W3MCG)

W4NPT A 223,780 317 90 178 D
(Club Station)

K5KOR A 10,615 81 25 30 C
(W5KOR—K5HWK—K5SEK)

W6RW A 538,935 635 111 194 D
(K6UYC—W6YMD—W6KFV—K6OXU—K6EWL—W6RW)

K6EVR A 154,775 297 83 122 D
(K6EVR—K6KII—W6UED)

VE2WW A 155,411 323 88 145 C
(VE2UQ—VE2WW)

AFRICA

ET2US A 341,735 587 66 139 D
(K1LQN—W4FGZ—W3FYL—WA2HYC)

EUROPE

OK1KLV A 173,470 641 56 153 B
(Club Staiton)

DJ3JZ A 1,091,832 1353 111 291 C
(DL1CR—DL3AO—DL6HW—DL9CI—DL6UR—DJ1BP—DJ1BZ—DJ3JZ)

OH1AA A 505,630 745 78 217 C
(Club Station)

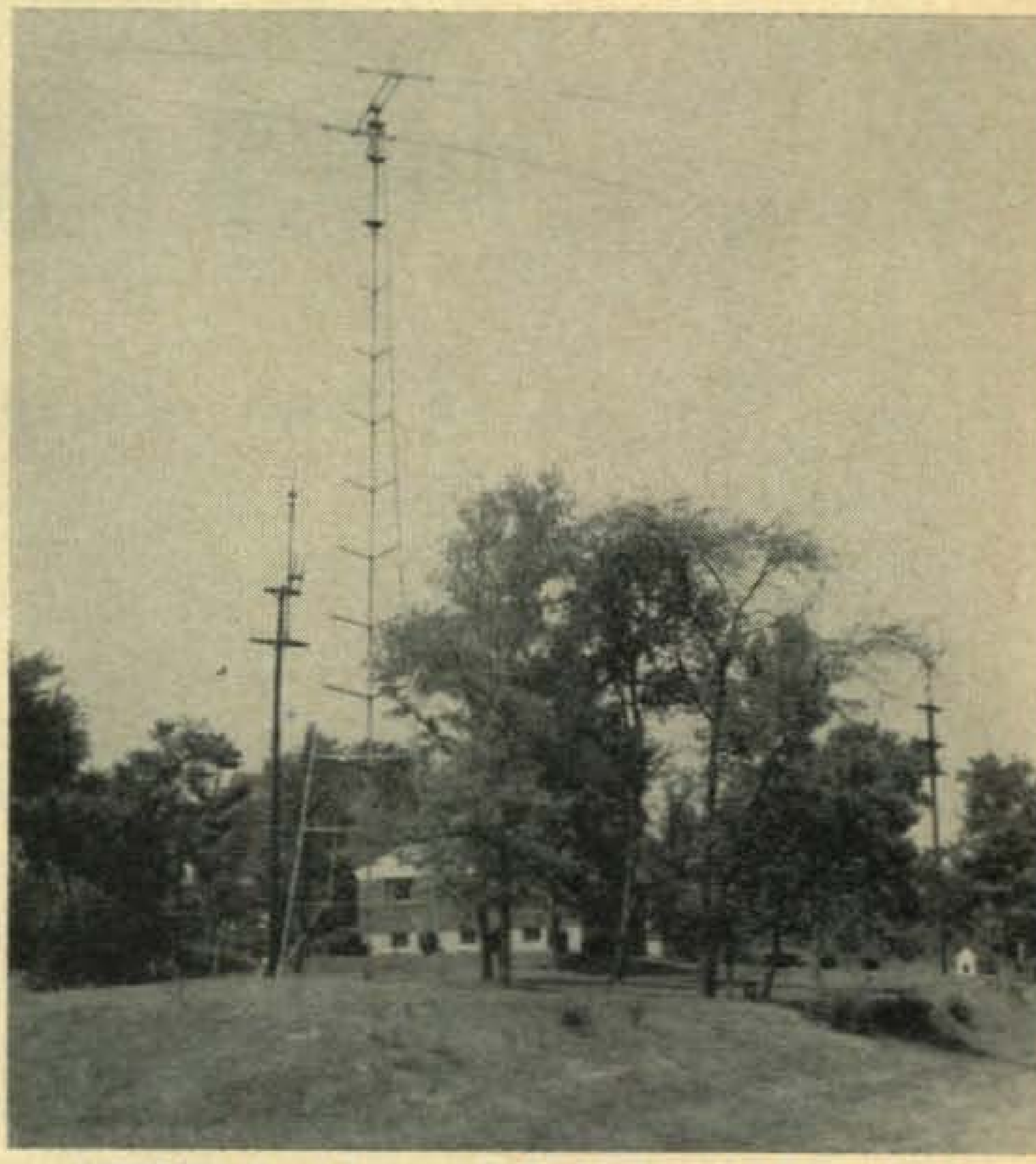
LA40 A 246,638 569 66 157 B
(Club Station)

UB5KBB A 938,245 1463 106 279 C
(Club Station)

Thanks to the following stations for sending us their logs for checking purposes.

W2ZKQ	KR6ZT	PAØVG
W3VTH	KW6CQ	SM5BRS
G2BP	OK1MP	SM5UU
TI2DN	OK1YZ	VE5GY
K4VNY	OY7ML	YV5FK
WØBPO/M3	PAØLY	ZE8JJ
F8DF	PAØMVS	

[*Continued on page 125*]



W8FGX's 7 mc rotary, full sized and 87 feet high. Does this explain Jake's potent signal on 40?

Rene Schmalz, OA4FM. Always a welcome signal in a contest.

Luis Desmaras, CE3AG, winner of the W7KVU Trophy for the highest score on a single band (14 mc).

"IFNL"

An SSB IF Noise Limiter

Wilfred M. Scherer, W2AEF

A really effective SSB noise Limiter is a rarity. The IFNL is a simple and inexpensive device which does an exceptionally fine job of impulse-noise suppression and provides good SSB signal inteligibility under adverse noise conditions. The unit shown here was constructed for installation in the 75A4, but it may be used with other receivers as well.

Ignition impulse-noise interference certainly can ruin the reception of a signal, especially if it is a weak one. Many types of noise limiters have been devised to cope with this situation, and most of them, particularly the popular TNS, do an excellent job in connection with AM reception, but when the reception of SSB or CW signals is involved, the conventional noise limiters are relatively unsatisfactory. Some receivers are equipped with so-called CW or SSB noise limiters, but from what has been seen so far, none of these is very satisfactory, with the possible exception of the *Collins* Noise Blanker, which carries a terrific price tag ($120)!

A very simple and extremely effective SSB IF noise limiter (IFNL) has been used by the writer for several years in a mobile SSB installation. This was modified for inclusion in a piece of gear recently described in *CQ*[1]. Since then, inquiries have been received regarding the installation of the IFNL, itself, directly in the 75A4, so a model was hastily constructed for this purpose. Cost?—$2.50!

The circuit of the IFNL is shown in fig. 1. Its operation was discussed in the previous article, but it is repeated here for those who may have missed the original description.

Two diode sections of the 6AL5 are connected in a full-wave arrangement in shunt with the *if* amplifier output circuit (at secondary of *T3*), and thus it functions at the *if* frequency, making it an *if* type of noise limiter. The diodes are selfbiased by the rectified potential developed across R1. The time constant, resulting from the combination of R1 and coupling capacitors C1 and C2, is such that the bias varies almost at a syllabic rate with an SSB signal. This minimizes diode conduction, tends to prevent any limiting action, and so allows the signal to pass on practically unhindered. But when a short steep-fronted noise-pulse is received, the self-bias at this instant cannot rise rapidly enough to prevent conduction, and the amplitude of the noise pulse is then limited by the action of the diodes.

The diode action of the IFNL is more like that of a variable load resistor functioning as a compressor across the circuit rather than as a shunt clipper. As such it does not develop the same distortion as is experienced with the conventional audio type noise limiters wherein the signal-peaks, as well as the noise-peaks, are clipped off thereby producing square waves which result in high audio distortion. Because of the self bias which is developed when an SSB signal is received, little limiting of the signal is found with the IFNL, except at the first impulse of a syllable, usually at the start of a word, or in the case of a CW signal it will occur at the start of each keyed character. Nevertheless, a small amount of distortion may be noticed, because the compression action of the IFNL is somewhat non-linear. In addition to this a hang-over effect, due to the time delay of the R/C circuits, can produce a characteristic which sounds like slight distortion. The extent of these effects depends on the values selected for R1, C1 and C2. Regardless of this, the distortion for a given amount of noise silencing is less than that experienced with conventional CW and SSB noise limiters, and the readability of weak signals under adverse impulse-noise conditions excells that possible with present CW or SSB noise limiting devices.

The IFNL can be effective only when it is

[1] "20 KC Filter Adapter and SSB IF Noise Limiter for the 75A4," *CQ*, April, 1960.

connected across a relatively high impedance circuit which works either out of, or into another high impedance circuit. It is also necessary that a fairly high *rf* potential be available at the source (2 or more volts). Installation of the IFNL across the secondary of the last *if* transformer (T3), as indicated in fig. 1, is the only suitable point in the 75A4 which satisfactorily meets these requirements.

The inherent loading presented by the IFNL (this is mostly dependant on the value of R1) is such that a small loss in level may occur when it is in use, so when the noise limiter is taken out of operation by means of SW1, an equivalent load resistance, R2 is switched in its place to equalize the signal level at either position of the on-off switch.

Construction

The SSB *if* noise limiter is built in a small Bud Minibox, 1⅝" x 2⅛" x 2¾". The location of holes and dimensions are given in fig. 2. A pictorial wiring diagram is also shown at fig. 3. No special wiring precautions are necessary, except do *not* ground the shield of the output cable which is used to make the *rf* connections to the 75A4. The output cable and two separate heater leads (ground and hot 6.3 *vac*) should be brought out through hole F.

Installation and Operation

After the unit has been completed it may be fastened to the right side of the 75A4 by means of self tapping screws (inserted in holes A and B). These are passed through the ventilation slots of the cabinet after a large washer is placed on each screw to prevent its slipping through the slot. See fig. 4. The location of the components is such that the on-off switch will automatically fall in line with one of the slots and protrude through it. The leads from the IFNL should pass through a 5/16" diameter hole which must be drilled in the 75A4 chassis between T3 and V11. Connect the heater leads to the nearest ground and 6.3 *vac* point. Connect the shield of the coax output lead to terminal C of T3 or to the diode test terminal. Be sure the shield lead does not touch any grounded point. Connect the inner conductor of the coax lead to terminal A of T3.

Set up the 75A4 for SSB reception without any antennas being connected to it. Place the IFNL on-off switch at off. Set the 75A4 Limiter at off, and adjust the *rf* and *af* gain controls until background noise can be heard. Tune the secondary slug of T3 (at bottom of chassis) counter clockwise for maximum background noise. Then check the IFNL switch by placing it at on, at which time the background level should drop.

Now, connect the antenna, place the IFNL switch at off and tune in an *ssb* signal. Then place the IFNL switch at on, and note the audio signal level which should drop only slightly from that found with the noise limiter out. Do not use receiver background noise for

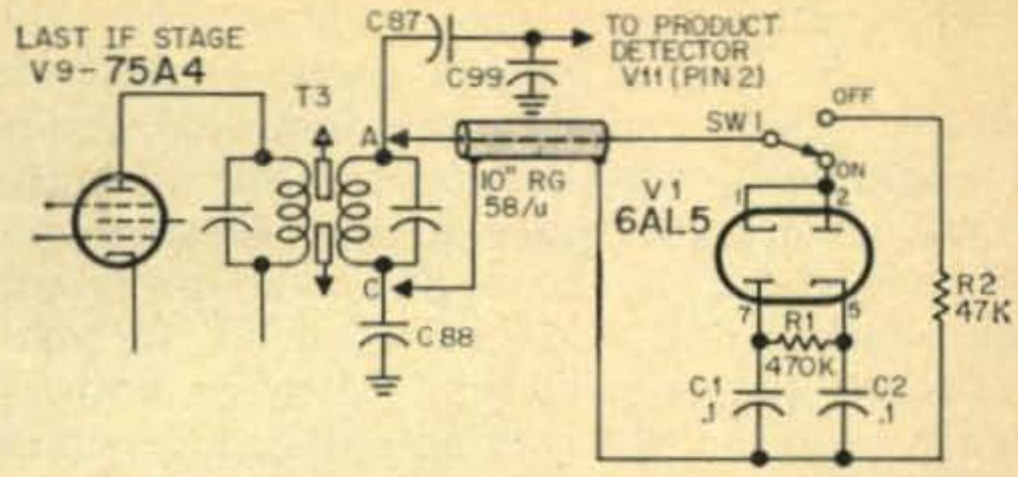


Fig. 1—Circuit of the SSB IF Noise Limiter. The IFNL connects permanently across points A and C of T3. While designed for the 75A4 it may be used with other receivers.

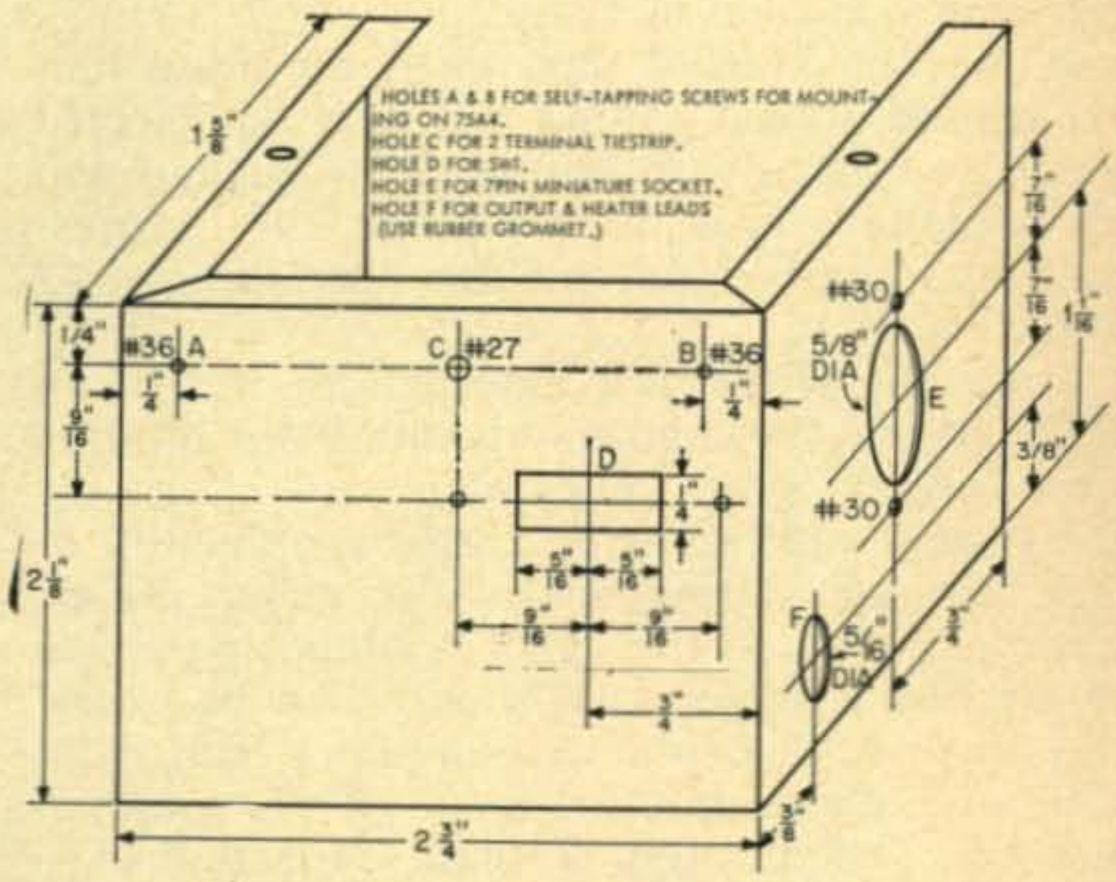


Fig. 2—Location and dimensions of holes for the construction of the IFNL.

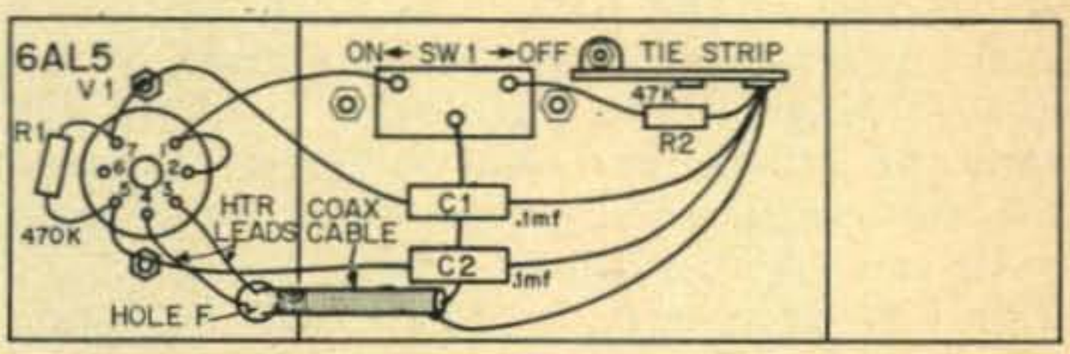


Fig. 3—A pictorial wiring diagram of the IFNL. The wiring it not particularly critical.

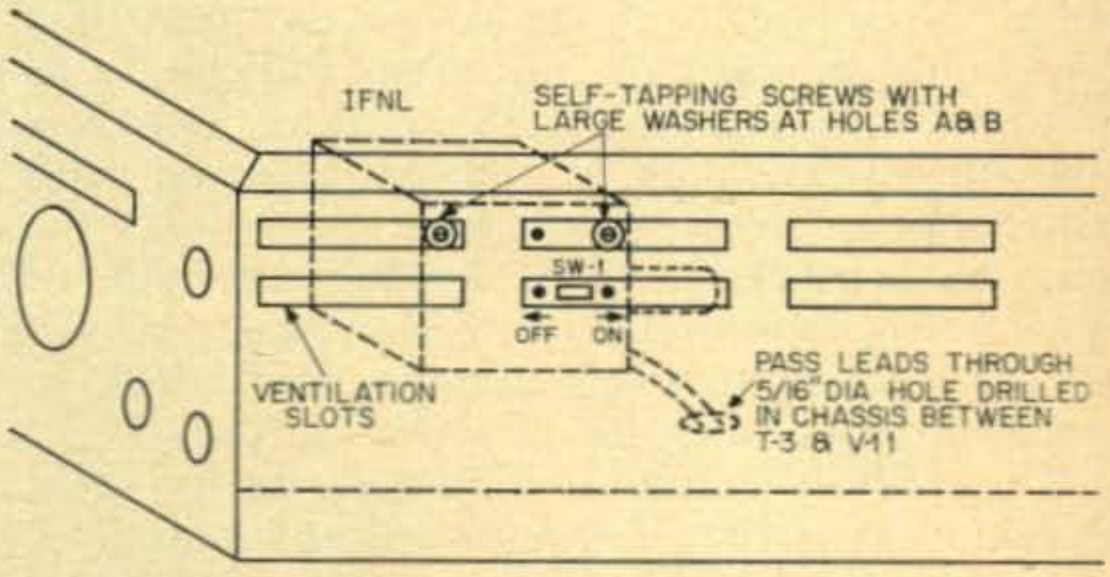


Fig. 4—How to mount the IFNL in the 75A4. Large washers are used to prevent the screw heads from dropping through the ventilation slots.

checking relative levels because the IFNL inherently drops the noise level anyway. The values of R1 and R2 have been selected for generally good impulse-noise limiting action and audio level equalization for use with the 75A4, but in some cases it may be desirable to change these. If the audio level drops too much when the IFNL is switched on, R2 may be reduced for equalization. If more limiting action is required, R1 may be reduced, at which time R2 will also have to be reduced to maintain equalization of level. In cases where extremely high noise impulses are likely to be encountered, the installation of a .1 or .22 mfd capacitor across *R1* will further enhance limiting action, although the hang-over effect, mentioned earlier may be more noticeable due to the time constant increase.

It may be noticed that when the noise limiter is used, a background hiss may be detected which was not heard before. This background effect actually *was* there before, but its presence was masked out by the prevailing noise conditions.

Since the IFNL is connected in the *if* amplifier, it may be used to advantage for limiting noise pulses which may otherwise effect the *avc* system sufficiently to cause a reduction of receiver gain during a train of noise pulses. The *avc* system in the 75A4 is connected ahead of the last *if* stage, so it would then be necessary to disconnect the *avc* amplifier feed from L27, and connect it to pin 2 of the product detector V11 through a small capacitor of a value which would normalize the *rf* gain through the *avc* amplifier. This was not done in the author's case, since existing noise conditions did not require it.

The 75A4 is notorious for its hard *avc* attack and popping at the start of a word, but since the IFNL tends to limit the amplitude of the initial impulse at the start of a word, it will soften the attack, and will virtually eliminate these unpleasant effects even when the *rf* gain is wide open with full *avc* action.

For CW reception the INFL will be found very effective for impulse-noise suppression and for the reduction of key-clicks. As mentioned previously, CW signals also will be softened at the start of each keyed character due to the instantaneous impulse-noise limiting action of the IFNL. It may also be noticed that the noise pulses tend to "ride in" on the *dash* of a CW signal as the bias builds up sufficiently to minimize limiting during this period. This is a characteristic similar to that experienced with conventional AM noise limiters where the limiting action decreases as the strength of the carrier increases; however, if the CW signal is strong enough to accentuate this effect, its readability will not be hindered anyway.

The IFNL is not as effective during AM reception as is the 75A4 noise limiter, nor is it as good as other types for this mode, so its use is not recommended in conjunction with AM reception.

Use With Other Receivers

The SSB *if* noise limiter, described herein, has been constructed specifically for installation in the 75A4 receiver. However, it may be effectively used with other receivers, and at any other *if* frequency if the circuit impedance and operating potential requirements are met as specified earlier. In addition, another requisite is that no *bfo* potential appears across the circuit to which the IFNL is connected. Such a potential will be rectified by the diodes, and thus will create a fixed-bias which will render the IFNL useless (this is also the reason why many conventional limiters are not effective for CW and SSB use). Detrimental *bfo* potential usually will not be encountered if a good product detector is used, and if the *bfo* circuits are well isolated to prevent stray leakage. The IFNL will be ineffective when the *bfo* potential is injected at the *if* transformer, as is usually done when a conventional diode detector is employed.

In most cases the best installation point will be at the output transformer of the last *if* stage, as long as the *bfo* potential is not present. If a "signal slicer" is being used with the receiver, the IFNL should be effective when it is installed across the primary or secondary of the receiver's *if* transformer to which the slicer is connected. If the secondary is chosen, it may be necessary to insert a 10 mmf capacitor between the transformer terminal and the connection which feeds the slicer. In any case, the best point of installation in a particular receiver may be subject to some experimentation.

Coupling capacitors C1 and C2 may be reduced in size as the *if* frequency is raised, as long as their reactance is about 200 ohms or less. If this is done, the time constant will have to be restored by the addition of the required size capacitor across R1. In general, the values of R1, C1 and C2 will be satisfactory for use with other receivers, but R2 probably will have to be altered to equalize the level at the separate on-off settings of the switch, as described aforehand.

Unfortunately, the IFNL cannot be successfully used with the KWM-1, because the latter has too much stray *bfo* leakage which appears at the points where the IFNL would have to be connected in the *if* system ahead of the product detector. It has been effectively used on an old SX-24 using a product detector, and on several home-built receivers using *if* frequencies of 50 and 20 *kc*. It has also been extremely effective in a mobile SSB installation which employs a broadcast ARC-5 receiver (*if* frequency, 265 *kc*) as the variable *if* system behind a crystal controlled converter. Although the circuit arrangement is slightly different in this case, it is equivalent to changing C1 and C2 to .01 mf and adding 1 mf across R1.

[*Continued on page 119*]

The Good Ship Hope
W8OLJ/Maritime Mobile

Project HOPE is the designation of a dramatic and heartwarming international good will mission which you have probably heard something about . . . and will hear much more about in the months ahead. The SS HOPE, a former U. S. Navy hospital ship, will sail from San Francisco in August bound for the South Pacific Area. On board will be physicians, dentists, nurses and equipment comprising a floating medical school. Also on board will be W8OLJ maritime mobile operating a 1 *kw* amateur radio station donated by the *Hallicrafters Company* to this charitable private enterprise. W8OLJ will operate SSB primarily and over a period of about six months is expected to provide some new countries and thousands of contacts with radio amateurs throughout the world.

Project HOPE is the mission of the People-to-People Health Foundation, Washington, D.C. It has been approved by President Eisenhower as part of his People-to-People Program, the concept of establishing international peace and understanding on a person-to-person basis. Project HOPE will share this country's health knowledge with less fortunate nations on a private, non-government basis. The idea came from Dr. William B. Walsh, co-chairman of President Eisenhower's People-to-People Medical Committee. Dr. Walsh is now serving as President of the People-to-People Health Foundation and is directing the snowballing efforts of private individuals, business and industry rising to the support of Project HOPE.

The SS HOPE is being made available to the Foundation from the U. S. Navy's moth ball fleet, but the complete staffing and operational costs which run $3,500,000 per year must be raised by the Project's supporters. The idea of this non-government, non-giveaway, training-for-self-help project is bringing forth an outpouring of support from people and organizations throughout the United States.

At the suggestion of Ralph C. Charbeneau, W8OLJ, amateur radio is being given an opportunity to make its unique contribution toward Project HOPE and the waging of peace. The thousands of radio contacts from W8OLJ maritime mobile will alert individuals throughout the world to the SS HOPE's unselfish, private mission and will reflect credit upon amateur radio as it exhibits once again its humanitarian role in providing important communications on a noncommercial, people-to-people basis. You may recognize W8OLJ from his around-the-world aeronautical mobile activities with the USAF on "Operation World-Wide" last summer. Just as "Operation World-Wide" provided amateur radio with an important public relations assist, so too, will Project HOPE afford further evidence that amateur radio operations serve the public interest and contribute toward international understanding and friendships.

The SS HOPE has received invitations from the medical professions of Indonesia, Korea, Vietnam, Okinawa, Pakistan and other countries. W8OLJ/mm will operate regularly on the high seas and also from those countries which grant special operating permission to Project HOPE. A special QSL card will be available picturing the SS HOPE in action and commemorating this humanitarian effort by private American citizens. QSL's should be mailed to Project HOPE, P.O. Box 9808, Washington 15, D. C. United States radio amateurs who desire to add their financial support to the worthy efforts of Project HOPE may, if they wish, include it with their QSL. All such contributions have been ruled tax deductible by the Internal Revenue Department. QSL's will be acknowledged whether or not they are accompanied by support for Project HOPE. ■

Ralph C. Charbeneau, W8OLJ (left) and Dr. William B. Walsh, President of the People-to-People Health Foundation, (right) examine some of the new Hallicrafters equipment donated by the Hallicrafters Company to the Foundation for use on the S.S. HOPE in its humanitarian mission to the South Pacific.

Matching The Panadapter To Double Conversion Receivers

Allie C. Peed, Jr., K2DHA
34 Ashley Drive
Rochester 20, N. Y.

Double conversion receivers which do not have an Intermediate Frequency of 455 kc cannot be used with Panadapters having a 455 kc input. The author has designed a simple converter to permit panoramic reception with many double conversion receivers.

I'm addicted to panoramic reception. The first time that I saw a panadapter in operation on an amateur receiver, I knew that this was for me; and I've yet to have a ham visit my shack and see my panadapter that he too doesn't become fired with a desire to acquire one. There is something hypnotically compulsive about the flickering, ever-changing "picture" of not only the signal that you are listening to, but those up and down the band on either side of your frequency.

For many years I had my panadapter (a Hallicrafters SP-44) on a good World War II vintage single-conversion receiver. Since the panadapter was designed to work only with a 455 *kc if* first mixer, I had for many years resisted the temptation to acquire a more modern double-conversion receiver simply because I would have to give up my panadapter.

However, the appeal of new receivers and the need for more selectivity in the increasing congestion of the phone bands, combined with a change to SSB operation (requiring more stability than was readily obtainable with the old receiver and generating a need for switchable SB selection) forced the acquisition of a new receiver.

But, there must be a streak of mule in my make-up someplace. An objective look at the problem revealed that what I needed was a "black-box" which would take in signals at 1650 *kc* (the first *if* of the new receiver) and convert them to 455 *kc* for feeding into the input of the trusty old panadapter. In addition, the "box" had to have a fairly broad-band characteristic with a fair conversion efficiency for at least 50 *kc* either side of the center frequency.

Considered from this fundamental viewpoint, it began to look somewhat less formidable. In fact, in view of the frequencies involved, it looked like a standard broadcast converter stage ought to fill the bill. After all, 1650 *kc* is at the upper end of the BC band, and 455 *kc* is the *if* of most BC receivers.

A circuit was drawn up for a conventional single-tube converter. The 6BE6 is popular in this type of circuit, and since one was available it was chosen. Then suitable circuit components were selected with an assist from a parts house catalog. It was decided to include a small power supply although the small drain could be taken care of easily from most receiver's auxiliary power sockets. My receiver was already being used to power a TR Switch and the additional load of the converter seemed undesirable.

Construction

The circuit together with its power supply was constructed in a 4 x 5 x 3-inch Minibox. Reference to the photograph shows it to be a full, but not particularly tight packed in construction.

The oscillator tuned circuit presented no problem, a standard BC oscillator coil (*Miller 5481C*) was chosen. BC oscillator coils are designed to tune on the high side of the received signal with a variable capacitor of effectively around 200 mmfd maximum capacity. So, since I was interested only in tuning the top end of the BC band, a 100 mmfd APC type screwdriver-set variable condenser was used and it tunes the oscillator to 2105 *kc* (1650 plus 455 kc) very nicely at about ⅓ mesh of the plates.

The 455 *kc* output tuned circuit was nicely taken care of by a standard 455 *kc if* transformer (*Miller 112C1*). Here the output was available from either the plate side of the transformer or from the secondary. It was assumed that the plate side connection would offer better broadband characteristics than if the signal were taken from the secondary, but a trial both ways revealed no appreciable difference. So, the output was taken from the secondary to eliminate the need for a coupling capacitor.

The 1650 *kc* input circuit of the converter was more of a problem and it is not certain that the best approach to this problem was found, but it represents the best of several methods tried. The problem is that the converter must not load or detune the mixer stage of the master receiver. Just the additional capacity of the shielded cable between the receiver and

Just to the left of the Hallicrafters SP-44 Panadapter is the single tube if converter. L1 is mounted just above the input cable.

the converter will tend to detune the receiver mixer plate circuit. Hence, the converter-box input should be capable of tuning out the reactance of the cable, or else it will be necessary to realign the mixer plate circuit in the receiver with the cable in position. In practice, it was found that the peak of the receiver mixer plate circuit was sufficiently broad in response that it was not noticeably detuned by a short length (about two feet) of RG-59U coax. So, the slug-tuned coil and compression type variable capacitor were arranged as a simple parallel resonant circuit tuned to 1650 *kc*. A small disc ceramic capacitor was used for blocking the mixer plate voltage from the converter.

Alignment

After the unit was constructed and checked-out (smoke tested), it was roughly prealigned. The oscillator was tuned to approximately 2105 *kc* using a grid dip meter. The input was tuned to 1650 *kc* in the same fashion. The 455 *kc if* transformer was then aligned and the system checked by putting in a 1650 *kc* signal at the input from a signal generator and tuning for maximum 455 *kc* signal from the output terminal of the converter box.

Then came the full scale test with the converter box connected between the receiver and the panadapter. It worked, although the frequencies were off by a country mile due to the rough nature of the prealignment. But a bit of tuning of the APC condenser of the oscillator circuit in the converter brought the right signals into view. Then it was a simple matter to maximize all of the other tuning condensers while watching the signals on the panadapter screen. One word of caution here, it is necessary to center the output of the converter in the passband of the particular panadapter. (It may not be aligned exactly on 455 *kc*.) If the signals tend to taper off in amplitude or one side of the screen and not on the other, it is a good sign that you are off center.

Along this same line it must be reported that the full 200 *kc* sweep originally available on the panadapter is no longer fully useable. The interposition of another conversion stage and several tuned circuits has narrowed the effective bandwidth to about 100 *kc*. But the full sweep was never used anyway. In fact, even 100 *kc* is more sweep than is used in normal operations. The sweep width control is usually adjusted for around 40 *kc*; 20 *kc* either side of the received signal. This converter provides that and considerably more.

Results

It must be said in the interest of objective reporting that the panoramic presentation on 10 and 15 meters is marginal. At full gain the signal deflections are only about ¼ to ½-inch in height. Useable, but not ideal. It is my guess

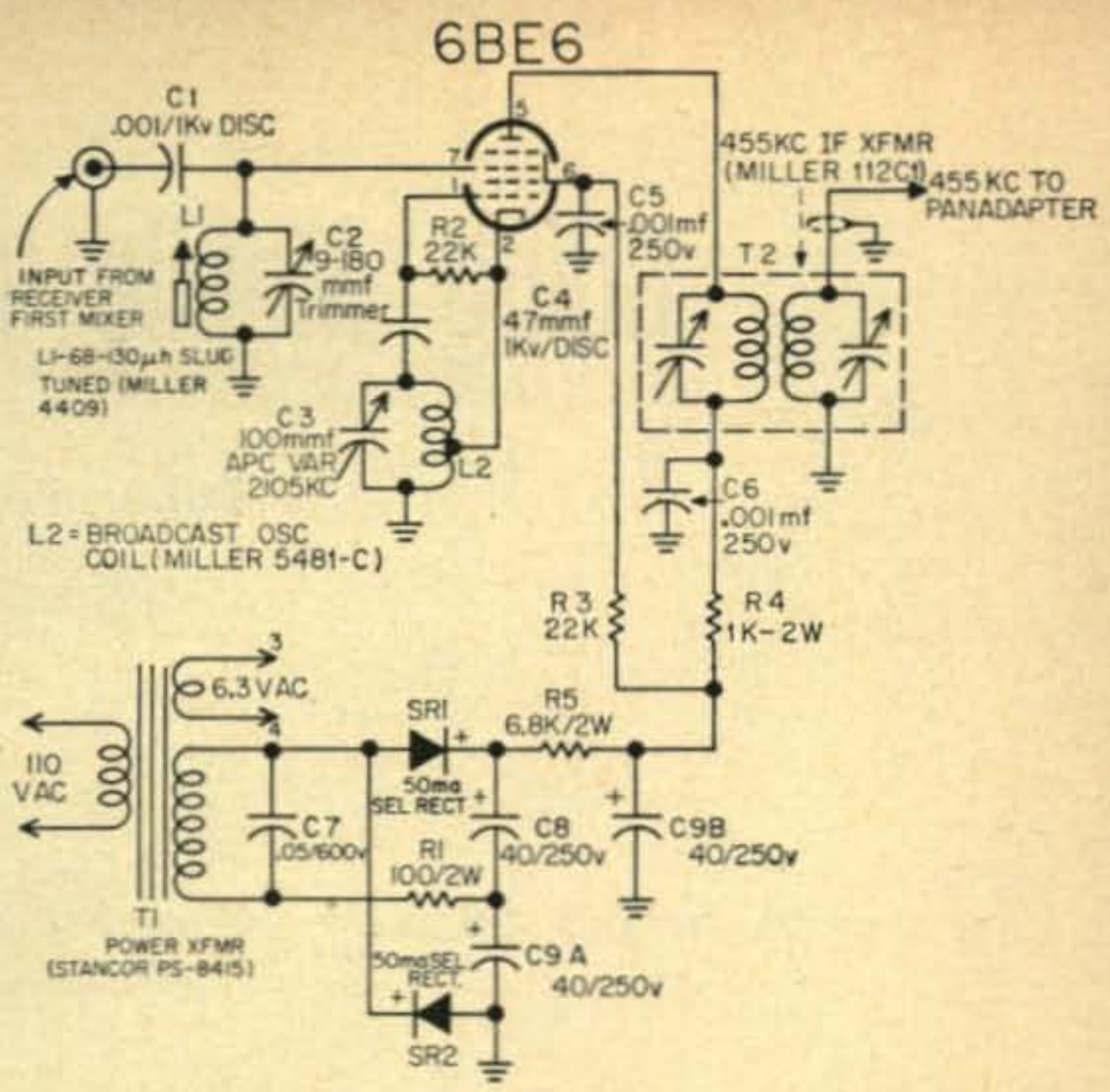


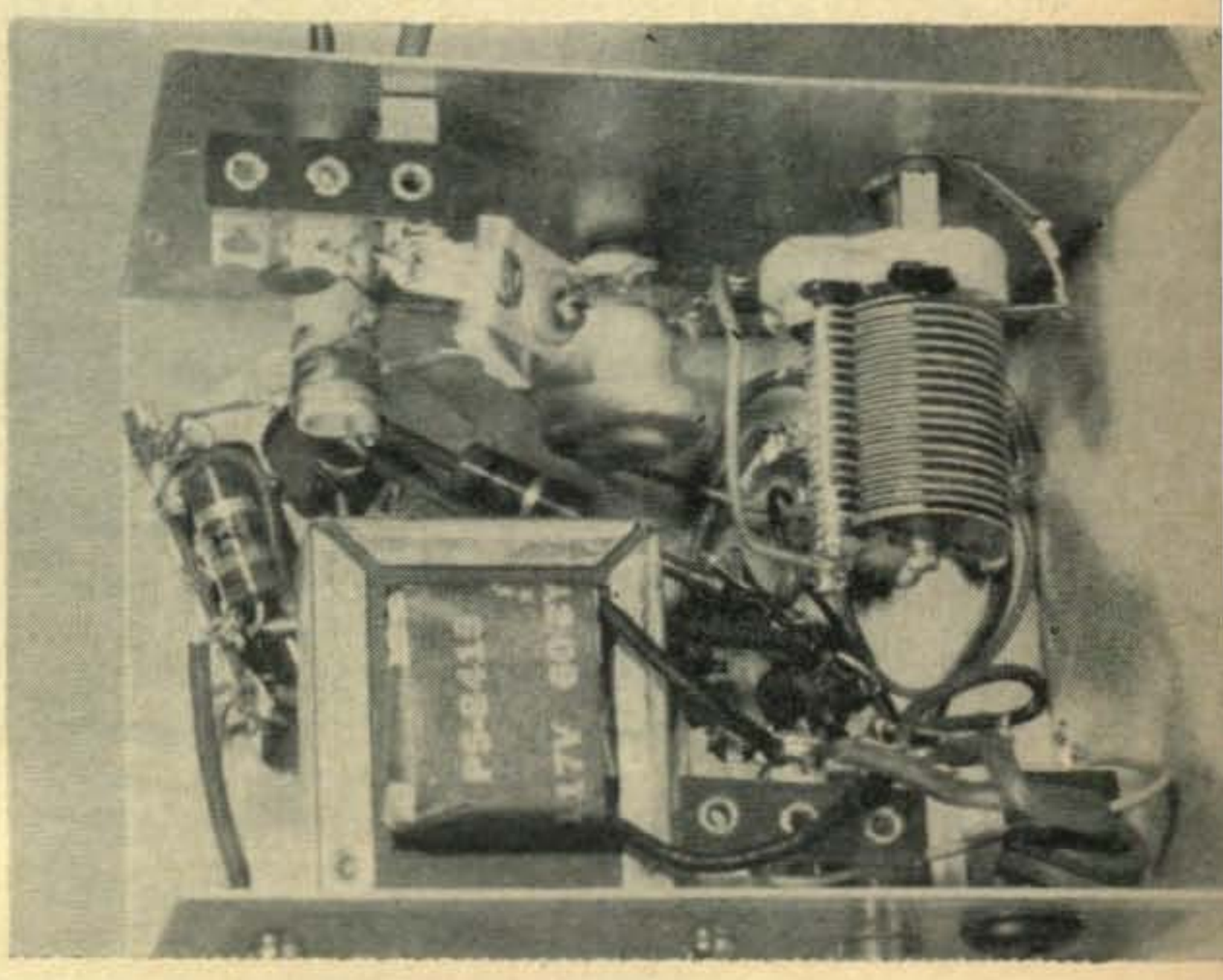
Fig. 1—Circuit diagram of a one tube if converter. The author uses L1, C2 constants for 1650 kc which is the first if of the Hallicrafters SX 101.

that this is because of the lower order of gain at the first converter stage of a double conversion receiver as compared to the gain at the plate of a single conversion set with two stages of *rf* amplification ahead of it.

If the performance on 10 meters is of sufficient importance, the signals can probably be brought up by the addition of one stage of conventional 1650 *kc if* amplification in the converter box. This would mean one more tuned circuit and thus might further restrict the bandwidth of the system, but probably not intolerably.

This same idea could be applied to receivers having other first conversion frequencies. It would be necessary only to change the input (L1, C2) to tune to the *if* output frequency of the receiver mixer, and the oscillator tuned circuit (L2, C3) to tune to the *if* plus 455 *kc*.

If you too have a panadapter unit which has been stored because it wouldn't work with your modern double-conversion receiver, now is the time to think about dusting it off and bringing it back into service. ■



Under chassis view of the 455 kc if converter. Above the power transformer is L1. The oscillator coil L2 is mounted to the left of the air trimmer C3. The output jack is mounted next to the ac input cable.

Going Mobile the Easy Way—

Robert Paige, W5TBC
2306 Maryland Avenue
Dallas 16, Texas

A simple 15 watt 10 meter phone rig that employs surplus 40 meter crystals.

Mobile operation had been considered for W5TBC since the license was issued in 1951, but nothing definite in the way of planning was done until delivery of a new automobile was received in 1956. It was then that the "mobile bug" bit.

In the rush to get "something on the air", a short pause was taken to consider the desired installation. After much literature had been reviewed, the problem was resolved to the construction and installation of the components described in this article. A small low powered transmitter which would take up little space and require a minimum of battery current, a tunable converter to feed into the automobile broadcast receiver and an antenna which could be mounted with as little effort and as much ease in removal for restoring the car for possible trade-in in the future was contemplated.

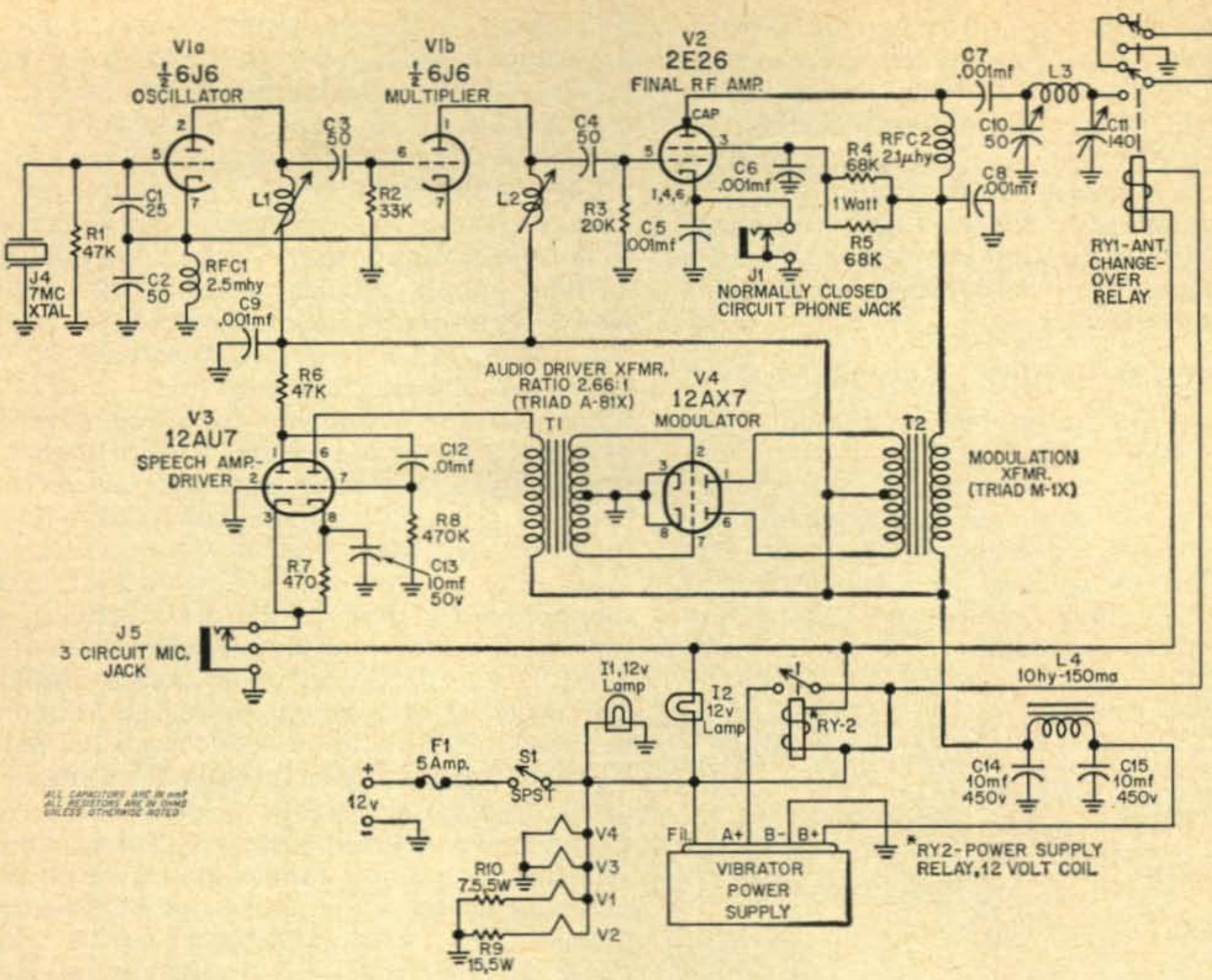
The choice of ten meter operation was decided upon because of local activity on this band, good possibilities for contacts with low power and the simple requirements for the antenna installation.

The Antenna System

The eight-foot whip was installed on a spring type body mount and located on the left rear bumper guard. This location was chosen due to the ease of mounting and restoration of the original appearance in the future. Bumper guards for this particular automobile were available and a spare was purchased for future use. The original bumper guard was removed and holes were drilled on the right side to accommodate the necessary mounting bolts, the assembly was sealed with body sealing compound at the joint of the rubber gasket and the guard and the installation replaced on the bumper. While this may not be the ideal location for best efficiency of operation, very good signal reports have been received. The only serious disadvantage noticed

The transmitter installation. The utility boxes in which the power supply and transmitter are mounted are bolted together and mounted under the instrument panel. The left hand section of this unit contains the transmitter with the power supply and components mounted in the right side. The converter is installed in the glove compartment in the center of the instrument panel below the broadcast receiver controls.

Mounting of the antenna. A standard spring type body mount is mounted on the right side of one of the bumper guards. Holes were drilled in the guard to accommodate the mounting bolts. RG-58/U cable loops through the bumper guard, through the trunk and under the floor mat to the transmitter. An 8-foot whip antenna is used for ten meter operation.



Parts List

C_1—25 mmf disc ceramic or mica capacitor.
C_2, C_3, C_4—50 mmf disc ceramic or mica capacitor.
C_5, C_6, C_7, C_8, C_9—.001 mf (Eirie ceramicon 801-001).
C_{10}—50 mmf variable (National ST-50).
C_{11}—140 mmf variable (National ST-140).
C_{12}—.01 mf capacitor.
C_{13}—10 mf, 50 volts, electrolytic.
C_{14}, C_{15}—10 mf, 450 volts, electrolytic.
I_1, I_2—12 volt pilot lamp assembly.
J_1—Normally closed circuit phone jack.
J_2—Converter antenna lead socket to fit antenna lead (Motorola type).
J_3—Antenna output socket (Amphenol SO-239).
J_4—Crystal socket, ½ inch spacing.
J_5—3 circuit microphone jack.
L_1—Oscillator coil, 28 turns #24 enameled wire wound on National XR-50 form.
L_2—Multiplier coil, 13 turns #18 enameled wire wound on National XR-50 forms.
L_3—Final output tank coil, 8 turns B&W #3010 Miniductor.
L_4—10 henry, 150 milliamperes filter choke.
S_1—Main power switch, SPST toggle switch.
R_1—47,000 ohms, ½ watt carbon.
R_2—33 000 ohms, ½ watt carbon.
R_3—20,000 ohms, ½ watt carbon.
R_4, R_5—68,000 ohms, 1 watt carbon.
R_6—47,000 ohms, ½ watt carbon.
R_7—470 ohms, ½ watt carbon.
R_8—470,000 ohms, ½ watt carbon.
R_9—15 ohms, 5 watts, wire wound.
R_{10}—7.5 ohms, 5 watts, wire wound.
F_1—In line fuse, 5 amperes.
T_1—Audio driver transformer, ratio 2.66:1 (Triad A-81X).
T_2—Modulation transformer (Triad M-1X).
Vibrator Power Supply (Mallory VP-12-325 unit).
Ry_1—Antenna changeover relay, DPDT (Advance AM/2C/12VD).
Ry_2—Power supply relay, SPST 12 volt coil.
RFC_1—2.5 millihenry *rf* choke (National R-50).
RFC_2—2.1 microhenry *rf* choke (Ohmite Z-28).
XTAL—40 meter crystal (FT-243).

Fig. 1—Circuit of the 10 meter phone transmitter. The power supply is constructed around a Mallory vibrator unit as explained in the text.

is the somewhat pronounced effect on directivity of transmission and reception. The car acts as a "beam", with signals received strongest in relation to the direction of travel of the car with a major lobe in the path in which there is the most amount of metal in front of the antenna, in this case off the right front fender. This may actually prove to be an advantage for on-the-road operation since stations in the line of direction described above will be stronger than others. On the newer turnpikes and freeways, where the road directions vary little, steady contacts may be enjoyed while in motion. The antenna installation was completed by drilling a small hole in the floor of the luggage compartment, with the coaxial cable laid on the floor to the transmitter and terminated in coaxial fittings. A heavy duty spring mount was used in this installation for future use with a center-loaded whip arrangement.

The Receiving System

The Gonset "3-30" converter provides reasonably good sensitivity and selectivity when used with the car receiver (the "deluxe" eight-tube receiver manufactured by Philco for the 1956 Plymouth). Units of this type are available in used but good condition for about one half the original cost at the used equipment counter of most large amateur supply dealers. B+ voltage was taken from the car receiver, which uses a vibrator type power supply, with a cable, plug

and socket connections made up for easy removal of either unit. To complete the receiving installation, a Gonset "Clipper" noise limiter was installed on the side of the broadcast receiver and a Morrow "GC-10" generator hash filter, which is tuned for minimum whine or hash, was mounted on the generator to eliminate the possibilities of internal interference. Coaxial cable connects from the converter to a socket on the transmitter chassis.

The Transmitting System

The "heart" of the mobile installation is the 15 watt, crystal controlled transmitter. Forty meter crystals, of the surplus FT-243 type are used due to their low cost and availability to frequencies to give coverage of the entire band. The tube line up consists of a 6J6 oscillator-multiplier, 2E26 final, 12AU7 speech amplifier-driver and 12AX7 modulator. The 6J6 oscillator is a modified Pierce circuit which doubles in the output of the first half of the 6J6 to 14 megacycles and further doubling is provided in the second half to 28 megacycles. L_1 and L_2 are wound on slug tuned National XR-50 coil forms. Straight through operation is possible on the 2E26 final since the oscillator circuit quadruples to ten meter output to the grid of the final, permitting greater efficiency than with circuits which require doubling in the final. A jack in the cathode of the final circuit provides an easy means of plugging a meter in the circuit for tuning purposes. A pi network circuit consisting of C_{10}, L_3 and C_{11} provides a good match for the relatively low impedances of the whip antenna. A miniature antenna changeover relay is used for switching antenna connections from transmitter to receiver. A surplus T-17 carbon microphone is used in the audio circuit with reports of good audio quality. One half of the 12AU7 twin triode serves as speech amplifier. The need for microphone voltage is eliminated by the use of the cathode feed. The other half of V_3 transformer couples through T_1, a miniature driver transformer, to the grids of the 12AX7 twin triode connected as a push-pull modulator. This circuit supplies approximately seven watts of audio to T_2, a miniature modulation transformer. This has proved sufficient for a relatively high percentage of modulation of the 2E26 when loaded to the full 15 watts input power.

The power supply is built around a Mallory VP-12-325 vibrator power unit with additional filtering by the pi-section network of C_{14}, C_{15} and L_4. The vibrator is relay controlled through Ry_2, a single-pole single throw relay, connected in the push-to-talk circuit of the microphone.

Construction

Both the transmitter and power supply are housed in identical cabinets 6x6x6 inches (Bud AU-1039HT). The power supply unit comprises

[*Continued on page 118*]

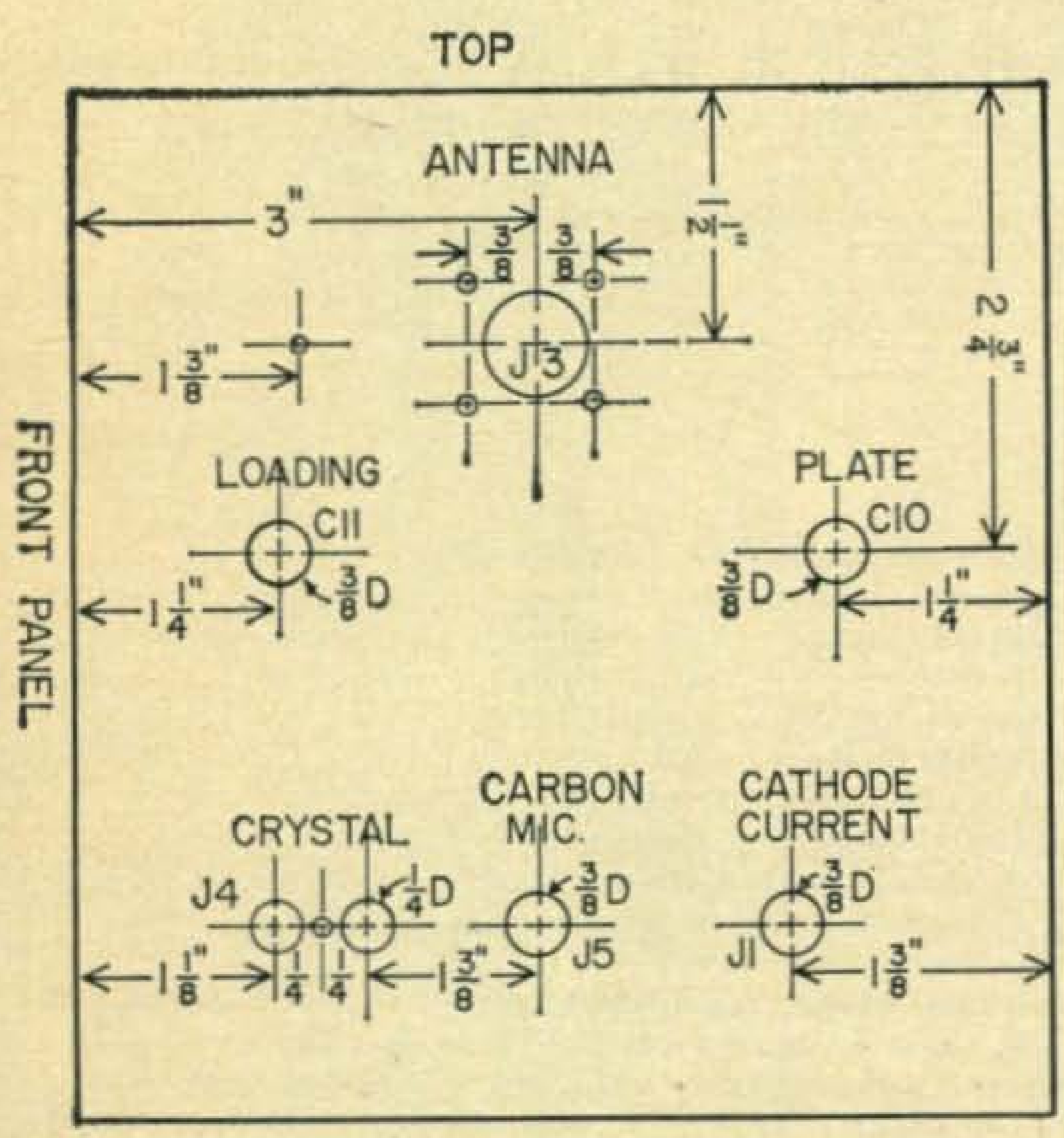


Fig. 2—Front panel layout.

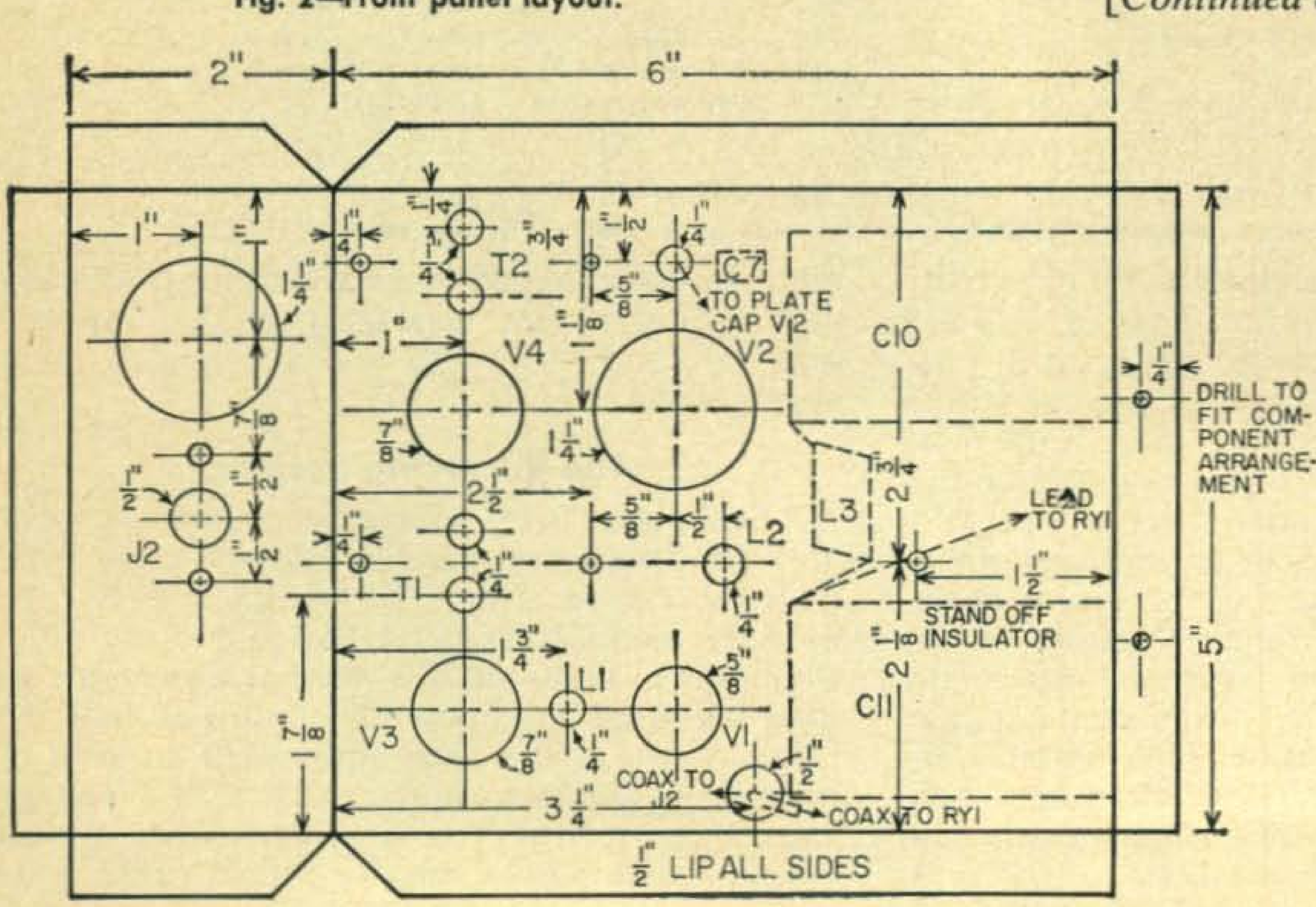


Fig. 3 — Chassis layout. The dotted lines indicate the component location. All holes with no dimension marking are to be drilled to pass a 6/32 screw. The two holes on the right lip are to be positioned to clear all components.

Better VFO Stability

Dr. Bruce Cameron, K9BDO
Bradley University
Peoria, Illinois

One of the classic electronic problems is the stable oscillator, especially for frequencies suitable for use as a transmitter *vfo*. Numerous solutions have been attempted, each with characteristic disadvantages.

The High C Hartley puts the full *dc* current through the coil, with heating which limits the stability. The Clapp uses a large unwieldy coil and output varies with frequency. Moreover, it is critical about minimum feedback. The Franklin is also critical about minimum feedback, and in addition is also critical about maximum feedback. Some of the elaborately compensated circuits require special components and test labs. Remotely tuned set-ups are mechanically awkward.

What is needed is a simple, non-critical circuit which the average experimenter can build out of his junk box, retune for whatever frequency he chooses, and have reasonable stability with no fuss. I think I've got it.

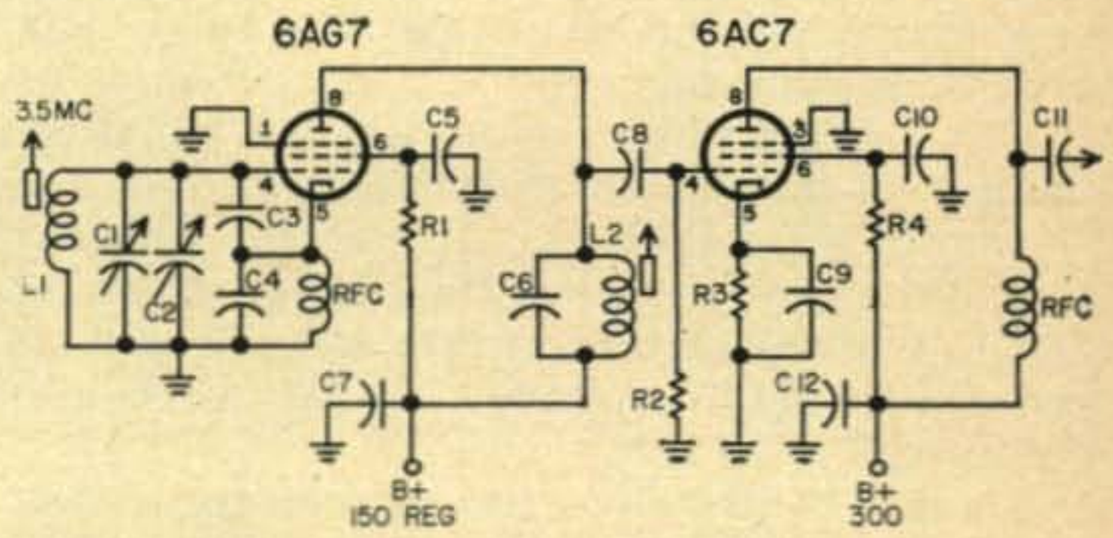
The key to stability in any case is to reduce the interaction of various components, especially that of the tube, and to stabilize the various voltages. A variation I have made in the familiar Colpitts does the job nicely. (See fig. 1.)

Notice that there is *no* grid blocking condenser and *no* grid leak in the oscillator. The grid is practically at ground potential, except for the minute resistance of the coil. Bias for the grid is developed in the voltage drop across the 40 ohms resistance of the 2.5 millihenry choke in the cathode circuit. The oscillator thus operates in Class A, and the bias voltage is almost independent of the feedback in the grid-screen triode oscillator. Feedback is set by the ratio of the two series condensers across the coil (C3, C4) which form a very stable voltage divider independent of frequency. The total capacity across the coil (more than .003) almost swamps out any capacitive changes in the tube. The grid is fed at such a low impedance (approximately 20 ohms for component values shown) that the tank circuit virtually ignores any reactive changes in the tube. The D.C. resistances are so low and so stable that they are virtually unaffected by resistive changes in the tube. Electron coupling to the plate circuit, and tuning the plate circuit to the second harmonic reduces other common sources of interaction. Following the oscillator with an untuned buffer isolates it effectively from load variations in following stages, such as a keyed amplifier. VR tubes regulate the B plus supply. You can blow directly on the coil and only produce a few cycles shift.

What makes it change frequency? The tuning dials, and that is about all. Total drift should not exceed 500 cycles at 7 megacycles with components as shown, and selection of tubes and parts could reduce it further. If desired, temperature compensation could be made in addition, if the device were to be used for laboratory measurements. As a ham *vfo*, it is quite satisfactory "as is" and will mulitply up to the 21 megacycle band with sufficient stability for good sideband operation.

Do follow good *vfo* construction practice techniques and insure mechanical stability—this is still important.

I don't suggest that you sell any stock you have in crystal companies immediately, but there is no longer any reason for a ham to feel that he *must* operate crystal in order to achieve stability. This circuit can provide as much stability as the present state of the art requires. ■



L1 5 Turns #24 enamelled ½" dia. spaced to ½". Ceramic slug tuned form mounted above chassis one inch from other metal objects.
L2 16 turns #24 enamelled ½" dia. closewound. Ceramic slug tuned form.
C1 100 mmf variable for vernier tuning, with a good dial drive.
C2 365 mmf variable for coarse tuning.
C3, C4 .006 Silver Mica.
C5 .001 mica.
C6, C11 100 mmf mica or ceramic.
C7, C12 .1 mf oil filled dual bathtub or equivalent.
C8 47 mmf mica or ceramic.
C9, C10 .006 mica or ceramic.
RFC 2.5 mh receiving type.
R1 30K.
R2 100K.
R3 680 ohms.
R4 51K.

All resistors may be one watt size.

Fig. 1—A stable oscillator circuit followed by an untuned buffer for improved isolation.

How The Bedspread Grew

Blanche Randles, K1IZT
62 Linda Avenue
Framingham, Mass.

About a year ago, when YLRL invited WRONE (Women Radio Operators of New England) to sponsor the Third International Convention, the gals of WRONE had more ideas and ambitions than money. Since money is an essential little detail in sponsoring any convention, the gals put their ideas and ambitions to work. To raise money for the YL convention they wanted something truly representative of YL's everywhere and so the souvenir bedspread was born.

In order to keep the squares for the spread uniform in size and material, the bedspread committee sent a square of cloth, cut to proper size and with suitable border, to each YL club that offered a certificate. These were mailed out in August of 1959 so the girls would have plenty of time to complete them.

It wasn't very long before we had many unexpected, but very pleasant surprises. First, we received a letter from the "Dark Eyed Queens" of Chicago who were preparing a new certificate. They wanted to be included in the spread. The commitee got quite a thrill when only 3 weeks later, the square was returned and we were the very first to see the certificate. The rules hadn't even been published yet.

Next we got a letter from the WAYLARK's, the gals in the Washington D.C. area. They too were preparing a new certificate. Boy this bedspread sure was growing! The committee was the first to see this new certificate too and that was just one of the many thrills we had working on the spread.

There was no contest but the Floridora's were the first to complete their square and return it. We think they sent it via Pony Express for it took three weeks for it to get to Mass. Good thing Amateur TV isn't going strong or you'd find a couple YL's that aged noticably before it arrived. But if the Floridora's think they had a corner on the gray hairs they should have been on the receiving end of these squares.

The PARKA square from Alaska somehow got lost and wandered around for several weeks before it was returned to the sender.

One of the clubs sure had their troubles. Their square got laid aside and overlooked till the last minute. Then when it was mailed to the gal who was to do the embroidery it somehow went to Ontario, Canada. They had almost given up when it finally got back to them. But that gal is a true YL for she received the square at three o'clock one afternoon, did all the embroidery and had it in the mail to Mass. at five o'clock the next afternoon. We are sure she didn't sleep during that twenty six hours but the square arrived OK and two hours later was already in place in the bedspread. How's that for timing? The square from South Africa managed to arrive just minutes before it went into the bedspread too.

Anyone who could make it was invited to join the living room floor brigade the evening the squares were laid in position. Let us say right here there was no partiality shown as to where the squares were placed in the spread. The YLRL Girl on the Globe was put in the center and the WRONE, center top as they were convention hostess. Aside from that design and color determined position in the spread.

After the squares were put together of course the spread had to be backed. We were very glad no OM was around with his camera because for three hours bare feet, knees and posterior sections were about all that were visible as we pinned the backing to the spread.

Some of the certificates are made out to the person who received the first certificate. Some are not filled in at all and one is made out to a charter member who is now a Silent Key. What a nice tribute. The Georgia Peach square has the call letters of every YL who was a member at the time the square was made. There are many hours of enjoyment in just looking at the bedspread but don't ask us how many hours of work! We wouldn't even try to guess the hours spent on each square and all are just beautifully done. Then there are the many, many hours of work by the committee, writing letters, selecting materials, putting squares together, etc.

We know there is not another bedspread anywhere like it and looking back we doubt there will ever be another collected and finished in quite the same manner.

The spread is complete in that it contains every YL certificate offered with the exception of one so new it could not be included. We have asked those girls to embroider their square and when it arrives it will go in a pillow to be given with the spread.

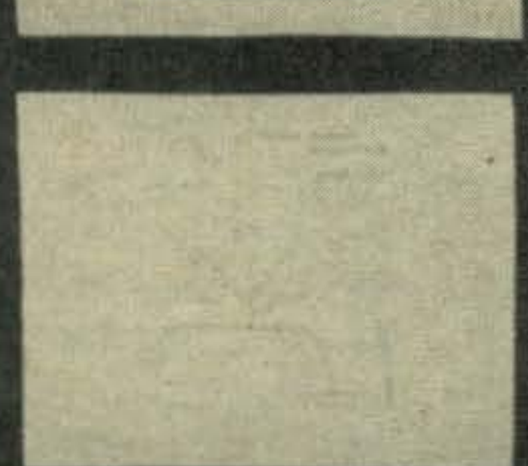
So many, YL's and OM's alike, have said they hoped to win it. The committee sure hates to part with it and it is our sincere hope it brings the winner as much pleasure as it has brought all the girls who have worked on it. ■

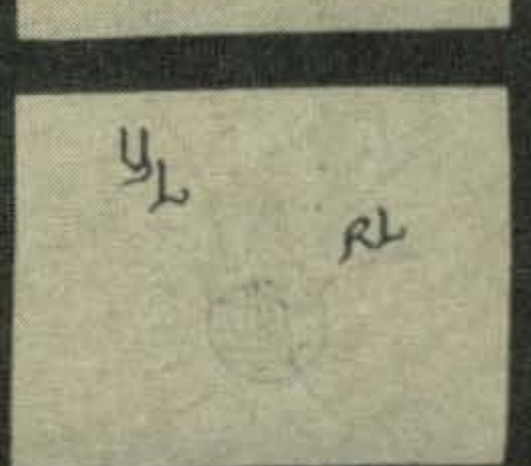
YLRL

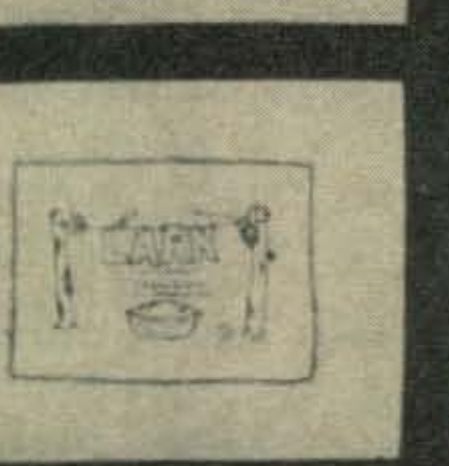
THIRD INTERNATIONAL

1960

BOSTON MASS.







Driving And Loading Grounded Grid Linears

A. B. Jones, Capt. USN, K9LKC
Industrial Mgr USN 9ND
Building 3209
Great Lakes, Ill.

In the past several years the grounded grid linear amplifier for use with single side band exciters has become more and more popular not only with those who "brew their own" but with several commercial manufacturers. This popularity is well deserved because they can absorb all the output of exciters in the 50 to 150 watt range without the use of swamping resistors. Also, the portion of the power not required to drive the filaments (cathodes) of the amplifier is delivered to the antenna. Generally speaking they do not require neutralization but this depends on the choice of tubes and good external shielding between the plate circuit and cathode circuits.

Overload

It has been apparent "on the air" that many amateurs connecting these grounded grid amplifiers to their SSB exciters do not understand the proper driving and loading procedures. First of all, no attempt should be made to load the amplifier without the plate voltage on. Without the plate voltage, the grid or grids which are grounded draw very high currents which, if allowed to exist long, will exceed their dissipation rating and cause permanent damage.

Input Impedance

Frequently the exciter used to drive the grounded grid amplifier has a nominal output impedance of 50 ohms or it may be variable over a range from 40 to 100 ohms. Most tubes amateurs use in these amplifiers have a relatively high cathode to ground impedance. For example, the type 813 triode connected with 2,500 volts on its plate, presents about 220 ohms. A single 813 with all grids grounded to both *rf* and *dc* with 2,500 volts on its plate will therefore present a poor match to most exciters. By adding a second 813 in parallel this cathode impedance will be cut to about 110 ohms. The pair then will reasonably match many exciters except those of the fixed impedance (50 ohms) type. To match these a fixed non-inductive resistor may be added across the input to the amplifier. In the above case suppose a 100 ohm resistor is added, then the exciter sees about 50 ohms which will match an exciter of this type. This resistor *will burn up half of the exciter power* which may prevent driving the amplifier to full capability. If this is the case, it will be necessary to put an impedance matching circuit between the exciter and amplifier. Various circuits of this type are shown in the handbooks and they should be as broad band as practicable to avoid the necessity of tuning for any given frequency band.

From the above discussion it should be apparent that if you're building your own grounded grid amplifier the proper choice of tube types should be carefully considered.* In general high mu triode tubes give good plate to cathode shielding, require little or no grid bias and produce reasonably low cathode impedance. By connecting tubes in parallel the cathode impedance of the combination can usually be brought within range of the exciter output impedance. Many pentodes and tetrodes make excellent choices if two or more of the grids are at *rf* ground potential. Unfortunately, many of the tube manufacturers have not published data on this type of operation. Some types which have been successfully used are the 6L6, 807, 1625, 813, RK65 and WE701A.

Loading

Having completed the amplifier using the right tubes to reasonably match the exciter and at the same time be capable of handling the power input desired, it is now ready to be loaded into the antenna or preferably a dummy load. For those who have built their own it is well to determine, *without any excitation applied,* the proper grid bias to keep the idling current to a value at least fifty percent of the maximum plate current allowed. This is usually higher than the optimum idling current and may even cause excessive plate dissipation. As a rough "rule of thumb" the idling current may be initially set so that the tubes are dissipating one fourth of their total maximum. For commercially manufactured equipment set the idling current as recommended in the instruction book. Now with the antenna or dummy load connected and *plate voltage on,* put the exciter in the tune position; or if there is none, in the CW position. Start with the exciter power output low and kick the amplifier tubes plate current up about double the idling current at the same time "dipping" the plate circuit and adjusting the antenna loading. At this point

[*Continued on page 110*]

*See 15th edition of "The Radio Handbook" by Editors and Engineers, pages 161-168 for details.

One Block DX

Ole B. Ritchey, W9MS
Metz, Indiana

Soon after entering High School in 1910, I became involved in physics with a Wimhurst Machine. Much to my surprise I was rudely shocked; knocked off my feet, you might say, and rightly so.

Perhaps the most shocking thing about it was, that from that instant on, all of my energy has been expended in the pursuit of those elusive electrons that jarred me so abruptly.

Securing a few old drycells from my uncle "Bob's" machine shop, I began sundry covert experiments with coils and various junk procurable from goodness only knows where. Having made the acquaintaince of the local telephone man, it soon dawned upon me that the telephone office should be a prolific source of junk-drycells, wire coils, and lots of funny looking gadgets. This proved to be the case, as the manager (Henry) was a very affable cuss, and my taking the junk saved him the bother of throwing it out.

I had made the acquaintance of a young fellow living on the next block who also was interested in electrical gadgets, and we soon became pals. Thereafter we swung into a stride that drew the interest, comments at least, of the most of the people of the town.

We both had to work to help defray school expenses, he in his father's truck-garden, and I as helper to the local electrical contractor.

Living as far apart as we did, a block, and having so much in common to talk about, it seemed that we must have some means of communication between his home and mine. Naturally we gravitated to the telephone office together, and so conceived a private line telephone. By numerous insinuations and broad hints we finally separated our indulgent friend "Henry" from a couple old receivers and fairly good transmitters, followed later by ringers and a set of bells.

As I look back now, it is a wonder that we got away with our doings–stringing wire across peoples backyards and across streets, but mostly they were interested enough in seeing how far we would get that they let us go to it. Friend Henry laughingly cautioned us that our contraption would not work and this perhaps offered the incentive that pushed us to final success. At any rate we soon had our line working, and many were the dates we made for getting together.

Soon, however, the novelty of the thing sort of wore off. After all, lots of people had telephones so ours was not so much of an achievement, so we decided that we would try something else. MORSE, that was it! No one would know what we were talking about if we used code, so out went the telephone.

Uncle Bob had an old key and sounder which I soon got possession of, and we located another down town. We began studying code and in a few days the house sounded like a Western Union Office.

This was in 1911, and some strange talk was being passed around concerning some new way of sending code without the use of those troublesome wires we had dangling across the neighbors' backyards, which by now were causing some remarks.

Wireless—that's the answer! But who knows anything about that?

We didn't, but old Lady Luck was looking for us and the opportune moment soon arrived.

Everybody went to the County Fair, the school went, so we went. We weren't much interested in the Fair, but—BZZZT, ZZZT ! -- gee, what a noise that is. Looking to see what made all the racket, we heard a guy say something about "wireless." We came alive then, and crowded up front to see what it was all about. A man on a box beside a table was talking about WIRELESS, then when he reached over on the table and tapped a key—ZZZT! From a spark-gap hung on a stick above the table came enough noise to drown out all the barkers on the grounds. Then he said, "Come right in, folks, and learn all about wireless, see it, hear it, learn all about it, only a dime—ten cents." Well, we didn't wait to debate—when the guy ducked into the tent where you learned all about wireless, we were tight on his heels. After "learning all about wireless," we went to the guy and asked to look some more, as we were interested in making one.

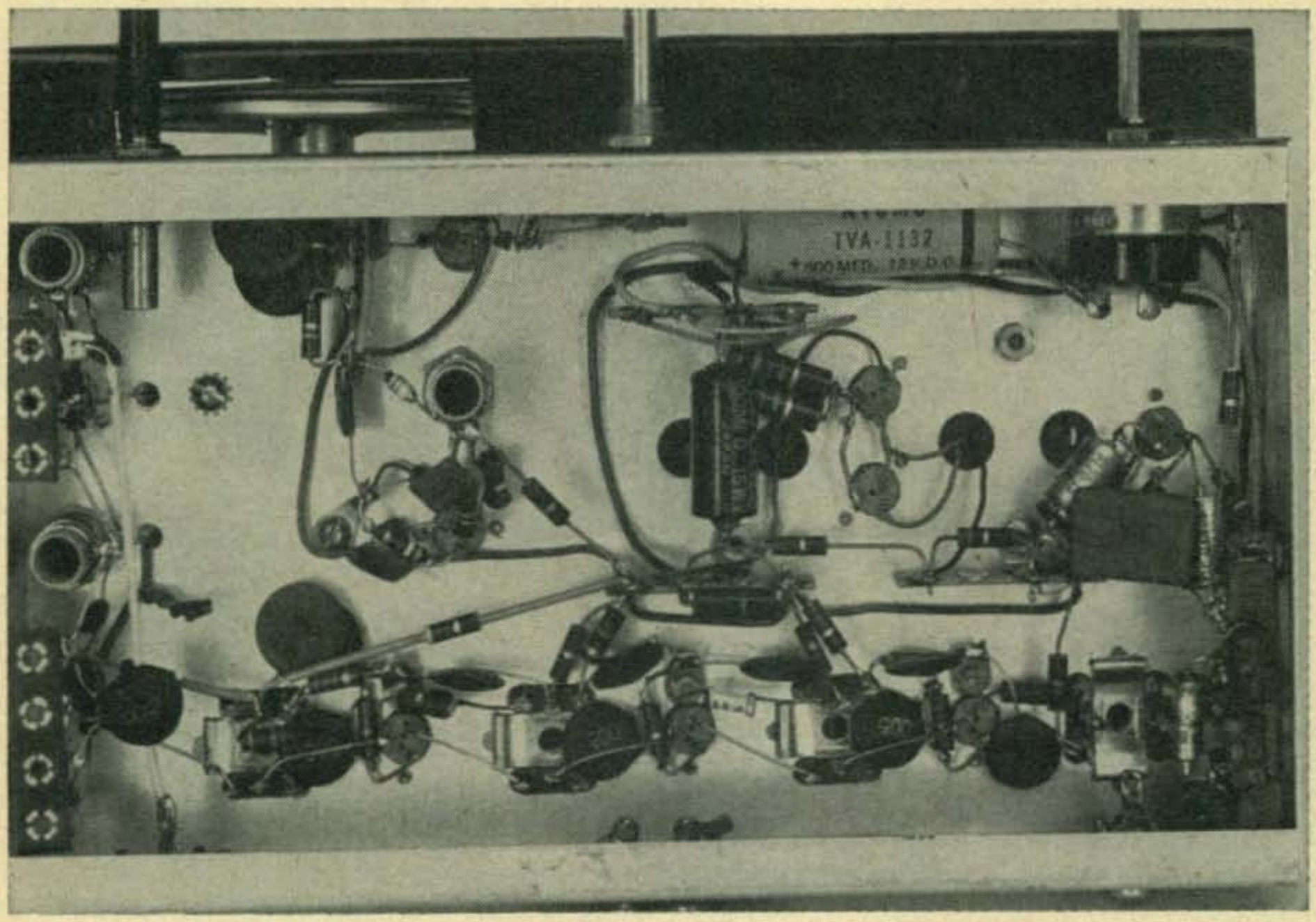
This was our first contact with "Ham Radio," popularly known at that time as wireless, and it was destined to be a permanent inoculation.

After being shown the works, we asked for help to get started, little knowing that the Ham Spirit is highly contagious and that Hams take keen delight in inculcating the disease in other likely subjects. Showing us the other station from whence the signals we had heard had emanted (aw'right, radiated), we were given the address of The Electro Importing Co., the Carborundum Co. of America, and a generous piece of Silicon, together with advice on how to get started. We left for home immediately, busy with all sorts of calculations as to how soon we could get a catalog on parts, how we

[*Continued on page 110*]

Transistorized Two Meter Superhet

Donald L. Stoner, W6TNS
Box 137
Ontario, California



Under chassis view of the Transistorized Two Meter Superhet. The if strip runs along the bottom while the ratio detector terminal strip is mounted on the right apron. In this view the rf gain control, had not yet been installed, the shaft, being a vernier drive for the tuning control.

Although it is not generally known, transistors suitable for use in *vhf* receivers have been available for some time. In 1958 the author designed a three transistor television receiver "front-end". The cost of the transistors was more than $10.00 each, however! Obviously this makes the construction of a *vhf* receiver prohibitive for experimenters particularly when one considers the need for *if* and audio transistors and all the related components.

A recent development has put a new light on the design of *vhf* equipment, using transistors. Philco Corporation has just introduced a new set of Micro Alloy Diffused Base Transistors (MADT) which have an alpha cutoff of several hundred megacycles. These transistors are used in their "Safari" portable television receiver, which of course goes up to 216 *mc*. Obviously these transistors would be suitable even in a 220 *mc* converter or receiver.

Parts List

C3—3-10 mmfd., three gang variable capacitor, modified per text (J. W. Miller #1461).
C12—4.7 mmfd. tubular ceramic or disc (npo).
C16—2.2 mfd., 3 wvdc (Centralab UK-104).
J1, J2—phono jacks.
L1—2¼ turns, #14 tinned wire, on ⅜" coil form, spaced ⅛" between turns. C3 end towards chassis. Antenna tap at 1 turn from C2 end, base tap ¾ turn from C2 end.
L2—2 turns #14 tinned wire, wound on ⅜" form, spaced ⅛" between turns. Base tap ¾ turns form C5 end.
L3—2 turns #14 tinned wire, wound on ⅜" coil form, spaced ⅛" between turns. Diode tapped ¼ turn from C13 end (see text).
Q1—Rf amp., PNP type T1694 (Philco).
Q2—Mixer, PNP type T1696 (Philco).
Q3—Osc., PNP type T1695 (Philco).
Q4, Q5, Q6—If amp., PNP type T1693 (Philco).
Q7—1st audio, PNP type 2N226.
Q8, Q9—Class B audio, PNP type 2N224 (matched 2N225-3 Philco).
Q10—Afc Amp., PNP type 2N207 (Philco).
R8—2.5K potentiometer (Centralab B7 with KB-3 switch).
R32—25K potentiometer, audio taper (Centralab B-29).
S1—SPST switch, part of R32 (Centralab KB).
S2—SPDT switch, rotary action (Centralab 1460).
S3—SPDT switch, part of R8 (Centralab KB-3).
T1—Transistor 10.7 mc. interstage (Miller 1463-T1).
T2—Transistor 10.7 mc. interstage (Miller 1463-T2).
T3—Transistor 10.7 mc. interstage (Miller 1463-T3).
T4—Transistor 10.7 mc. ratio det. (Miller 1465-TRD).
T5—Interstage audio, 10K to 2K ct. (Triad TY-56X or equiv).
T6—Audio output 500 ohm ct to 4, 8, or 16 ohms (Triad TY-45X or equiv).
X1—Varicap diode, V15 (Pacific Semiconductors).

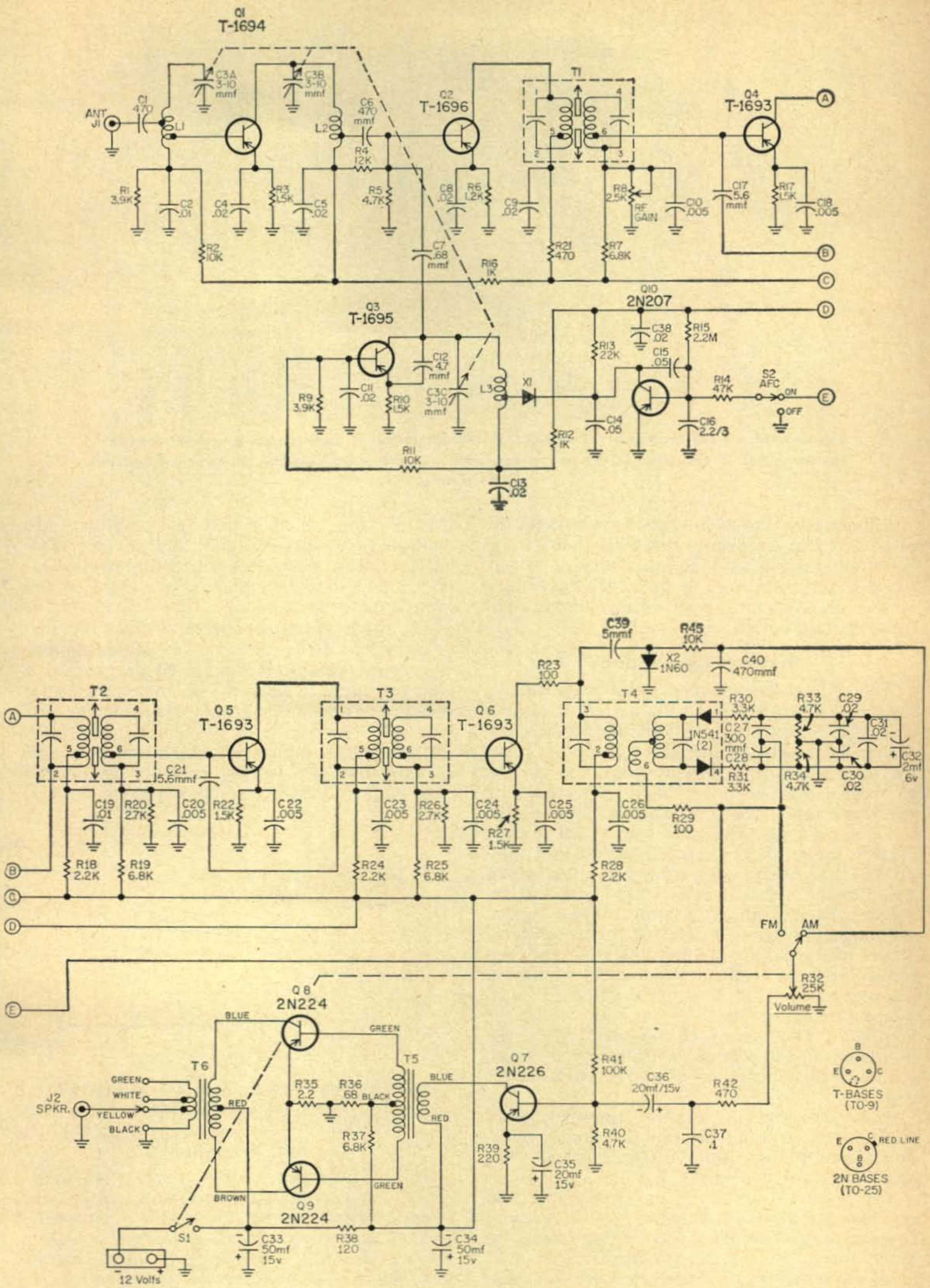
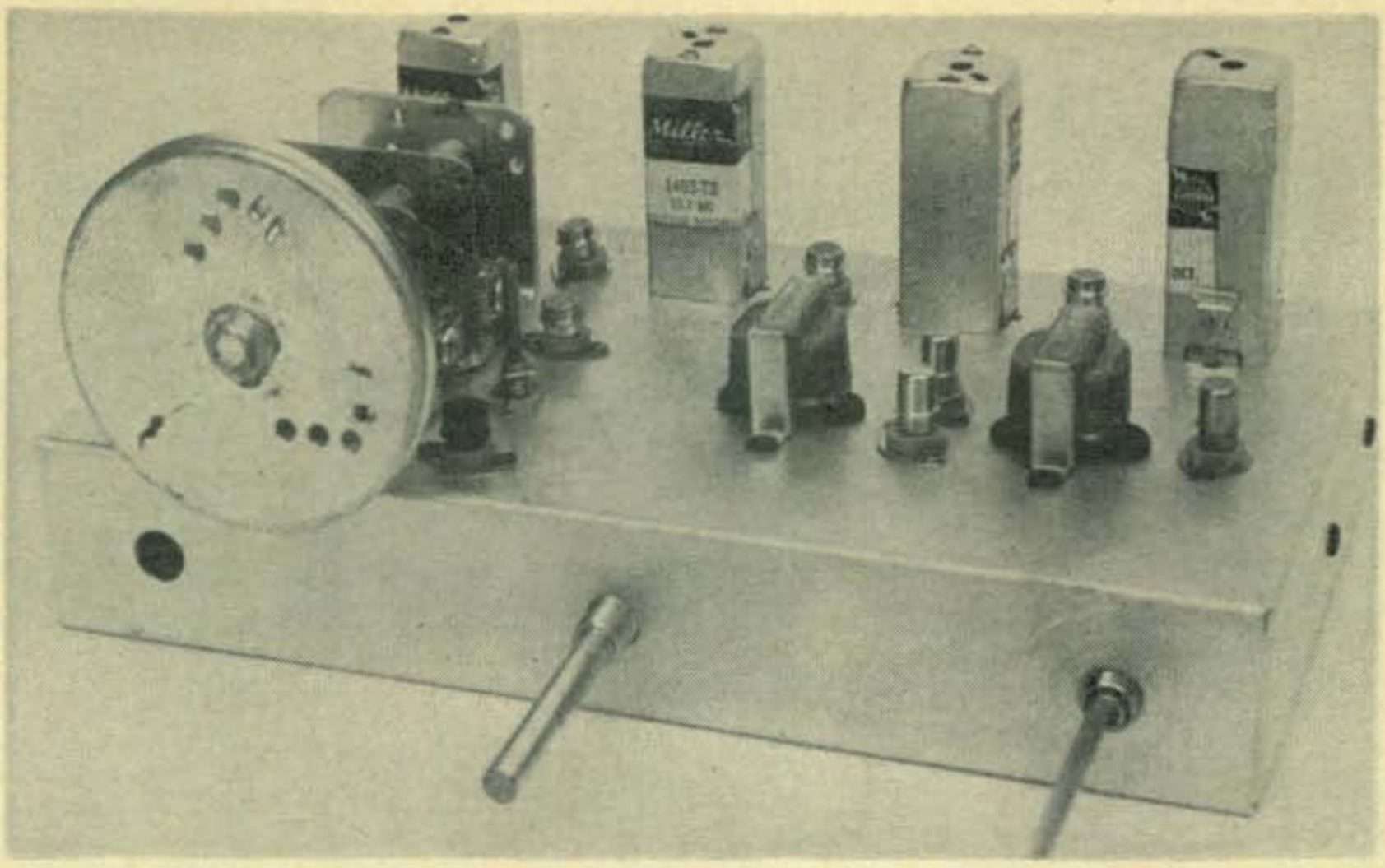


Fig. 1—Schematic diagram for the transistorized VHF Receiver. Potentiometer R8 is wired so that when it is rotated CCW, and turned off, the audio switches from the AM detector to the ratio detector.



Top view of the ten transistor vhf receiver. In this photo the rf gain control is not yet installed. The large hub is connected to the tuning capacitor, and the audio circuitry is positioned in front of the if strip.

Mass production techniques have brought the price of these transistors down to about $4.00 each, or about what you would expect to pay for a 30 *mc* transistor. At this price the experimenter or amateur can afford to construct *vhf* receivers and converters.

Receiver Description

The *vhf* receiver shown is the outgrowth of another project involving the design of a portable FM receiver for audiophiles. Upon completion of the device, the author could not resist the temptation of modifying the tuned circuits to receive the two meter band. After aligning the front end it was immediately obvious that the receiver performance was equal to, or slightly better than, the commercial unit used at W6TNS. At the same time it was discovered that the *afc* circuit normally used with FM receivers provided an extra bonus on two meters. Although the signal is detected in the collector circuit of the last *if* amplifier, the *rf* energy continues on to the ratio detector as *if* would for *fm* reception. This detector develops a plus-minus *dc* voltage which is fed back to the *afc* amplifier. This transistor, in, turn, locks the oscillator on the station being received. Thus, even on two meters there is no sign of oscillator drift.

Ten transistors are used; *rf* amplifier, oscillator, mixer, *if* amplifier (3), 1st audio, push-pull Class B audio output stage, and the *afc* amplifier, as shown in fig. 1.

Transistor Q1 serves as an *rf* amplifier and provides about 10 *db* gain at 144 *mc* without neutralization. The signal and oscillator are combined at the base of Q2, the mixer. The oscillator, with feedback between collector and emitter, operates at 10.7 *mc* below the incoming signal frequency.

The beat difference from the mixer stage is applied to the *if* amplifier chain consisting of Q4, Q5, and Q6. The first two amplifiers are neutralized to increase gain and prevent feedback. Transistor Q6 does not require neutralization due to the heavy loading presented by the ratio detector circuit.

The *rf* energy at the collector of Q6 is rectified by a simple diode detector for *am* reception. The ratio detector is connected to provide a voltage output whenever the incoming signal varies from the nominal center frequency of 10.7 *mc*.

The audio circuitry is straightforward, with Q7 operating as a voltage amplifier driving the push-pull Class B stage composed of Q8 and Q9.

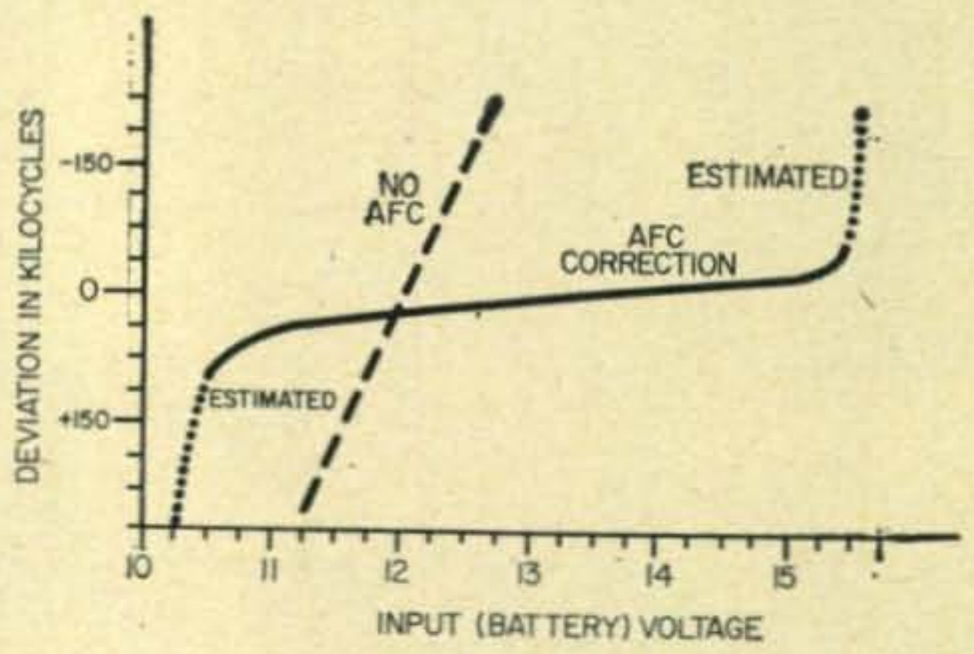


Fig. 2—Voltage stability, with and without afc, for a 1000 microvolt signal.

AFC Amplifier

The *afc* amplifier, Q10, is simply a *dc* amplifier. It increases the plus-zero-minus voltage developed by the ratio detector to the point where it can operate the *Pacific Semiconductors "Varicap"* diode, X1. This diode is interesting in that the barrier between the p-n junctions is made to "move" with different applied voltages. As this barrier shifts, the terminal capacity varies and the diode becomes a voltage sensitive capacitor. In this circuit, if the station drifts slightly

the ratio detector provides a correction voltage which is amplified by Q10. This of course changes the cathode voltage on X1, which in turn changes capacity slightly to correct the oscillator frequency. This type of circuit may seem like "gilding the lily" in an amateur receiver that is not intended for *fm* reception. However, the oscillator drift due to temperature and voltage variations is quite severe at these frequencies. It is not critical in the portable television receiver mentioned earlier because of the wide *if* bandpass. The bandwidth of the two meter receiver is slightly more than 100 *kc* which would tend to make drift troublesome.

Construction Notes

The receiver is built on a 5 x 9 inch aluminum chassis and the approximate lay out is shown in fig. 2. The front end components are grouped

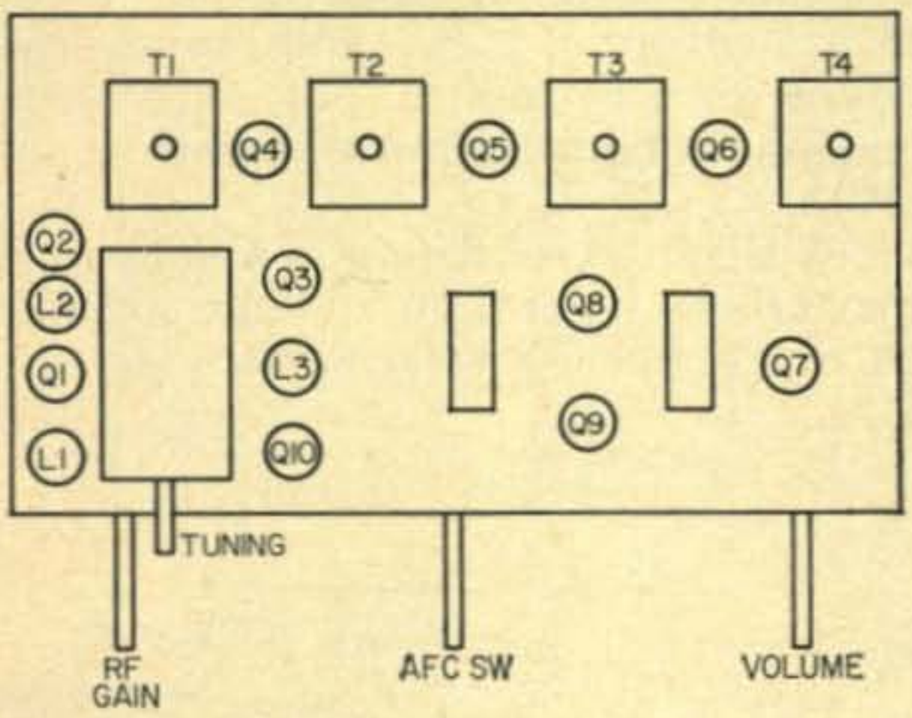


Fig. 3—VHF receiver chassis layout. Notice that the rf components are closely grouped with the tuning capacitor C3.

around the tuning capacitor to obtain the shortest possible lead lengths. Although the antenna coil is tapped for a 72 ohm input, a one turn link could be substituted to provide optimum match for 300 ohms. Naturally J1 would have to be changed to a balanced type connector.

When wiring the coils be sure the "hot end" is nearest the chassis so the associated leads will be short. A "gimmic" type capacitor is used to couple energy from the oscillator to the mixer base. This is made from two 1½" lengths of insulated wire, by twisting four turns to cover ½ to ¾ inches. The *afc* amplifier and associated components are located close to the oscillator section to keep the diode leads short.

The *if* system is strung out along the rear apron to place the ratio detector circuitry as far from the mixer as possible. Wherever possible the bypass capacitors should lay against the chassis, and of course all component leads should have the shortest possible length. The components associated with the ratio detector are particularly "hot" and are tightly grouped on a four lug (six, counting grounds) terminal strip. A detailed layout of this section is shown in fig. 3.

The audio driver is located behind the volume control, near the detector circuit. The push-pull

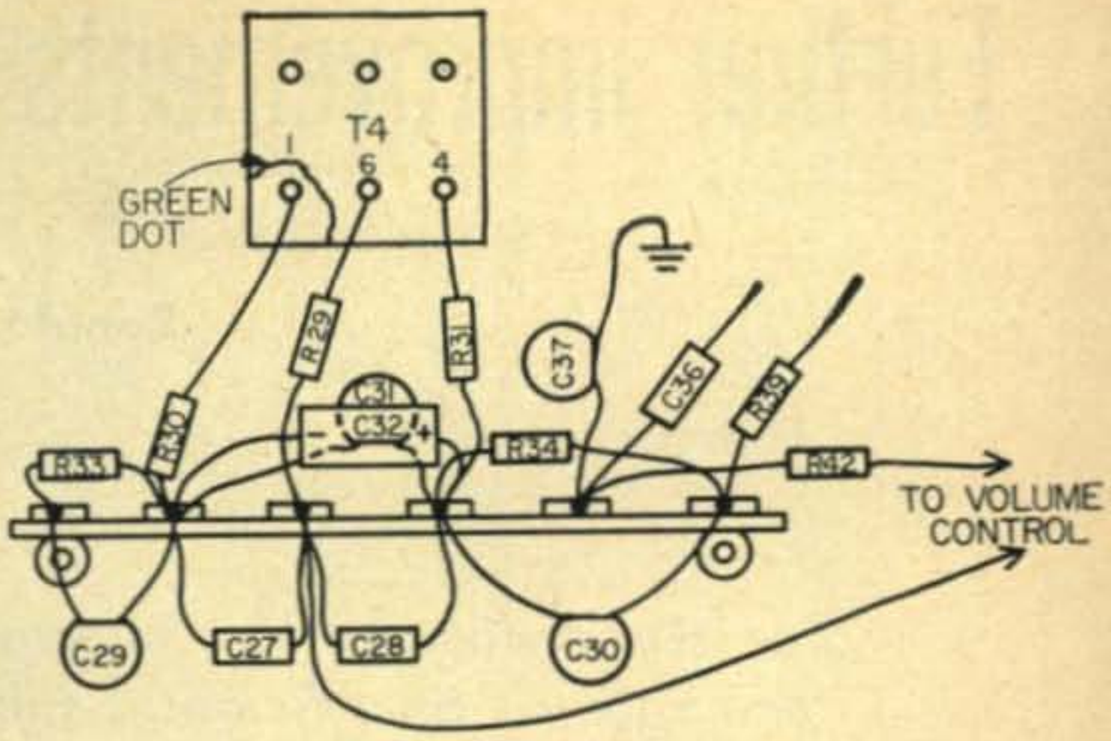


Fig. 4—Position of components in the ratio detector section.

Class B stage is between transformers T5 and T6. The second of T6 is brought out to a terminal strip to the rear of the *afc* switch (S2). One end of C33 and C34 is also secured to this terminal strip.

Testing and Alignment

About the only problem that may arise is the adjustment of the *afc* circuit. The collector voltage of Q10 should be 4 volts, and resistor R15 should be optimized for this voltage. The *position* of the "Varicap" diode on the oscillator coil is rather critical. If it is too high (toward hot end) it will load the oscillator and prevent oscillation. If it is too low, there will be insufficient *afc* action.

Symbol	Type	Collector	Base	Emitter	Calc. Current
Q1	T1694	10.1 volts	2.4 volts	2.2 volts	1.45 ma
Q2	T1696	8.8 volts	1.5 volts	1.4 volts	1.25 ma
Q3	T1695	8.6 volts	1.9 volts	2.05 volts	1.36 ma
Q4	T1693	7.4 volts	2.1 volts	2.0 volts	1.4 ma
Q5	T1693	6.5 volts	2.8 volts	2.7 volts	1.8 ma
Q6	T1693	6.9 volts	2.8 volts	2.5 volts	1.66 ma
Q7	2N226	8.8 volts	0.5 volts	0.35 volts	1.6 ma
Q8, Q9	2N224	12.0 volts	0.1 volts	*	1.5 ma
Q10	2N207	4.0 volts	*	0	0.6 ma

Notes:
1. * voltages too low to measure
2. no signal
3. resistance data not included since transistor resistance tends to confuse readings
4. All readings negative with respect to the chassis

Fig. 5—Typical voltage measurements in the transistorized FM receiver.

The alignment process is simplicity itself. If the receiver is to be used for communications purposes, simply peak the *if* transformers for maximum hiss or signal strength. Adjust the ratio detector transformer for *minimum* hiss in the *fm* position. As this slug is adjusted, you will note a spot where the hiss suddenly drops then rises. Leave the slug in this minimum position. The *dc* output from the ratio detector (developed across the volume control) should be symmetrical about zero as you tune each side of a signal.

The tuning capacitor will have excessive capacity for tuning the two meter band, and it will be necessary to remove plates until the receiver tunes a band four to five *mc* wide. ■

Further Improvements On The "Selectoject"

Ronald L. Ives
2075 Harvard St.
Palo Alto, Calif.

For over a decade the "Selectoject" has provided superb performance as an efficient 2 tube receiving accessory. With a few simple modifications, up to date standards are attained.

Shortly after the end of WW II, various tunable audio filters were widely used for reducing interference on crowded bands, and for eliminating heterodynes. Perhaps the most effective of these "denoisers" was the Villard Selectoject[1, 2], one version of which was manufactured for a time by the *National Company*. Even though the principles involved are now almost old enough to vote, this tunable filter, slightly modified for construction with currently available parts, is still one of the best, simplest, and most versatile of the "signal improvers."

Both components and principles of operation of the Selectoject are simple and straightforward. Basically, it consists of a dual *R-C* phase shifter, a mixing tube, and a linear amplifier. The phase shifter is resistance tuned, and will dephase one frequency only by exactly 180°. To boost a signal, the phase shifter output is passed through a single stage amplifier, which dephases it 180° more, and feeds it back to the input. This amounts to controlled regeneration, and the output of the mixer tube, at the frequency to which the phase shifter is tuned, is very much greater than that at any other frequency. The amount of feedback is adjustable, so that relative amplification of the desired frequency can be adjusted to suit operating needs. As commonly constructed, the amplification can be so far advanced that oscillation takes place at this same frequency.

To null, or eliminate a signal, the output of the phase shifter is passed through the mixer tube, dephasing it 180° more, or 360° in all. The amplifier is connected to amplify the input, and its output, dephased 180°, is coupled to the output of the mixer tube. At the frequency to which the phase shifter is tuned, and at no other, the two signals in the output are 180° out of phase, and cancel when the amplitudes are made equal.

Both the peak and the null are relatively sharp, so that a specific signal can be boosted out of a bedlam of CW, and an annoying heterodyne can be nulled out of a speech transmission without seriously impairing intelligibility.

A block diagram, outlining components and functions of this tunable audio filter constitutes fig. 1. Curves showing what happens to a specific sinusoidal signal, to which the phase shifter is tuned, in both peak and null position, are shown in fig. 4.

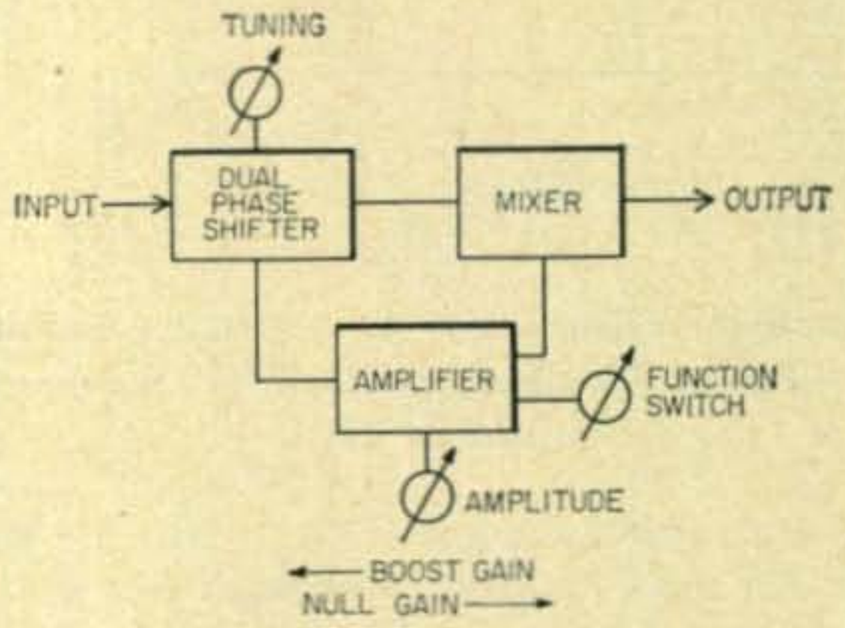


Fig. 1—Block diagram of the Selectoject.

The circuit of a Selectoject, designed to give peak, straight amplification, or null, as desired, comprises fig. 2. The straight amplification function, corresponding to the "switched out" position in older versions of this filter, makes possible the elimination of one audio stage if the device is incorporated into a recever.

Construction

Construction of a Selectoject is simple and straightforward. There are three controls—FREQUENCY, FUNCTION switch, and AMPLITUDE. These may be arranged in any way mechanically convenient, and the tubes can be placed at any reasonable distance from them. To facilitate both mounting and tuning, the two potentiometers in the phase shifter were ganged by use of split gears, and given a 4 to 1 drive reduc-

1. Villard, O. G., Jr., and Weaver, D. K., "The Selectoject," *QST*. Nov. 1949, p. 11.
Villard, O. G., Jr. "Tunable A. F. Amplifier," *Electronics*, July, 1949, p. 77.
Villard, O. G., Jr. "Independent Control of Selectivity and Bandwidth," *Electronics*, April, 1951, p. 121.
2. Villard, O. G., Jr. "The C. W. Man's Selectoject," *QST*, May, 1951, p. 54 et seq.

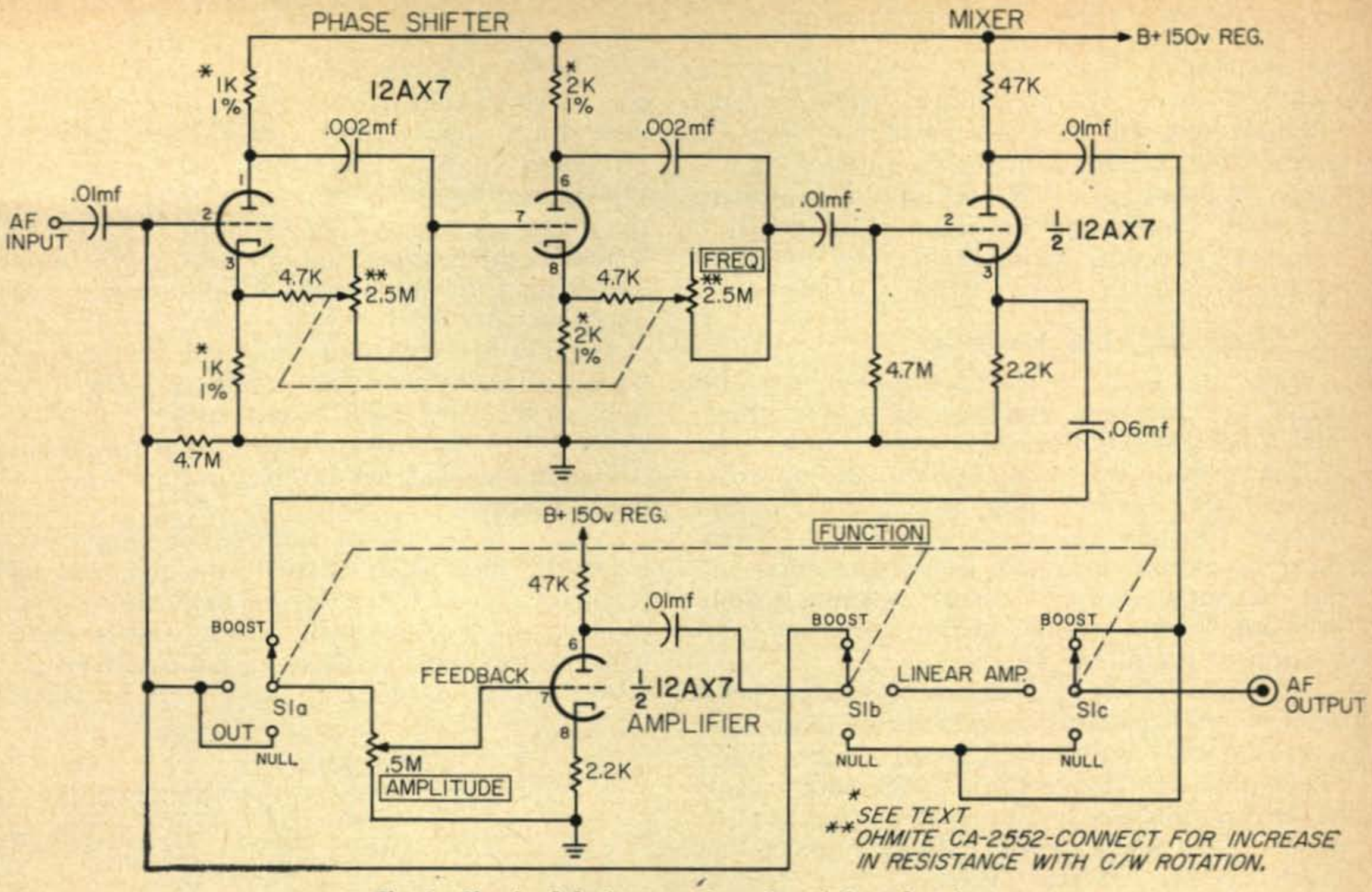


Fig. 2—Circuit of the improved version of the Selectoject.

tion, permitting fine tuning. Gears used were split anti-backlash elements salvaged from a defunct Hallicrafter reeciver.

Choice of potentiometers for tuning the phase shifter of this tunable filter poses a problem since the frequency varies as 1/R. If a linear potentiometer is used, tuning will be very broad on the low frequencies, and almost inoperably sharp at the high frequencies, as in curve A, fig. 3. If, in contrast (and assuming such a resistor were available), a linear calibration were chosen, as in curve B, tuning would be seriously crowded in the low frequencies, and very broad in the upper audio range. As this filter is a constant percentage bandwidth device, uniform sharpness of tuning will be obtained when the "slot" or "peak" occupies the same number of dial degrees regardless of frequency. This calls for a logarithmic resistance characteristic, as in Curve C, fig. 3. This type of resistance curve is closely approximated by a clockwise logarithmic potentiometer. The *Ohmite CA 2552* was chosen for this position because it is a standard item of known dependability. Potentiometers of other manufacture, having the same catalogue characteristics, are available at about a quarter the price, and *may* work just as well. The small fixed resistor connected in series with each potentiometer is a padder, to eliminate from the tuning range the very high audio frequencies. The value used—4700 ohms, in conjunction with a 2.5 megohm pot and an .002 *mfd* capacitor, limits the top frequency range of the filter to about 12,500 cycles.

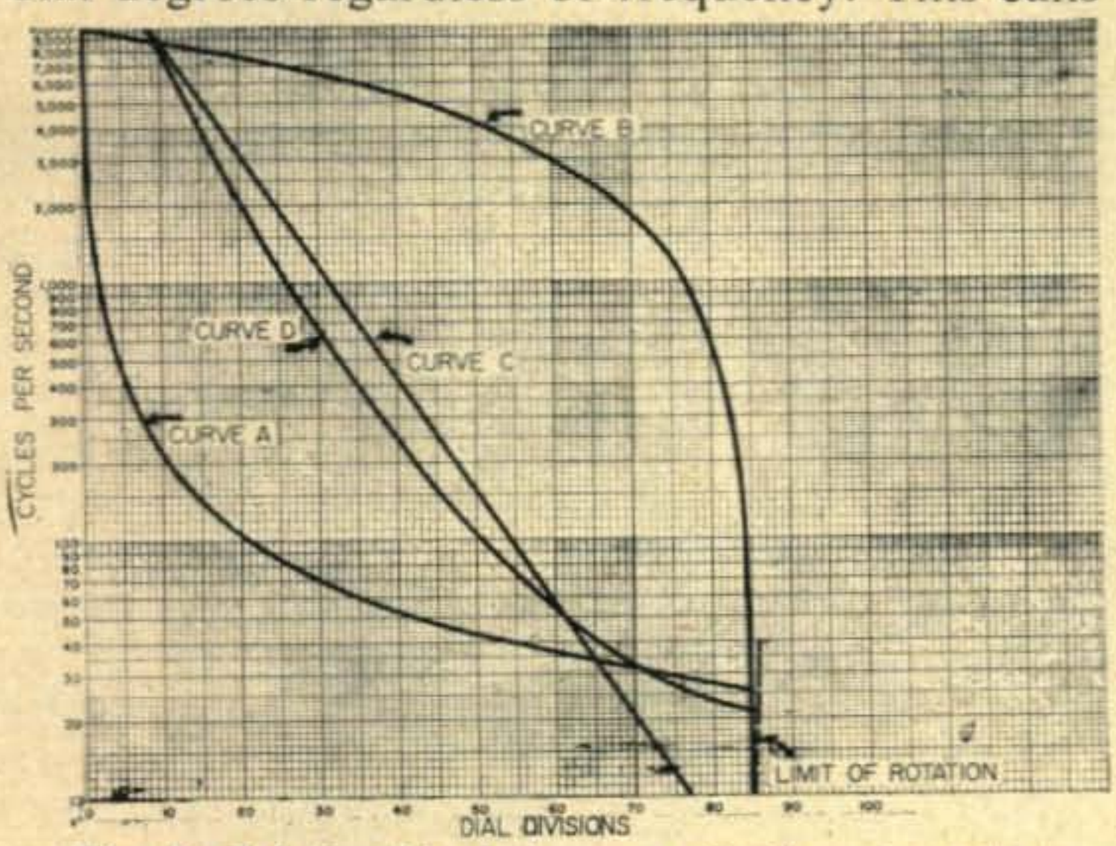


Fig. 3—Relationship between potentiometer rotation and frequency. A linear pot produced A and B and a log pot curve D.

Actual attained calibration with this filter is shown in curve D of fig. 5. Note that the attained calibration is within about 7 percent of the theoretically ideal calibration throughout the range of 50 to 10,000 cycles, and because of the constant percentage bandwidth characteristic already mentioned, the tuning is equally sharp at all points within this range.

Connections between the panel-mounted controls and the chassis mounted tubes and other components are made with shielded wire to prevent interaction between stages and to minimize hum pickup from the power supply as well as the control circuits. To increase stability, and to reduce possible hum pickup, the plate supply is regulated by means of a VR-150 tube, and the filament center tap is biased positively about 50 volts with respect to ground. The use of regulated plate voltage is particularly important when the filter is used near the maximum of its "boost" position.

At that setting, a line surge or switching transient will drive the unregulated system into oscillation, but will have no detectable effect on a regulated system. Although regulation at 150 volts, by means of a VR-150 tube, is indicated, the plate supply can be at any voltage from about 125 to 350 without affecting operation in any way.

1% Resistors

Plate and cathode resistors in the first two triode sections are specified as 1,000 ohms, 1%, and 2,000 ohms, 1%, respectively. The values of these resistors can be varied approximately 30% without impairing operation, but the two resistors associated with a given triode *must* be closely matched, or performance will not be satisfactory. Resistor mismatch may also put "wobbulations" in the frequency calibration of the filter.

Standard 12AX7 tubes are specified here, because they perform satisfactorily, and have a reasonably long life. Use of "Five Star," "Premium," or "Ruggedized" tubes here seems to be an unnecessary expense. Tube life exceeds 7,000 hours in the only Selectoject that the writer has run that long.

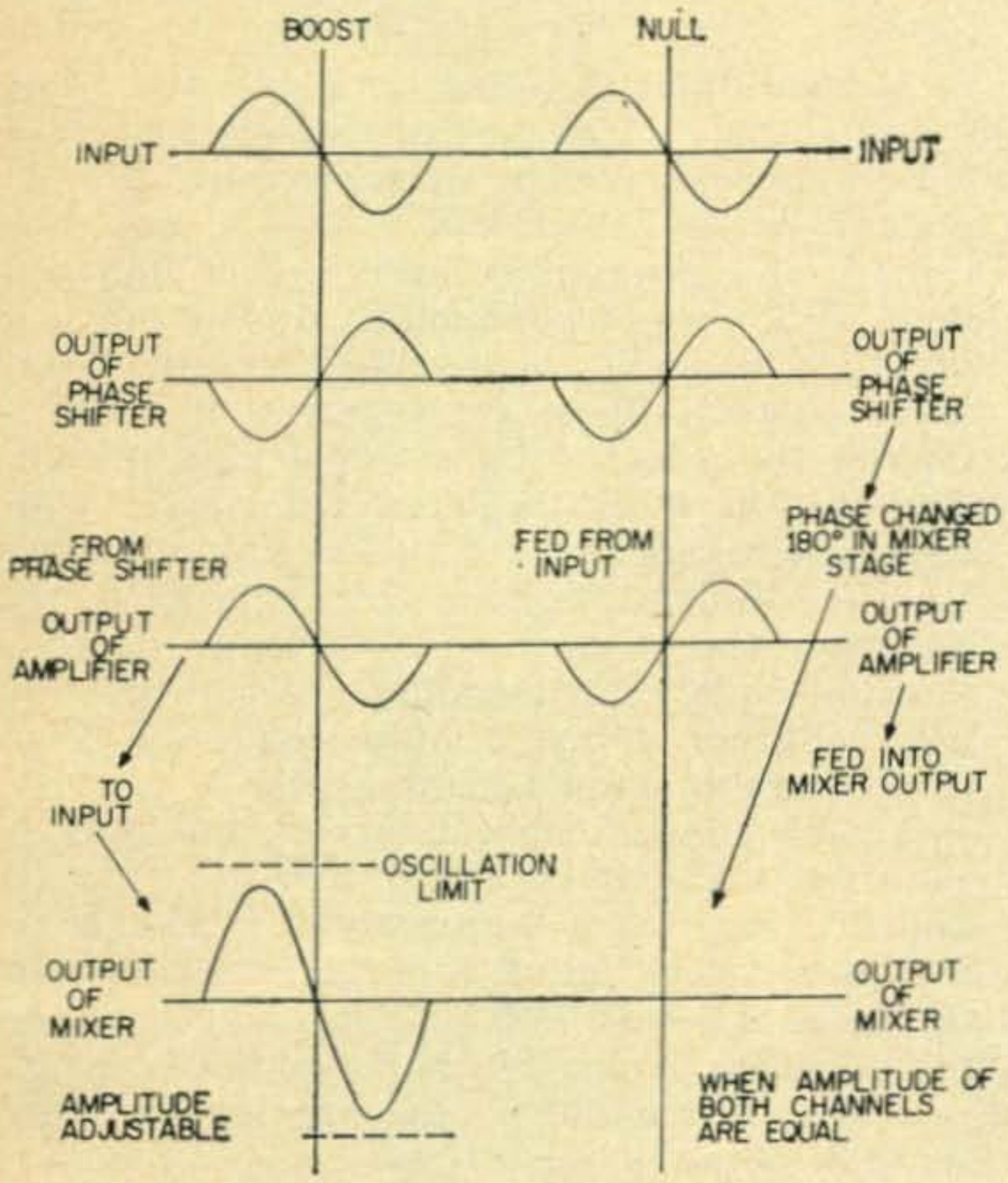


Fig. 4—Effect of tunable filter on sine wave input in both peak and null positions.

Operation

Use of this filter is simple and straightforward. With normal signals, not suffering from interference, the function switch is placed in the "Off" position, and volume is adjusted to suit by use of the "Amplitude" control ("Feedback" in fig. 2. No tuning is necessary in this instance, as the tunable phase shifter is out of circuit.

When a CW "Bedlam" is encountered, set the feedback control to about mid scale (regeneration impossible), turn the function switch to "Boost," and adjust the tuning until the desired signal is dominant. Then advance the feedback control slowly until the desired signal is at optimum intelligibility. Too great an advance of the feedback control will produce oscillation.

When a heterodyne is received, set the feedback control to about mid scale, turn the function switch to "Null," and tune the phase shifter until the heterodyne is at a minimum. Advance the feedback control until the heterodyne disappears.

Actual reduction of heterodyne amplitude, when the filter is tuned to resonance, and the feedback control set to balance the signals through the two channels in the filter is somewhat better than 20 to 1, as indicated by the curve in fig. 5. This is an actual measured

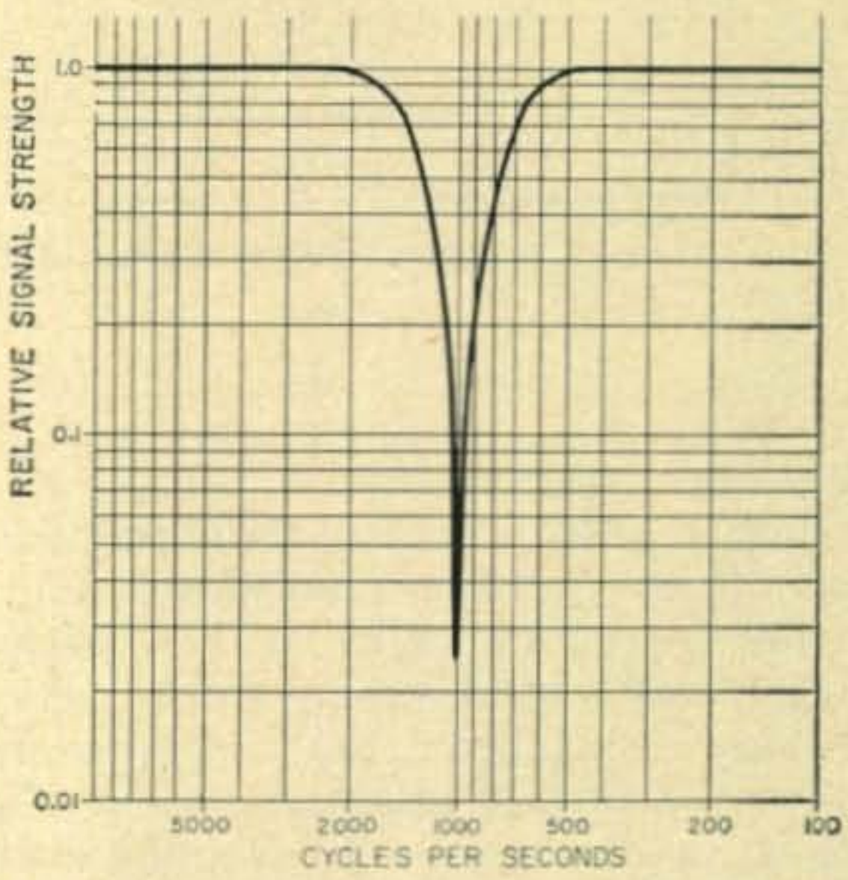


Fig. 5—Nulling characteristics of filter tuned to 1000 cycles.

curve, not a computed curve; and is drawn on a logarithmic base, rather than a linear base, to give a better impression of "how it sounds." This is done because the human ear has approximately a logarithmic response to volume.

Care should be taken at all times to avoid overdriving this filter. If it is overdriven, particularly in the "Null" position, clipping occurs, and harmonics are produced at multiples of the frequency to which the filter is tuned. This will make it seem that the filter is not working, for, if the ear is presented several harmonics of a given frequency, it automatically reinserts the fundamental. This is the "synthetic bass" effect, frequently made use of by the manufacturers of $19.98 kitchen radios.

In its present slightly improved form, the Selectoject offers a choice of adjustable "straight" amplification, tunable single-frequency rejection; or tunable single-frequency exaltation. For boosting or rejecting a single CW signal, it appears to be the simplest and most dependable device of its type. ■

A Remote Control 80 Meter VFO For RTTY

Byron Kretzman, KØWMR

Those of you who have worked KØWMR, or W2JTP/Ø, on RTTY have expressed an interest in the setup here where separate transmitters for each band are located in the basement and controlled from a "family room" on the main floor. This is not as complicated as it sounds, thanks to the wonders of silicon diodes. Briefly, transmitters are turned on and off by relays, and the *vfo's* are tuned by just an ordinary potentiometer at the operating position.

The following is a description of the *vfo* used for 80 meter RTTY operation. It is located in the rack with the transmitter. There is nothing special or critical about this *vfo*. The basic "Clapp" circuit and even the silicon diode tuning circuit has appeared many times before in the pages of *CQ*. For RTTY operation it was desired to limit the frequency excursion of the *vfo* remote control to a maximum of roughly plus and minus 15 kilocycles from the nominal 3620 *kc* RTTY channel. This gives quite a nice vernier action to the pot *vfo* control at the operating position, so no dial is necessary; only a knob is used. A small push button turns on the *vfo* alone for frequency spotting.

Construction

Just ordinary precautions are followed in the construction of this unit, the same precautions you would follow with any *vfo*. For example, make sure that the connections made to the coil and to the tuning capacitors are made with stiff solid wire, and as short as possible. The oscillator coil is below the deck and is at the opposite end of the chassis from the power transformer. The oscillator tube, as well as the others, are above the deck to keep heat away from the oscillator coil. Local tuning of the *vfo* is done with a heavy double bearing capacitor of about 15 *mmf* coupled to a vernier dial on the front panel. A 100 *mmf* variable air trimmer on the chassis is used as a "band-set" capacitor. The only other controls on the front panel, besides the LOCAL TUNE capacitor, are the SHIFT setting pot and the doubler plate coil in the output circuit.

Circuit

Figure 1 is the schematic diagram of the *vfo*. The basic Clapp oscillator operates on 160-meters, and it is followed by a buffer and then a doubler stage. Octal based tubes were used as they were on hand. Miniature equivalents are; a 6CL6 for the oscillator, a 6AL5 for shift, and 6BA6's for the buffer and the doubler. Apparently there is no miniature equivalent for the VR-75; however, the substitution of the miniature OB2 for both regulator tubes would merely raise the screen voltage bus to about 105 volts and the plate voltage to about 210 volts. Slightly more *rf* output would be the result.

The 50 *mmf* fixed padder connected across the LOCAL TUNE capacitor is an Erie negative

[*Continued on page 100*]

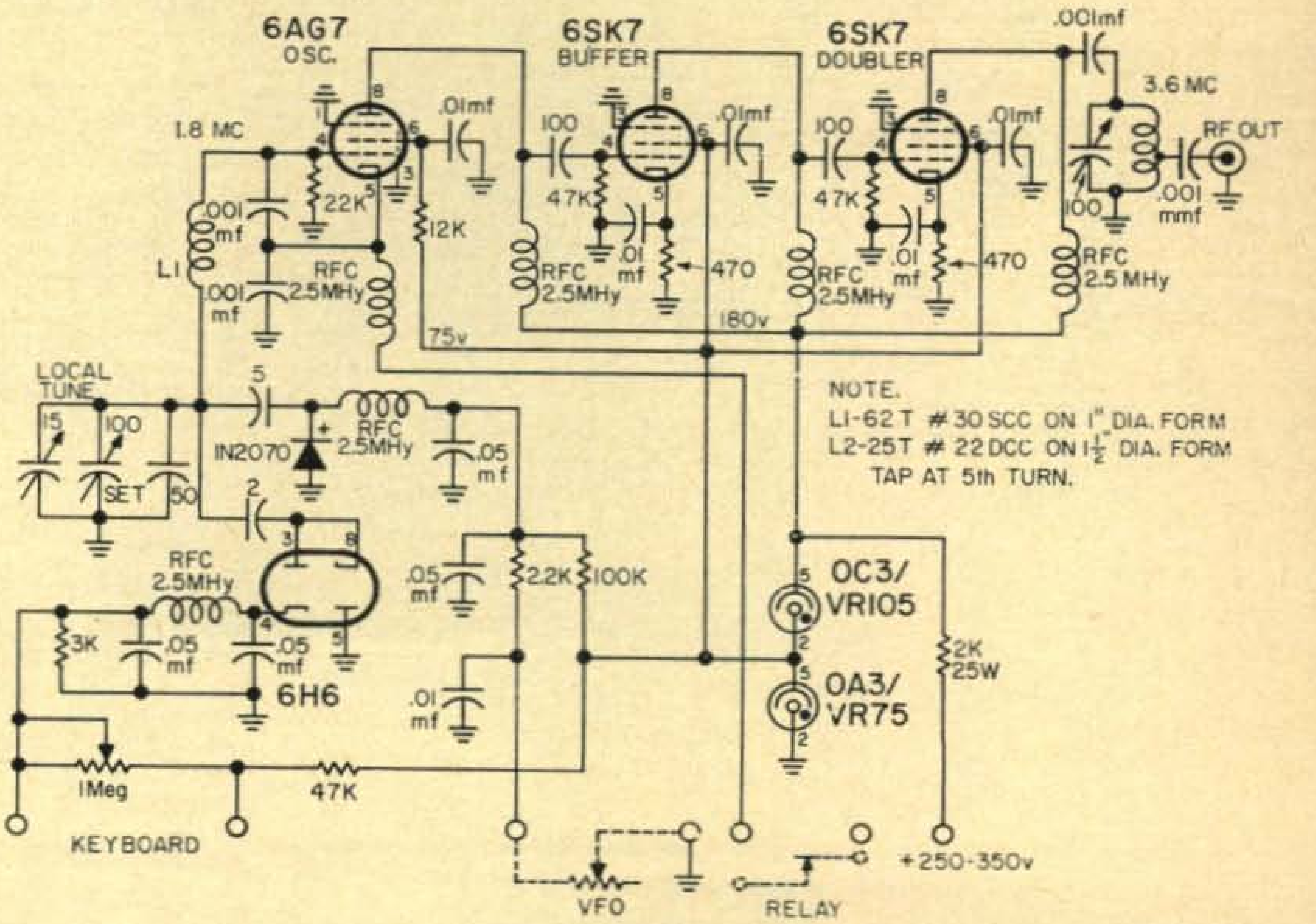
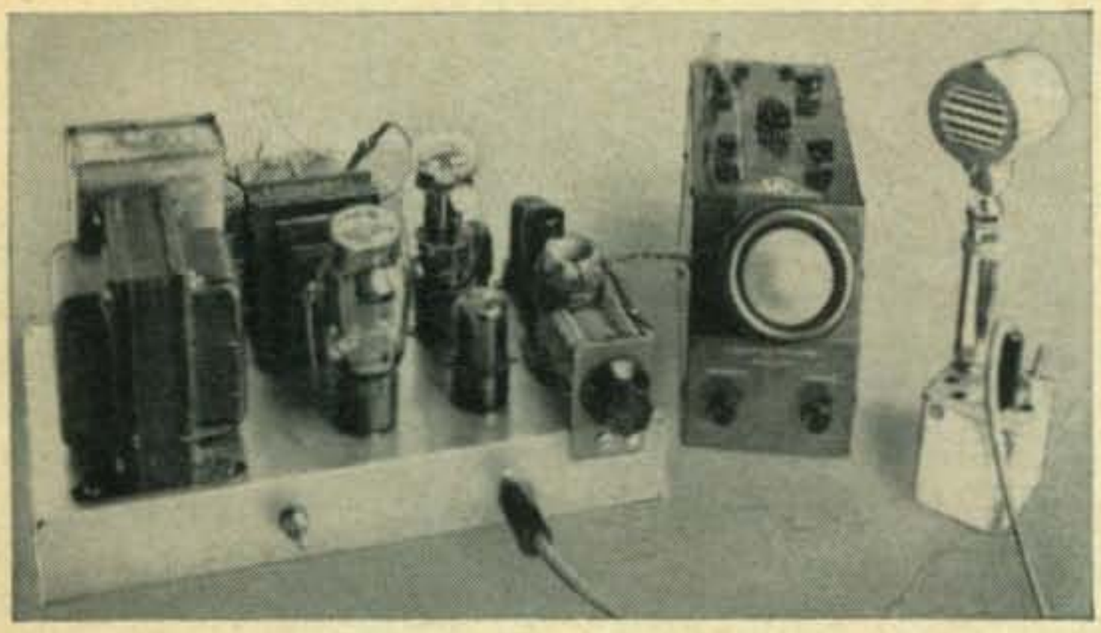


Fig. 1—Circuit of a remotely tuned 80 meter vfo. The 6AG7 is wired as a Clapp oscillator and operates at 1.8 mc. The last 6SK7 doubles to 80 meters. The remote tuning is accomplished by varying the voltage applied to the 1N2070 diode.

Series Modulation or Ultra Modulation the Easy Way

R. E. Baird, W7CSD
Oregon Technical Institute



Series Modulation in its Simplest Form

Series modulation as shown in either fig. 1 A or B has been known since the development of the triode tube. The method has been very seldom used for several reasons. However, the development of the 6AS7G tube removed one of the major objections.

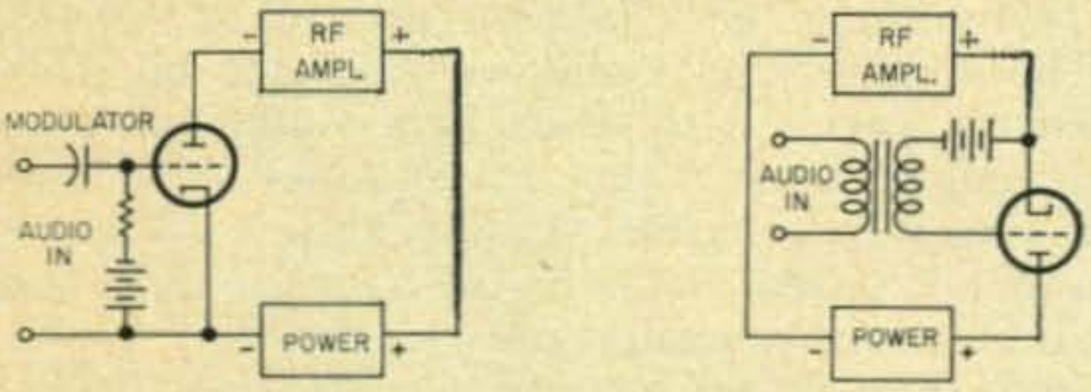


Fig. 1—A&B—Two basic methods of accomplishing series modulation.

Basically the ideal series modulator is a variable resistor which varies from zero to infinite resistance in accordance with the audio signal presented to its grid. When the grid is driven to plate current cut-off, infinite resistance is achieved, and when the modulator grid reaches zero, or cathode potential, zero resistance is approached.

If we assume an ideal modulator it is only necessary to have a power supply voltage double the rated voltage of the modulated amplifier. Then the voltage is divided equally between the modulator and the amplifier by applying the proper bias to the modulator grid. Now, as the signal voltage drives the modulator to cut-off, 100% negative peak modulation is achieved. And when the modulator is driven to zero resistance, on the other half of the cycle, all of the voltage (twice the unmodulated value) will appear at the amplifier and hence 100% positive peak modulation.

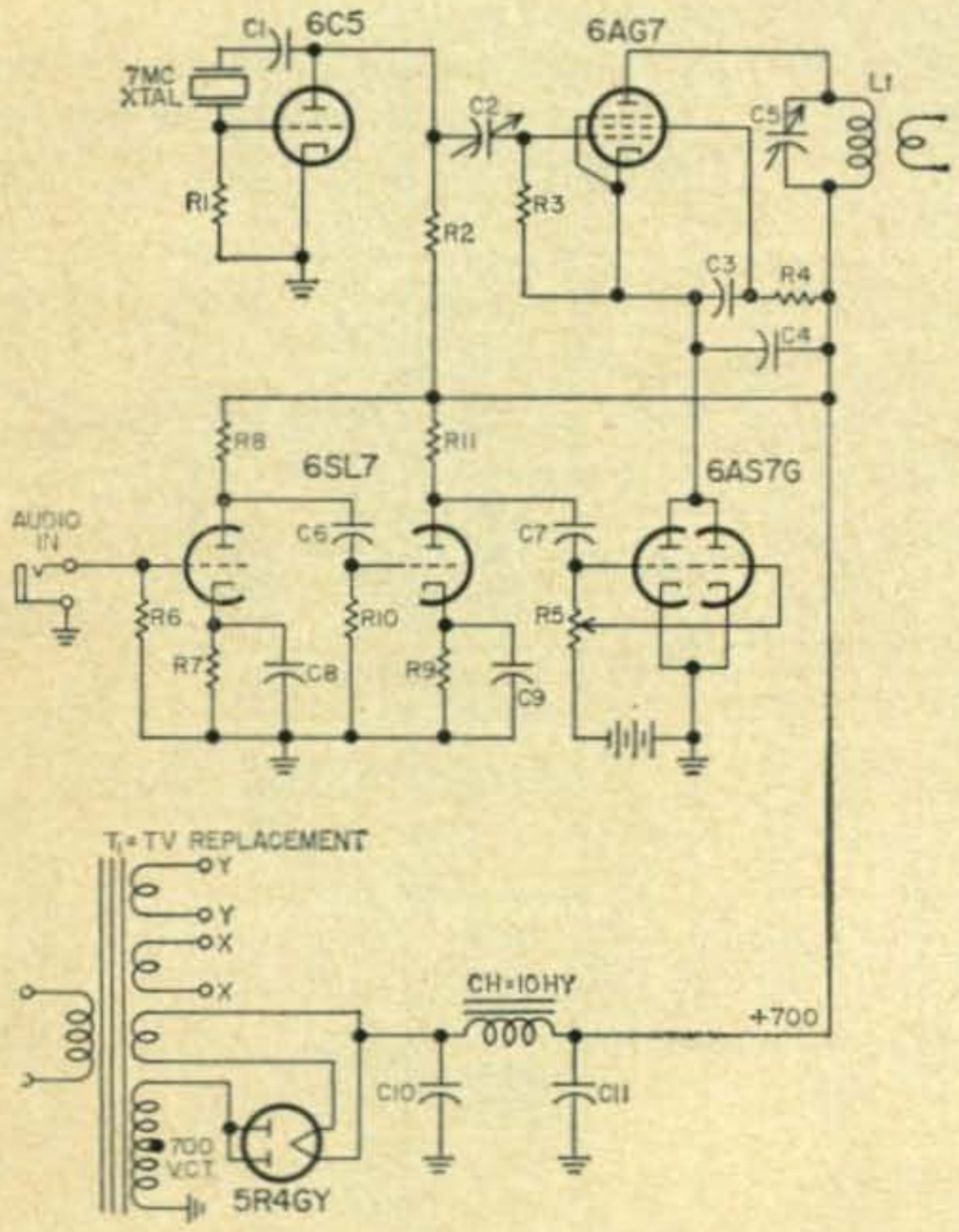


Fig. 2—A small practical transmitter employing a 6AS7 as a series modulator. Filament winding Y is for the 6AG7 and winding X is for the other tubes.

Practical Limitations

Achieving this zero resistance in a physical

Parts List

R1 —100 K ½ watt	C1 —.001 Ceramic
R2 —50 K 2 watt	C2 —7—48 Trimmer
R3 —50 K ½ watt	C3 —.01 Ceramic
R4 —10 K 10 watt	C4 —.01 Ceramic
R5 —2 watt potentiometer, 1 Meg	C5 —100 mmf
	C6 —.005 Ceramic
R6 —1 Meg ½ watt	C7 —.005 Ceramic
R7 —10 K ½ watt	C8 —.01 Ceramic
R8 —1 Meg ½ watt	C9 —.01 Ceramic
R9 —10 K ½ watt	C10—2 mf 1000 v.
R10—1 Meg ½ watt	C11—24 mf 800 v.
R11—1 Meg ½ watt	L1 —17 turns B&W 3012

triode is impossible; in fact, for most triodes the plate to cathode resistance with zero grid voltage is quite high. In order to overcome this drawback it is necessary to have *more* than twice the rated voltage of the amplifier, in the power supply. In some cases this may run close to three times the rated voltage in order to get linear 100% modulation on both peaks. For example, some years ago in order to get away from phase shift troubles, the writer used this system of modulation on a broadcast transmitter. The modulated stage operated at 1200 volts and 150 milliamps. The modulators were a pair of 304TLs and the power supply delivered 3000 volts. It might be of interest to note that the measured distortion of this system for all frequencies and percentages of modulation, with absolutely no feed back, was less than 4% While this didn't solve some other troubles it did show that the method had more merit than most books, that bother to mention it at all, give it credit for. Some books even say that the system is not capable of 100% positive peak modulation. This is untrue.

The practicality of the series modulation system for sizeable power outputs is questionable. The writer has been told that it has been used to some extent in TV transmitters in Europe. The absence of reactive elements would make for broad banding if special tubes were designed for the purpose.

A Small Practical Transmitter

The 6AS7G tube offers exceedingly low cathode to plate resistance at zero grid voltage. For any current within the rating of the tube the voltage drop is well under 50 volts. This makes series modulation quite practical. With R5, in fig. 2 adjusted to maximum signal and the bias battery adjusted so that 300 to 350 volts exists across the 6AG7 stage, nice linear modulation is easily attained.

Ultra Modulation

The possibility of accentuating the positive peaks by using a variation of series modulation was noted in the writer's article in Electronics of December 1948.[1] This article was not much read by amateurs and was written using 304TLs. Perhaps it lacked appeal for this reason. The basic idea of accentuating the positive peaks enjoys much popularity in the ham fraternity at the present time. Most of the systems employed to gain this advantage are not exactly simple. This one is *simple*.

Going back to our ideal situation, we provide three times the rated voltage in the power supply and hence on the "zero" resistance side of the cycle we get a 200% positive peak. What happens to the negative peak? If we left R5 at maximum we would have bad over modulation. BUT, instead, we drop the setting of R5 until the signal drives the associated grid not quite to cut-off. The other grid is driven past cut-off on this half of the cycle and some distortion is created but not of a nature that will cause "side splatter." On the positive half of the cycle the tube on the tapped R5 doesn't go up in the zero resistance region but the other tube does. (Actually the higher the positive peak the less dissipation on the tube.) Summarizing: The tapped down tube smoothes out the corners in the bottom of the trough on the negative peaks thereby preventing over 100% modulation. The other tube with some help from the tapped down tube produces 200% positive peaks. There are no special pulse shaping circuits or distortion "cleaner-uppers," just one little volume control!

[1] Baird "Series Over Modulation" *Electronics*, Dec., 1948.

Adjustment

Assuming about 700 volts *dc* is available, adjust the bias battery until approximately 200 volts is across the modulated stage when loaded. This may run over 300 volts of bias. While viewing the oscilloscope, apply modulation up to 200% positive peaks and adjust R5 to give just short of 100% negative peak modulation. You now have "talk power."

Comments

The voltage drop across the 6AS7G is more than the manufacturer's rating. So far ours, a discard from a TV studio, has worked fine.

The bias seems very high. Remember the 6AS7G has a mu of 2, so 300 volts doesn't seem out of line. Old batteries out of the family portable will probably work all right since there is no current requirement. Normal operation of 100% modulation on both peaks requires less battery, more plate power, generates more carrier, but does not generate more talk power.

The 6SL7 is not quite sufficient amplification, even at the voltage used, for a low level mike. The mike illustrated has a single transistor with battery in the base can.

The modulator is on the cathode side of the amplifier in order to eliminate the need for an audio transformer.

The transmitter illustrated is a product of the junk box. The power components are larger than need be. A 600 volt dynamotor, which lightly loaded usually gives more than 600 volts, might be used for a mobile unit of this kind. Separate filament for the modulated stage would have to be provided. A small 6 volt glass storage battery, chargeable when not in use, might solve this problem. The transmitter, less power, measures 5" x 7" x 7" high.

Conclusion

We dragged this one out and dusted it off. As noted, the principle was advanced over ten years ago. This article applies the idea to a small transmitter and uses the low plate resistance 6AS7G tube. It is hoped that someone may be able to further perfect the system possibly at a higher power level. ■

A Review of the Pierson KE-93 Receiver

James L. Weeks, W6FNG
Colonel, USAF (ret.)
P.O. Box 282
Wrightwood, Calif.

A 12 tube amateur receiver built on a cast aluminum chassis measuring 5⅛" high, 6⅛" wide, 9 inches deep and weighing only 10½ pounds is somewhat of an innovation even in today's state of the art in receiver design and construction. Add to this package the design "know-how" of Karl E. Pierson, W6BGH, and you have a thumbnail sketch of the Pierson KE-93 amateur receiver.

My original reason for purchasing the KE-93 was largely one of geometry—it was a better fit for the small operating area at W6FNG, an area comprising a corner of the XYL's kitchen. However, the performance of the receiver so far surpassed anything in its price range that I felt obliged to the amateur fraternity to pass along a few words (maybe a thousand or so!) via *CQ* Magazine.

The KE-93 is an "all amateur" receiver. A good pictorial view of the unit and its power supply is shown in the photo above. The KE-93 covers the broadcast band and the 6 ham bands between from 10 through 160 meters. I for one like to listen to a little music and news when the family has the TV completely tied down. There is a tuned *rf* stage, dual conversion on all bands except broadcast and 160, crystal controlled second oscillator-mixer and three stages of quadruple tuned *if*. As shipped from the factory, the receiver is set for a 3 *kc* bandwidth, flat-topped with a shape factor of better than 2:3. The shape factor is the ratio between the bandwidth measured at a point 6 *db* down on the response curve as compared to the bandwidth measured at a point 60 *db* down. An incoming signal must pass through 14 of these tuned networks. Figure 1 shows an example of how the *if* is tuned in the usual receiver and how it is tuned in the KE-93. This method of tuning the *if*'s accounts for the uniformly steep slope on the bandwidth. Such design luxury is usually found only in the more expensive receivers.

Front End

The most unique feature of the receiver is in the bandswitching mechanism. Bandswitching is accomplished by the use of a TV type turret. Why more manufacturers have not adopted this mode of coil changing is one of the mysteries of current receiver design. The drum assembly is

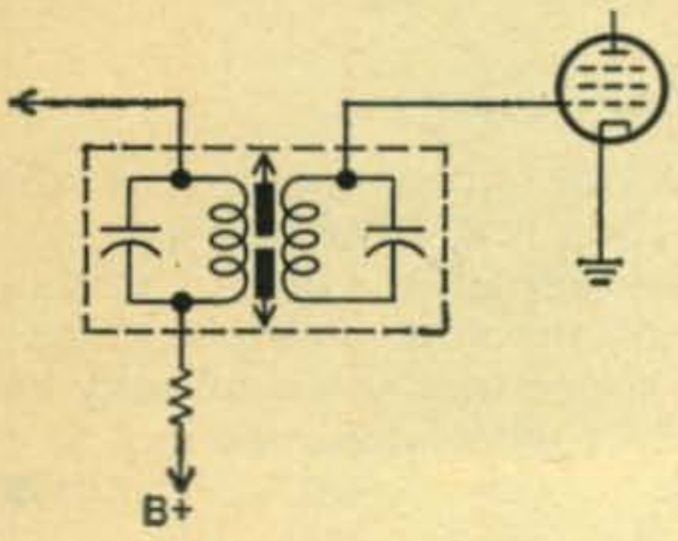
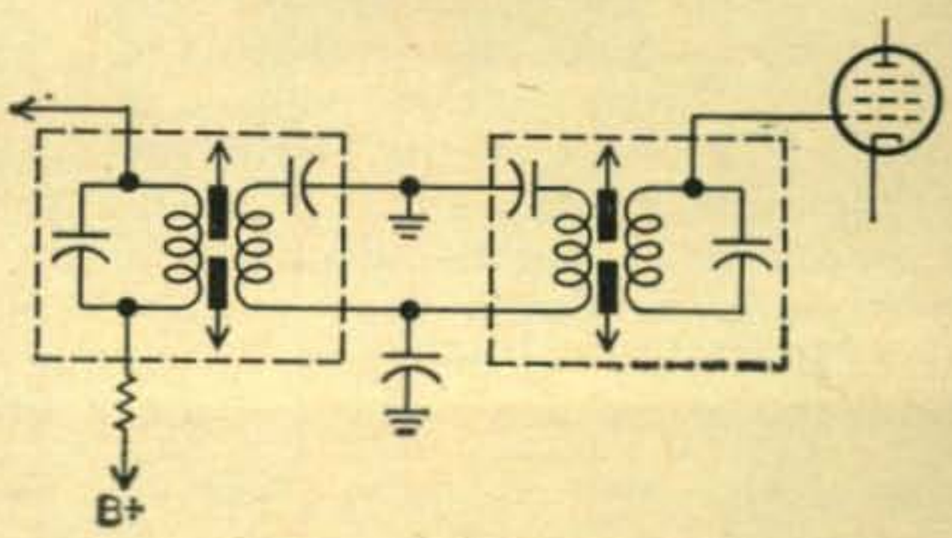


Fig. 1—Left—Conventional if coupling.

Right — KE-93 — Quadruple tuned if transformer.



made of a rigid and tough moulded mica-filled alkyd which provides optimum *rf* insulation and rigidity to coil mountings and trimmer housings. The turret drum itself is housed in a rigid, die cast frame on ball bearings. The second photo shows quite clearly how the *rf* turret is mounted and functions. The coils and trimmers associated with each band can be removed in a few seconds. This is done at no disturbance to any wiring and without benefit of frayed nerves or un-Victorian language. Did you ever try to repair or dig into the *rf* section of some receivers and retain your sanity?

I.F.

Access to the *if* section is equally easy. All of the *if* circuitry, including the noise silencer, *avc* and audio components are mounted on one small subchassis. This subchassis in effect is a "plug-in" unit. Remove a couple of machine screws, and you lift it right out of the main chassis.

Rear End

A very effective squelch and noise limiter are employed in the KE-93. Most of the medium priced receivers that I have ever used always had a switch labeled ANL, but for the life of me I never could tell much difference, if any, with the switch in or out. Hence, I was much surprised to note that the noise limiter on the KE-93 really worked without introducing serious audio distortion. On AM reception, the squelch is highly effective. You can silence the receiver so that the ambient noise level is just below the threshhold point, and no sound comes through until an actual signal is received. Unlike some receivers, the squelch on the KE-93 will *always* open on any signal that is readable.

Aside from its operating excellence, the KE-93, to me at least, shows craftsmanship and neatness rarely found, if ever, these days except in the $600.00 plus receivers. Machined aluminum knobs, sprocket-chain driven dial drum, cabled and laced wiring are but a few of the things that give the KE-93 a truly professional look. Too many medium priced receivers these days look like a "plate of spaghetti" on the underneath side of the chassis.

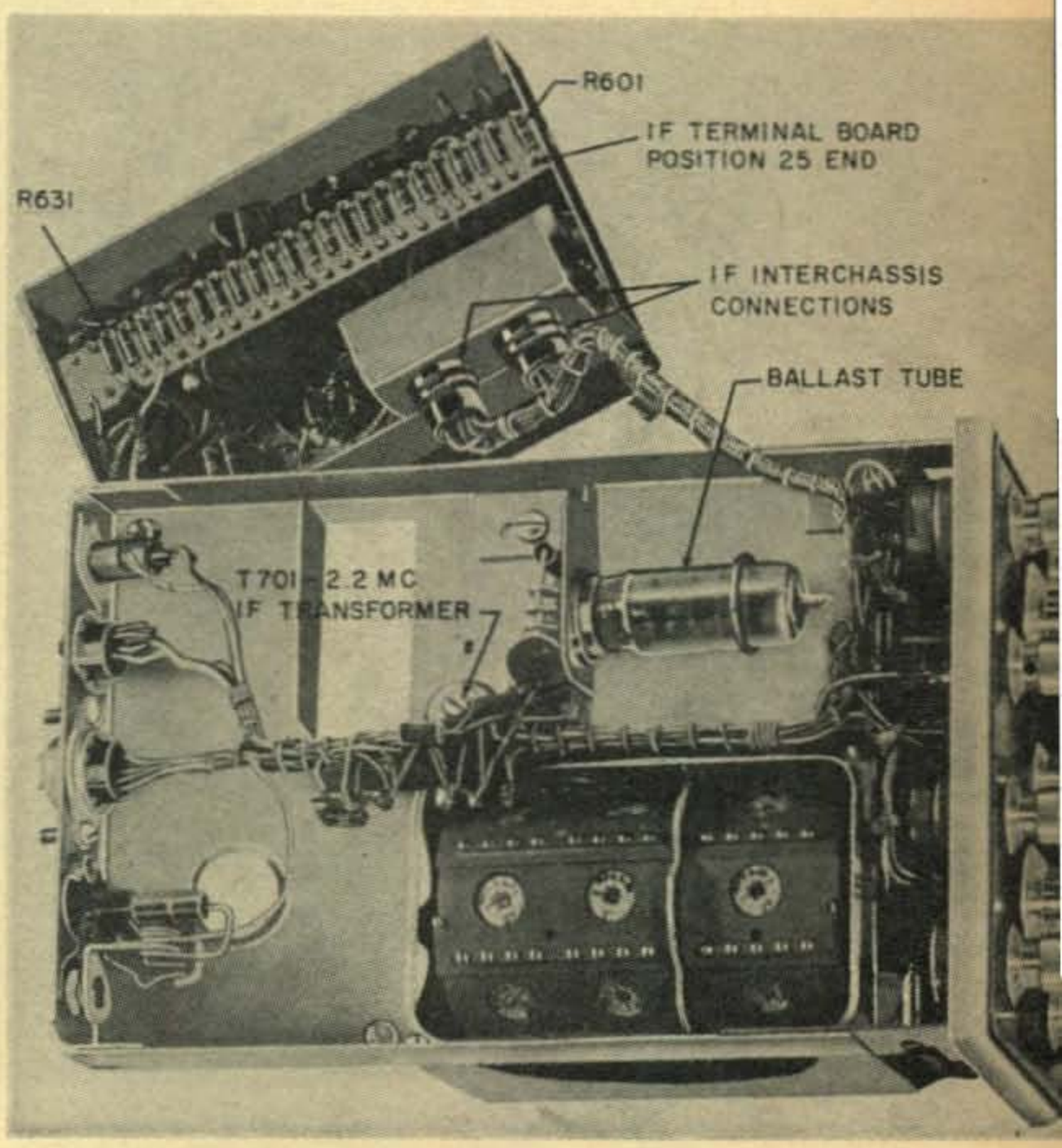
This receiver is exceptionally good on either CW or SSB. Most receivers that I have used in the KE-93's price range begin to lose gain from 20 meters on down. Many of them were for all intents and purposes "dead" on 10. Those which did give signals on 10 were subject to loss of the signal when the receiver was bumped or in any way subjected to mechanical vibration. With my KE-93 on 10 meters, I can drop the receiver several inches or pound it with my fist and have no noticeable effect on an incoming CW or SSB signal.

For the SSB man, the KE-93 has a feature not found on many receivers regardless of cost. Good VOX operation requires instantaneous disabling and recovery of the receiver. Most receivers break the –B to one or more stages of the receiver. While this method is effective, it is not by far the most satisfactory. Tubes cool when the plate voltage is removed and drift is the inevitable result. The KE-93 has a plug on the rear for connecting to the VOX relay so that the receiver is instantaneously blanketed; yet all voltages on the tubes remains normal.

My chief complaint with the receiver is the lack of audio for the headphones. I seldom use a speaker because the XYL complains of the noise. I like to sometimes hang the "cans" around my neck or push them up on my temples. This means a lot of audio. The KE-93 develops plenty of audio; but, like so many current design receivers, headphones were an afterthought. In the KE-93 the output transformer from the 6AQ5 audio output tube has an 8 ohm secondary to match the voice coil of the integral speaker. When the headphones are plugged in, the 8 ohm secondary of the output transformer is switched to the headphone jack and at the same time a 12 ohm resistor is shunted across the headphones. While this arrangement keeps the 8 ohm secondary of the output transformer looking into roughly 8 ohms, most of the signal goes to ground via the 12 ohm resistor. If you do not wear earphones or like your cans to rattle loudly, the headphone volume is probably more than adequate.

As manuals go, the one furnished with the receiver is probably better than average, but several of the schematics are not too clearly presented for the newcomer in the game. The literal description of circuitry functions is much too brief. Especially good, however, is the section on trouble shooting and *rf*/*if* alignment.

If I gave my reader the impression that I am sold on my KE-93, believe me you are right! ■



Mounting The HT-32

Bill LaHiff, W2IVT
180 Van Cortlandt Park South
New York 63, N. Y.

For the past three years I have enjoyed the convenience of a six foot open rack which housed the HT-32, 75A3, GG 813's and associated gear. A rack type desk completed the assembly and I believed the set-up to be truly beautiful as did the visiting hams. It looked mighty powerful, like a VOA installation, and I really enjoyed hanging the haywire in the rear of the rack.

I don't know how it came to be, perhaps the XYL was in a benevolent mood (for three years?) but she never complained, even though the rack was installed in the not so master bedroom of our apartment. But as they say "crime does not pay" and eventually came the day of reckoning. The XYL decided to re-decorate the bedroom and issued orders that the rack must go. Because she is a Girl Scout Leader and has developed a method of command which cannot be ignored I made quick to bargain with her. She agreed that I could install the HT-32 and 75A3 on a desk but without the "hay" or "wire" or whatever. Of course, she stipulated that the desk must harmonize with the proposed furniture.

After a rough week trying to convince Department of Defense personnel that our firm is the one and only good electronic facility I returned home on a Friday night with my morale hovering at −30 decibels. But that was nothing! One glance at the new desk and even a Maser couldn't detect my morale. I placed the bug on the desk and it moaned. I installed the loudspeaker and the desk groaned. Thinking I could wreck the darn thing I boldly threw the 75A3 atop the desk. The legs held but the mechanical stress was evident, even the lime oak finish cracked. There was no room for the HT-32, a sad fact, because this last of the environmental tests would have proven grounds for rejection, for sure.

The following day I hooked the gear up and went on the air. The HT-32 sat on the floor and I tuned to zero-beat with my bared toes. If I were younger I probably could have continued operation in this manner but keeping the transmitter within 40 cycles of the net caused a severe cramp in my ankle. Something had to be done, so I reverted to an unusual process for solution . . . thought.

Because someone once told me it was the thing to do I read the Sunday Times from front to back. It's supposed to be educational, and in this case it was. I discovered these modernistic furniture legs made of oak or something. The rest was easy.

I purchased the legs, removed the rubber feet from the HT-32 cabinet and mounted the hardware associated with the legs on the cabinet, using some of the holes intended for the rubber feet. Of course I had to drill a few more holes, but Harvey won't notice it when I trade it in. A coat of a marvelous new flat black paint, Satin Impervo out of Benjamin Moore and Company, applied to the legs made them look like metal. I screwed the legs on and presto. . . . The HT-32 Consolette.

The XYL has explained to the neighbors that the gadget is a new type of television set and the TVI complaints have dwindled to zero. Looks like the legs work better than chokes and bypasses, eh? ■

The "HT-32 Consolette".

DX DX DX DX DX DX DX DX

Urban Le Jeune, Jr., W2DEC
416 North 15th St., Kenilworth, N. J.

FLASH W2AYN and W3ZA have secured permission to operate from Iran. US amateurs may contact W2AYN/EP and W3ZA/EP. This does not mean, however, that any other EP stations may be contacted. Tks W4GF, FCC.

The following certificates were issued between March 15th, 1960 and April 14th, 1960:

WAZ

1321	KØBIT	Peter W. Dahl
1322	4X4FQ	Aron Slomin
1323	W6DIX	K. D. Wilson
1324	G6UT	T. A. St. Johnston
1325	VE7CE	R. J. M. Gauvreau
1326	W8FRW	Gerald L. Ryan
1327	K2DSW	Bob Panek
1328	VK4AL	Everett R. Brown
1329	DL1YA	Hans Schleifenbaum
1330	G3JZK	George Sassoon
1331	W8NJC	Clayton Baenziger
1332	W2RDD	Jim Cronn
1333	G2AOL	W. S. Hall
1334	K6DDO	David Morgan
1335	JA2DW	Masakazu Yoshida
1336	ST2AR	Eric Dowdeswell
1337	K4SXR	Emmett O. Herman
1338	W6PHN	Kenneth R. Walker
1339	K8LSG	Roger W. DeBusk
1340	K1MLI	Gordon Orelli
1341	W9GFF	E. P. Frohardt, Jr.
1342	K9PJN	William A. Pope
1343	W9TPA	Robert W. Davy
1344	W6OF	E. L. Lamoureux

ALL-PHONE WAZ

56	W2APF	David L. Marks
57	SM5LL	Hilding Andersson
58	G8KS	Les Hill

CW WPX

105	DL9KP	Paul Kleinholz
106	W2GVX	J. P. Jessup
107	LA6CF	Jorgen S. Aabech
108	OH3TH	Pertti H. Mure
109	K8IKB	Dan Redman
110	WØAUB	W. J. Bergmann
111	W7TPE	Richard Gerbering
112	SM7TQ	Gustav G. Johansson

PHONE WPX

14	W3DJZ	Arden B. Hopple
15	W9PQA	Loren F. Ashwood

SSB WPX

26	W4OPM	Chas. J. Hiller
27	W8JXY	Chester W. Bolg
28	K6HZP	Joel E. Clark

WPX Honor Roll

CW PX

W2HMJ	553	K6SXA	400	VE3DIF	357
W6KG	514	W1EQ	400	DL7CS	356
W5KC	461	W2MUM	400	KL7MF	356
K6CQM	455	W9UXO	390	W5OLG	356
W1NLM	455	W3BQA	385	W6WO	356
W8KPL	453	K4JVE	377	W8LY	354
W2EQS	429	W2PTD	374	K9AGB	354
OK1MB	428	W9YSX	368	W5AWT	353
W4OPM	411	W9DYG	367	WØPGI	353
W5AFX	407	W4AZK	365	W5DA	351
W8JIN	403	W9QGR	361	VK3KB	350

Phone WPX

W8WT	485	PAØHBO	363	W5ERY	315
G3DO	432	PY2CK	354	W3DJZ	306
CT1PK	431	5A5TO	353	ZP5CF	306

SSB WPX

TI2HP	231	K2MGE	203	DL4AS	166
HB9TL	221	W1GR	203	W3MAC	165
K9EAB	204	W6BAF	170	VE3MR	164

In the past certificate applications and requests for WPX endorsements have been accepted until the 15th of the month. However, due to tightened deadlines, it is necessary to request that all cards reach me before the 10th of the month. All cards received after the 10th of the month will be in the following issue. Please send all cards for WAZ, WPX and WPX endorsements *directly* to me at the address shown at the beginning of this column.

Letters

The following was received from VE2AFC:

"This coming summer I am planning a DXpedition to Sin Marten, French part of it (FS) and would like to know if any of the *CQ* readers would like to join me (and YL). Tonight I am writing to Mr. Malandain at N. Y. to know the procedures to get a call down there. Being a member of the R. E. F. (the French Radio Society) I don't think it should be too hard and Canada gives reciprocity to French immigrants.

My station consists of a Viking Valiant and a GPR-90 which would be a little too big to carry, so if you could, by means of *CQ* magazine, find any chap who had something lighter to take with him, I am willing to QSY to FS land for at least 2 weeks, to each his own: we each pay our own expenses and we QSL without respect of IRC or not. I can in that case take care of the cards myself and handle the service.

In 1957 I went to Martinique and operated FM7WQ for a whole week with excellent results. As I expect to attend the DX Convention in August, I would rather like to go around the 15th of August till the end of the month."

Anyone who would be interested can reach Alex at:

Alex Desmeules
P. O. Box 382
Quebec City, Que., Canada

Earl, DL4ZX (KØHUL) sends the following information:

"The Luxembourg government has most kindly approved an expedition for the period of 16-19 June 1960, and has provided the following calls for use:

	Name	German Call
LX3ZW	Betty McSwain	DL4ZW
LX3ZX	Earl McSwain	DL4ZX
LX3EN	Guenter Heinzen	DL6EN
LX3EQ	Rudie Brumm	DL6EQ
LX3JW	Hubert Esser	DL1JW
LX3HD	Hilmuth Beilmann	DL3HD

Presently there are approximately 23 stations operating in Luxembourg, all but one being on AM. This situation has provided little opportunity to work LX calls on SSB or CW. This expedition will provide both and on the following bands: 15, 20, 40, and 80 meters. Highly qualified CW operators are available. It is also interesting that LX3ZW is most probably the only XYL operating with an LX call.

The following information (rules) is announced and will be adhered to, if at all possible, in order to provide maximum opportunity for contacts.

1. Stations calling are requested to call on a frequency other than that used by the LX station.
2. CW operation will be on or as close to the following frequencies: 14080, 21080.
3. SSB operation will be above 14300, 21400.

Two stations will be operated on a 24 hour basis. One station being composed of an SX 100

This is the group that is going to Luxembourg this month. From left to right, sitting, DL3HD and DL4ZW; standing DL4ZX, DL6EN, DL1JW and DL6EQ. See text for details.

The gang that went to Rathlen Island which is where many firsts were made in short wave history. In front is SWL Simon and GI3MUS, ex VS9AT, in the back is SWL Dave, GI3HXV, GI3LZS, GI5UR, GI3KYP, GI3NEB, GI3KVQ, and GI3ILV in the usual order.

When we talk about DX the topic will shortly turn to this good-looking chap, who is none other than JT1AB. Thanks to K9EAB for this fine foto.

This is Ben, JA5AI, who has one of the best-known signals from the Far East. (Tnx K2IEG)

and an HT 32, the other being a Geloso receiver and a home-built transmitter. Both transmitters are capable of CW and SSB operation.

QSL's are to be sent to DL6EN or DL6EQ. 100% reply on receipt of QSL cards."

Who, Where and What

EP Iran—W2AYN has been putting the boys into a dither operating as W2AYN/EP. No official word yet but EP is still listed on the ban list although 3W was on the ban list all the while we were permitted to work W3ZA/3W. Frank, W2AYN/EP has been on 14070 *kc* about 0100 GMT with a T7 note.

JZØ Netherlands New Guinea—JZØHA is now on SSB crystal controlled on 14190 *kc* between 1100 and 1700 GMT. (Tnx WGDXC)

VK5 Northern Territory—VK5's BP, DY, NO and NQ will operate VK5BP/NT during September. Northern Territory has no licensed operators at present so the VK5BP/NT activity for Alice Springs should prove to be very popular. (Tnx W4ORT)

VK9 Cocos Island—VK9HC is now active from Cocos Island on 14090. (Tnx WGDXC)

. . . Rumor has it that HB9JC will try to operate from CR1Ø soon . . . CR1ØAA, who is now on leave in CT1 land, will return to CR1Ø soon . . . W3ZA of W2ZA/3W and XV5A fame is now OD5CT. He will travel quite a bit in that area and expects to operate from EP, HZ, 4W1, etc. with a KWM1 or 2. (Tnx OVARA) . . . People like HL9KT, ZK1BS, KH6BGS, VQ6-FB, ZL3HJ, OA5G, and PAØFB are driving the Ohio Valley boys to RTTY with a vengeance. They report Danny is taking RTTY kear with him . . . ZD9AC has returned to the mainland, leaving Tristan da Cunha hamless unless Nick's replacement is a ham (Tnx WGDXC) . . . ex VK9AD is now VK3AWX and ex VR3A is now VK2ANB (Tnx WGDXC) . . . The Ted Henry SSB rig, which is presently being used by FB8CJ, is due to go to the Comoros next where it will be used by FB8CJ and FB8GC then return to Reunion Island to be used by FR7ZD, and then to VQ8 land. (Tnx W2FXN) . . . 9N1GW cards are now handled by the Ace Radio Club, c/o Cook Electric Co., Box 9136, Wash., D. C.

. . . XW8AI is now FG7XG . . . XZ2OM's present QTH was listed incorrectly. Try him at this QTH: Capt. A. Myint, BAF 1064, OMR-#117, Sqdn 3401, Keesler A. F. B., Biloxi, Miss. (Tnx W4LYVes XZ2OM) . . . It does not look as though OK7HZ will get permission to operate from Yemen . . . Tnx to W8YIN for the following: VK4DD, who is in contact with Willis Island, declares that there will be no DXpeditions made there because of rigid security regulations and that none of the scientific weathermen there, who will not be rotated before 1962, are hams . . . SSB activity is expected shortly from ST2AR, KJ6BB and K6CQV/KS6. UQ2AN, OE1RZ, HS1B, EAØ-AC, KC6AQ (West), and TA3GI are already active. KC6AQ is active mainly on Thursdays around 1300 GMT, EAØAC prefers 14303 *kc* and 1330 GMT-Tnx Mickey . . . Tom, W8PBU, the new editor of the OVARA's Ether Waves, is doing a very fb job . . . VR3Z is ex DL2MZ and G3DAF, QSL via RSGB (Tnx W6KG) . . . W4KWC, the QSL manager for FO8AC, has a new QTH, which is as follows: Ed Brittain, Route #1, Hampton, Georgia. The logs are a little slow in coming from FO8AC, so Ed asks that the gang be a little patient . . . CN8JX is now QRT. Glenn hopes to have W7GGO set to go around July 1st. His new QTH is: Maj. Glenn Luse, E 1707 Bridgeport Ave. Spokane, Washington. Glenn has quite a few CN8JX cards left over so anyone needing one drop him a line . . . 160 Meters: Vic, W4KFC as KS4AZ, and Bob, WØNWX as VP1JH, did a fine job on 160 during the ARRL DX Contest. HC4IE and VP5FP/Turks were also active . . . W1IGU flies a kite! "The kite flew high last night, Feb. 21, I should say BOTH kites because it took two to lift the load. I started in about 11:30 P.M. to let the wire out and it took nearly half an hour to reach 500 feet at an 88 degree angle. I used it first to listen and the W's were solid. But a funny thing, above 500 feet the W1 and W2 boys began to drop in signal strength and at 560 feet (#26 wire) the locals had gone down in S reading and the DX, other than W1, 2, 3 had increased so that they were QRMing the previously R9 Plus boys!

Mike, UA1-716 and his listening station. In Leningrad, Mike is one of the operators of UA1KAS. (Tnx K2UKQ)

Here is mobile DX DU style, DU1RC has had 21 JA QSO on 50 mc with this rig. DU1RC, who is an M.D., uses this rig on some of his calls. (Tnx DU1RTI)

NEXT, I put a second KITE at the 550 mark and let out to 1185 feet and 85 degrees. At this time, about an hour or so after the first try, the 1, 2, 3 stations were nearly out. I heard W1BB, 1802 *kc*, a little later at S4 and W1PPN at S3 but VP1JH was 589 and QRMing W8s, NBD and W9PNE. VE1ZZ was S7 as was VE1HO. At 1.20 AM EST just at noise level 1832 *kc*, a station called G8AR? but went down as the kite began to come down. Because QRL listening and watching kites only 4 transmissions were made. The field strength meter on long vertical shows very low but maybe it was stronger at distance. On the listening end it was wonderful—the noise level goes down as do the 500 mile radius signals, but beyond that they increase so long as the kite is nearly 90 degrees. The trouble is the division point of about 600 feet of #26 wire, and the wind has to be strong to lift 1100 feet and keep it at 90 degrees, especially at the TEST hours. The wire alone is over ½ lb. I strongly suggest greater effort with the vertical on 160. The one used this AM was end fed thru a Pi network, but with other lifting devices perhaps hydrogen filled balloon, it should be possible, maybe, to center feed a long vertical to see how it works. Anyone trying to fly a kite at midnight should be warned—the neighbors will think the Ham is crazy! I live in a very small place and the solid citizens clear a path for me at the combination store and P.O. ("I" above refers to W1IGU)

Certificates

Stan Cable, KA2LP, the Awards Manager of the FEARL (M) lists the following awards issued by the FEARL:

Award: Worked Five KA stations (WFKAS)
Awarded By: Far East Auxiliary Radio League (M)
Address: Awards Manager, FEARL (M), APO 994, San Francisco, California
Requirements: Contact with 5 (KA) stations (JA and WA QSL's are not acceptable)
Application: Send QSL's or letter signed by officer of recognized club, notary public or responsible public or military official that he has checked the QSL's
Charge: Return postage if QSL's submitted.
Indorsement: Indorsement for 2 way SSB and worked all stations on same band either 10, 15 or 20 meters. Application and charge same as above

Award: Worked Twenty-five KA Stations (WTFKAS)
Awarded By: Far East Auxiliary Radio League (M)
Address: Awards Manager FEARL (M), APO 994, San Francisco, California
Requirements: Contact with 25 (KA) stations (JA and WA QSL's are not acceptable)
Application: Send QSL's or letter signed by officer of recognized club, notary public or responsible public or military official that he has checked QSL's
Charge: Return postage if QSL's submitted
Indorsement: Indorsement for 2 way SSB, worked all stations on same band either 10, 15, or 20 meters and for each additional 25 stations worked. Application and charge same as above.
Comment: No time, band or mode of transmission limitation except 2 way SSB and band Indorsements.

The following number of certificates have been issued:

WFKAS	546
WTFKAS	106
WSKAD	166
WFKAS	2 w SSB 12
WTFKAS	2 w SSB 0
All on One Band	
WFKAS	15
WTFKAS	4
WTFKAS w/Ind for 50 sta.	1

The WSKAD award is no longer issued because there is no KA3, 4, 6 or Ø activity.

QTH's

Tnx to W6KG, W8YIN, W2LPE, WGDXC, NCDXC, SCDXC, WVDXC, FEARL (M) and the OVARA for the following list:—

BV1USE	via W9HCR
BV1USB	op Chad via W5 bureau
ETE3CE	via W9ZQF
FB8CJ	Box 730, Tananarive, Madagascar or via W6BAF
FF8CP	Box 5098, Dakar, French West Africa
FM7WU	via W9YSX
FQ8HK	Box 919, Brazzaville, French Equatorial Africa
HP1HC	P. O. Box 3523, Panama City, Republic of Panama
HP1LO	Box 4864, Panama City, Panama
HZ1TA	Box 195, Riyadh, Saudi Arabia
I5TUF	P. O. Box 16, Mogadiscio, Italian Somaliland
KC6AQ	Roman Catholic Mission, Koror Is. W. Carolines Territory
KG6CY	Box 445, Agana, Guam
KP4KC	Box 8786, San Juan, P. R.
LA6CF/MM	via W6 QSL Bureau
LU7ZL	Demetria Luizon, Dolores 186, Buenos Aires, Argentina
UA3DR	P. O. Box 111, Moscow, U. S. S. R.
UA3FG	P. O. Box 570, Moscow, U. S. S. R.
VK9HG	Joe, c/o Cable Station, Cocos Island, Indian Ocean
VK9TK	Karu, c/o P. O. Kavieng, New Ireland, T. N. G.
VKØPM	via VK4PM
VP2ML	via K4SXO
VP3IG	P. O. Box 331, Georgetown, British Guiana
VP7BI	via W4ISH
VP7NY	P. O. Box 1007, Nassau, Bahama Islands
VR3A	R. J. Baty, VK2ANB, 41 Lawson Parade, St. Ives, Sydney
XZ2AD	via WØUUV
YN4AB	QSL via K4ASU
YA1BW	via DL8AX
ZB1FA	via W2CTN
ZD1RO	Box 54, Freetown, Sierra Leone
ex-ZD9AC	N. W. Meyer, "Dunmar" Goya Road, De La Haye, Bellville Cape, S. Africa
ZL3VH/3	J. Pye-Smith, c/o S. D. Signals Troop Poulston St., Christchurch, N. Z.
ZS3X	via W1DGJ
ZS6IF	Lambert Ledoux, 101 Lyndhurst Road, Lindhurst (Johannesbourg), South Africa Union
ZS7P	P. O. Box 3650, Johannesburg, So. Africa

73, Urb, W2DEC

ham clinic

CHARLES J. SCHAUERS, F7FE/W6QLV

CQ Magazine, 300 West 43rd St., New York 36, N. Y.

Learning the "New" Phonetics

A number of requests have been received for copies of the ICAO-NATO phonetic alphabet that has been adopted for *world-wide* use. I believe the easiest way to learn it, is to incorporate the 26 letters of the alphabet into a story using a minimum number of words.

If, after reading over the "story" here you feel that you can do better with fewer words (and still make sense), sit down and write one up. Send it into HAM CLINIC. I will pay the $25.00 that no one won for the scope book name.

This will be a "one-shot" deal—no entries will be acknowledged or returned. The winner will be announced in the August issue. Duplicate payment will not be made—entries received first will be judged first. If space permits, the winner will have his entry published here.

Shortness, cleverness, neatness, etc., *count*. Why not give it a whirl?

Here's my story:

It all started one night last *N*OVEMBER at a *H*OTEL called the "*S*IERRA *A*LPHA." A girl had just finished dancing the *T*ANGO with her boyfriend *O*SCAR. "I'm very happy the *X*-RAY of your dog's leg is negative," she said starting to lead him to their table.

As he began his reply, a tall sleek looking chap suddenly appeared. "May I dance the next *F*OXTROT with you?" he asked a little unsteadily.

"I never dance with anyone who drinks too much *W*HISKEY," she replied.

"Yea, get going '*R*OMEO' or I'll call *M*IKE, the bouncer," her companion in *U*NIFORM said angrily.

"*B*RAVO!" bellowed a man from *Q*UEBEC called CHARLEY, "tell him where to head-in!"

At that, a fight broke out.

"Get the *Y*ANKEE!" someone called.

"No, hand me that *G*OLF club," a man from *L*IMA hollered.

One of the ladies dumped about a *K*ILO of ice from a champagne bucket on the floor—then fun really began!

"That woman is a ZULU!" screamed a man as he skidded across the floor on a chunk of ice.

"*P*APA—where are you?" the girl screamed.

"I'm on my way to *I*NDIA," a voice near the door replied. "Come on, there won't be a *V*ICTOR in the bunch."

As they drove off towards the **D**ELTA, they could still hear the *E*CHO of crashing bottles—all caused by a man merely asking *J*ULIETTE for a dance.

Serious Note to Manufacturers

Equipment modification is inevitable; if this was not true, there would be very little technical progress.

New equipment eventually becomes second, third or even fourth hand—very little of it ever ends up in the city dump.

Although it may be argued that the manufacturer's interest in the equipment he has sold ends with the first buyer, I do not wholly agree.

HAM CLINIC constantly receives requests for modification information on used equipment (and some new) from reader owners that cannot *always* be supplied—because we simply do not have it.

I advocate either factory or authorized service agency modification of equipment—but I do think that there are many hams who can do most modifications themselves—if guided properly. This can only be done if manufacturers cooperate by furnishing the necessary information.

When one owner receives factory modification information and another does not–bad public relations are bound to ensue. This applies to old as well as new equipment.

By making certain that HAM CLINIC is on the service mailing list, a manufacturer is certain of receiving proper publicity for any set modifications that he might make. In this way he helps the original as well as subsequent owners of his equipment.

It is very true that *some* modifications cannot be made by the average ham who lacks proper test equipment. In this case, those interested are encouraged to contact nearby *authorized* factory service organizations. This *is* publicity that would not otherwise be available to these agencies. The thought that publicity for modifications would cut out some of the factory service business is NOT a correct one; because how can a ham know that modifications are available to make his set perform better, unless this information is carried in HAM CLINIC?! This being especially true of the second or third-hand owner.

A manufacturer not only sells a product, he

sells his NAME. His product carries his name until it (the set) does become inoperative or discarded. By making modification information *public*, it is my belief that a manufacturer enhances his sales position by demonstrating his willingness to help *all* who possess his equipment.

Modifications made to equipment *do not* indicate a lack of proper engineering—no one is perfect; electronic parts do fail; new circuit designs are "discovered" every day. When the time comes that a set never needs modification or cannot be improved, we will all be communicating via ESP (extra-sensory perception)!

So if you are a manufacturer of ham gear and you *know* that HAM CLINIC is *not* on your list and you are ready to give your engineering changes, operating hints etc., *proper* publicity, then shoot them to me. They will be appreciated by the ham fraternity at large and indicate that you are interested in just a little more than selling your product. How about a little cooperation?

Observation (On QSL Cards)

Exchanging QSL cards can be a pleasant hobby within a hobby; and for many hams it is just that.

Some hams are also stamp collectors—this fine hobby is a natural for them. But when QSL card collecting becomes a *mania* (as it has with some hams), it is no longer pleasant and can become an aggravating nuisance.

For every ham to expect a card for *every* new contact is asking too much.

Personally, I'll answer all cards received and will send a card when one is requested—but that is where it ends.

Some of the pleas (please) one hears over the air for cards are often sickening. One would think that the requesting operator needs QSLs for life-saving purposes! Have they no dignity or pride?!!

Another thing: I have heard a *few* American hams complain that a certain DX station seldom if ever QSL'd; they were mighty vociferous about this. But a little "research" on their part would disclose that the DX ham in question is on the air "by the skin of his teeth." He is the guy who has a hard roll and a cup of black coffee for breakfast; soup and brown bread for lunch—ditto for dinner (and if he is lucky—a piece of meat). His pride prevents him from telling you that he earns all of $2.65 per day and that his butter costs the equivalent of about $1.80 per pound.

This DX ham saves his pennies for electricity. Would *you*, in his position, work for nearly 30 minutes to obtain and send out one QSL card, let alone buy a ham publication? Maybe you would—but think it over!

Not all DX stations are as bad off as the fellow just described, but before you criticize, make sure of your facts.

It is hard to realize how unfortunate some people are in this wide-wide world!

Some American hams I know have exhibited the true *HAM SPIRIT* by sending a rare DX station operator some QSL cards; in this way they have helped many others to get cards that would otherwise really not be available.

I, like most of you, detest the "QSL grab attitude" of many fellow-hams—*they* feel that they have a RIGHT to receive one regardless of the circumstances—to this I say "bosh"!

Observed: QSL cards are an important part of the hobby of ham radio—QSL bureaus do work hard and *Mr. Average Ham* takes his collecting quite seriously. But there are some hams who need some instruction in *courtesy* and *thoughtfulness*. A tip to those who are experiencing trouble getting a confirmation with a *rare one:* enclose with your card, an International reply coupon in an envelope with this note: "My dear Mayor: I would deem it an honor if you would convey the enclosed radio verification card to Mr. . . . . , operator of radio station . . . . . and express to him my appreciation for his contact and his contribution to International Goodwill. Thank you." It works! Remember: every town and hamlet throughout the world has a mayor or burgermeister. These fellows are important and *most* of them *are* for PEACE AND FRIENDSHIP —IN FREEDOM (72).

Questions

Apache VFO. For those of you who might have received condensers for your TX-1 *vfo* from a bad production run or mica type units, replace them with ceramic NPO units to reduce drift caused by heating. *Heath* will be glad to supply you with the capacitors *if* your set happens to be one that drifts. Please note that HAM CLINIC has only received *1* complaint relative to TX-1 drift.

If you wish to obtain the capacitors locally and install them do this: obtain 1-24 mmf; 1-56 mmf and 1-75 mmf NPO ceramic capacitors and 3-4.7 mmf N750 capacitors; all 5% units.

Remove the capacitors from the 80 meter section; install a 4.7 mmf N750 and a 24 mmf NPO.

Remove the capacitors from the 40-10 meter section; install a 4.7 mmf N750 and a 56 mmf NPO.

Remove the capacitors from the 20-15 meter section; install a 4.7 mmf N750 and 75 mmf NPO. Be *careful,* when installing these capacitors, to avoid damage due to overheating. Heat sink the connections with a pair of long nose pliers, hemostat, etc. Consult your instruction manual for *exact* placement. Reinstall and recalibrate the *vfo* according to instructions. She'll be real *steady—if* you made sure that you constructed the *vfo* exactly as the manual told you to. Long loose wires, poor connections, *wrong* tube heat-shield, etc., and you may have drift. I've had no trouble in this "department" *with* the TX-1 I bought.

Bandspread Dial Kit. "I understand that *HAMMARLUND* is making available a bandspread dial kit for the Hammarlund HQ129X and the HQ120X. Is this true? How much is it and is it easy to install?"

Yes, $3.85 (post-paid) will get you a bandspread dial kit for the sets mentioned, direct from Hammarlund. This new bandspread dial is calibrated for the ranges of 3.5-4.0 *mc*, 7.0-7.3 *mc*, 14.0-14.4 *mc*, 20.9-21 *mc* and 28.0-30.0 *mc*. The kit includes a dial, dial disk and hub assembly, hardware and instructions. It is a cinch to install.

AF-68–G-77. "I wish to go mobile *(am)* and would like to run 60-75 watts input to a transmitter that will fit the space available under the dash of my car. I figure that a transmitter about 14¼" wide, 6¾" high and about 8¼" deep will be ideal. What transmitter do you personally recommend which will come close to fitting my specifications?"

Try the AF68 by *Multi-Products* or the G-77 by *Gonset*. The AF68 gives you 6 meters too. Take your pick!

Meter Resistance. "How do I find out what the internal resistance of a surplus 0-100 milliameter is?"

You can write to the manufacturer (if he is still in business) or do this: connect the *ma* in series with a flashlight cell (1½ volts) and a rheostat (say 50 ohms); adjust the rheostat to get a full scale reading on the meter. Then, *across* the meter, connect another rheostat (up to 100 ohms) and adjust it so that the meter reads ½ scale. Remove the 100 ohm rheostat now (being careful not to disturb its setting) and, using a ohmmeter (on low range), measure the resistance that it took to halve the meter full scale reading. The ohmmeter will give you the internal resistance of the meter. Be dern sure all the first rheostat's resistance is IN when you start, otherwise your meter may go "poof." Don't try checking meter resistance with an ohmmeter that uses a high voltage battery and which contains no zero adjustment. There are other methods for determining internal resistance of a meter, but I like this one.

Signals On Scope. "Without an elaborate setup, can you give me a diagram showing how I can connect my scope to my receiver to give me an idea of what incoming signals look like?"

Sure. See fig. 1. Also read WØRF's fine article, "The Pan-Scope" in February 1960 CQ; you'll find it on page 46.

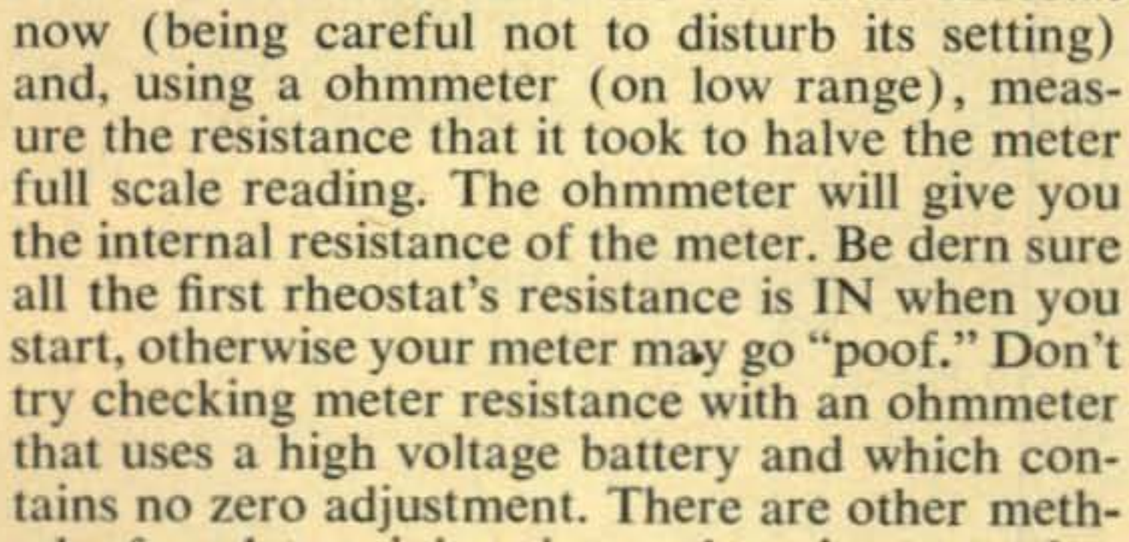


Fig. 1—How to connect a scope to a receiver to indicate incoming signals.

After installation of the probe, you may have to re-align the *if* stage that it is connected to a little.

TX-1 Meter Reading. "When my TX-1 is on *am* I note that when I flip the operations switch to standby the final plate current will begin its descent to zero—go there and then flip up to around 50 mils or so before it dies down. Of course there is a 'bloop' in the receiver when this happens. What's wrong?"

Replace a 470K ½ watt resistor with a 1 watt unit of around 750K. This resistor ties in at the bottom of the 500K clamp pot in the grid of the 6AQ5 and the other end goes to the center of the 15K bleeders and the two 125 mf filter condensers. If your transmitter has not been operated in the SSB mode, you more than likely will not notice the meter "flipping" in the AM position. Why, I cannot say.

Who Has the Answer? Some time ago I read in a technical publication that someone in England had picked up a TV program from a U.S. station *that had been off the air for over 5 years.* I wonder how far out in space this signal went and what it hit to be finally bounced back 5 years *later!?* Anyone with more details? (or ideas?) If this is true, maybe the day will come when all TV and radio transmissions in the higher frequency bands *will be coming back* and make regular service impossible! This is something to think about. Hi!

NC-303 On SSB. "I have an NC-303 that I am very happy with. The other night on the air a friend of mine mentioned that there had been some minor changes made to the later models to improve SSB. Is this true?"

Yes. Change C55 from 33 to 5 mmf; change R-46 from 120 ohms to 270 ohms and interchange R72 and R73, i.e., make R72 100K and R73 470K. These little changes allow somewhat less critical tuning on SSB and in general provide better performance. THANKS *NATIONAL!*

20A 10 Meter Drive. "I purchased a *Central Electronics* 20A SSB Exciter secondhand. The 10 meter drive seems to be a little low. Any suggested changes on this one?"

Remove the 3 mmf capacitor C72 from pin #7 of the grid of the 12BH7 cathode follower. This will increase your 10 meter drive. The new models reflect this change.

TR Switch. "I note that my *Johnson* TR switch 250-39 lowers my received signal now. I just finished re-installing my station and it is as *before* when I had no trouble at all. How come?"

Use the same piece of coaxial you used before to connect the TR switch and transmitter. This length of coax no doubt was correct. On re-installing the station, I'll bet you used another length which acts as a shunt across the antenna. Experiment a little with the length and she'll operate as she did before. You have a good TR switch. I'd advise that you also check the isolat-

ing capacitor in the switch.

SX24. "I'm determined to make my Hallicrafter's SX24 perform better in spite of what anyone says. I want to start by changing tubes. How about looking over the diagram and making a few suggestions?"

Ok, ok I get the hint! Replace all 6SK7s with 6BZ6s; leave all other stages as they are.

HT32. "How do you suggest going about re-aligning the filter units in my HT32, that is, FL1 and FL2?"

I can only suggest how you can check for proper operation. You should have realignment done (if needed) by the factory or an authorized *Hallicrafter's* service agency.

First tune up your HT32 for SSB operation into a *stable* 52 ohm load. Next, feed 1000 *cps* audio in and adjust the output for zero *db* reference on the OP meter. Make sure that the *meter* compression is set for maximum meter sensitivity so that your rig will be operating far below the saturation output level. Don't touch the generator attenuator setting and check your rig output at 650 and 3000 *cps*. There should be no indication of a drop off below 3 *db* in this audio passband range. Use C121 located on the top deck to correct for frequency vs transmitter tilt.

50 MC Osc and 813 Final Info. "I need a diagram of an ultra-stable 50 *mc* oscillator and also one for an 813 SSB final. What can you suggest?"

Write Don, the editor of *Western Radio Amateur*, enclose two bits. He can help you. A recent issue contained two of the best circuits I have seen in a long time.

Fan Noise. "No matter what I try, I can't seem to get the blades adjusted on a blower fan I have for quiet operation. There is no need to tell you I dropped the confounded thing. What can I do?"

If you don't have a machine shop there is little you can do. I'll bet the shaft is bent!

Vertical Noise. How do some of you in windy areas, using vertical antennas, keep the vibration noise (caused by the wind) down? We'd like to know. Maybe your ideas are better than ours. How about a helping hand, 'podner'? We know you have to break up the "resonant" points and there are a number of ways of doing this. What have you found successful? Let HAM CLINIC know.

DSB Neutralization. "I'm using two 6146s in a DSB final. What's the best way to neutralize them?"

Nine out of ten times you don't need to neutralize in DSB operation. Your grids are *usually* in push-pull and your plates in parallel. Neutralization of any *rf* amplifier is a feedback arrangement. In DSB you may run into trouble if you try the conventional methods—you'll have carrier feed-through. I suggest that you try inductive link coupling between the output and input. Make certain that the coils you use are polarized (end for end). You can use coax between the 2 to 2½ turn links at the bottoms of the final and grid coils as long as the run is not too great. Tubes in parallel and not operating on the same cycles will tend to neutralize each other. Incidentally, this inductive link neutralizing system is fine for pi networks.

Zener Diode Square Wave Generator. "Will you please publish a circuit for a simple square wave generator using a Zener diode?"

Yes. Thanks to *Motorola* here is your diagram. See fig. 2.

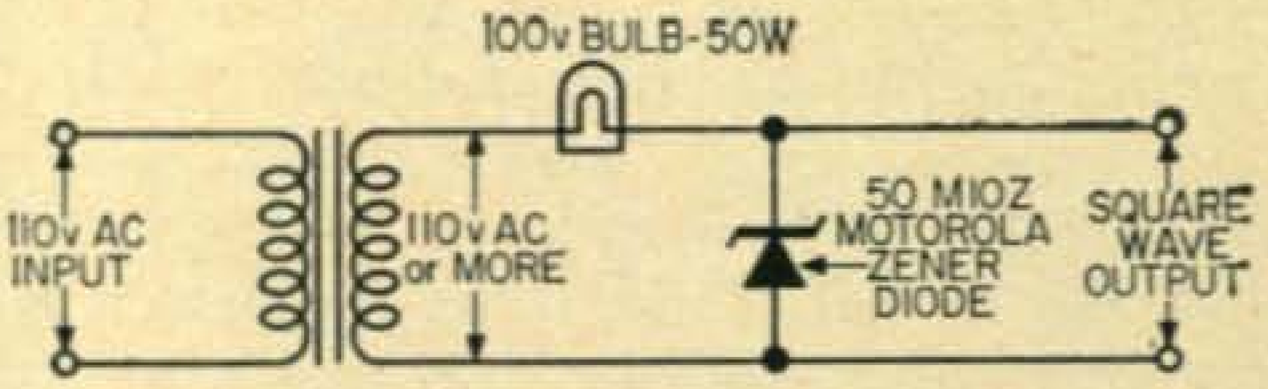


Fig. 2—A simple Zener diode square wave generator.

Tech Twists Wanted. The lowly but very famous neon, the NE2 has been used in hundreds of circuits (from voltage regulating to keying)—its uses seem limitless. If you can come up for a *new* use for this glowing little giant, shoot it into HAM CLINIC. If your information has never been published before we'll give it wide publicity.

Non-Technical Gripes (New Department)

"When I rented an apartment a few years ago, the original landlord told me I could use the building roof for my beam antenna installation. The new landlord has raised my rent and told me to take my "fool contraption" down or he would. What can I do?"

I'd advise you to get a good lawyer. But first, if I were you, I'd invite him in for a cup of "tea" and show him what you do with your rig and that "fool contraption." Use a little psychology and show him how important it is to you *and* his other tenants. Remember that sugar catches more flies than vinegar!

No Info. "I wrote to the .... Company that made my transmitter. I asked them for full technical information on how to use another manufacturer's SSB exciter. They answered and said they have no information. Now why would this company be so reluctant to give me the information requested?"

Ever hear of Cadillac ever passing out information to a customer on how to install a rival company's accessories? I seldom have. One would think .... Co. would, because you bought your set from them, but maybe they are a little "miffed" that you would not consider their own exciter. Just hold tight—someone will eventually come up with the info you seek and it may be published here.

Book Glances. If you are one who does not have a copy of the *CQ License Guide* you're missing a good bet. Its 212 pages are packed full of the info every ham needs—especially the new ones. Suggest that you get a copy from the book department of *Cowan*. It is indeed worth

[*Continued on page 102*]

RTTY

Byron H. Kretzman, KØWMR
108 W. Teresa Drive
West St. Paul, Minn.

First of all, I want to thank all of you fellows who sent in those Readers' Poll forms (page 122, March *CQ*) with the accent on RTTY. In addition, the mail bag contained several letters to the Editor from individuals and organizations asking that the RTTY coverage be expanded. It sure was nice to learn that so many of you read the column and want it to appear every month. Well, it gives me great pleasure to announce that, starting this month, your RTTY Column will once again be a monthly feature of *CQ*. Also, articles on RTTY equipment will appear as they become available.

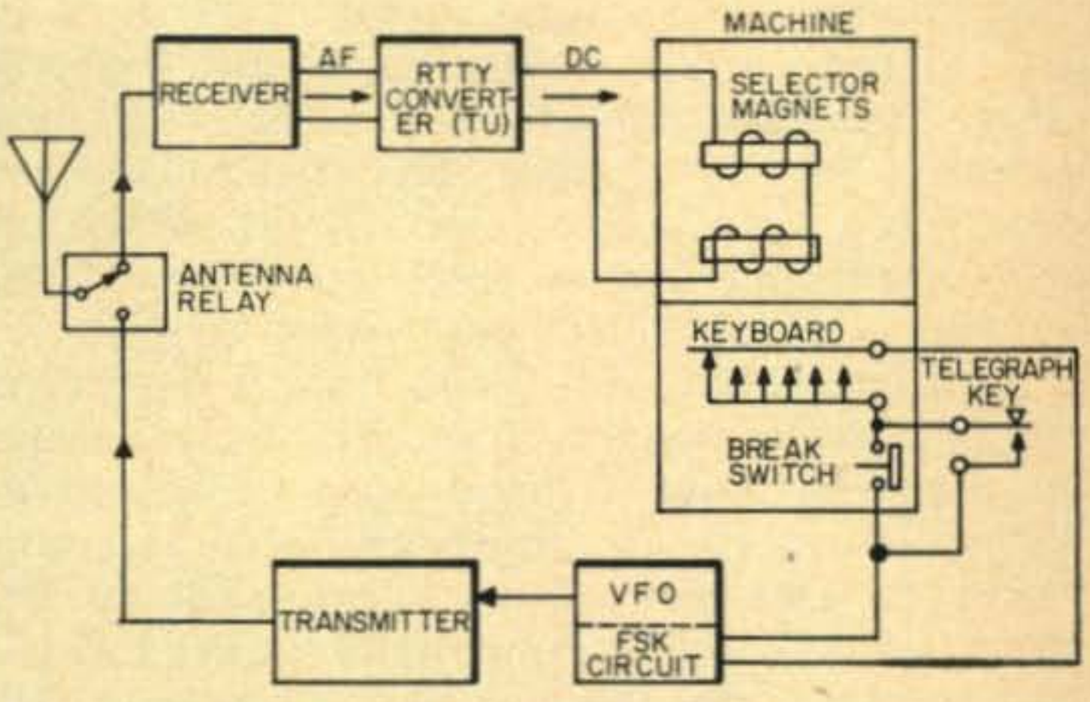
Surprisingly, a number of letters received were from newcomers, or I should say, fellows just getting interested in this last frontier of amateur radio, where hams still *build* most of their gear. Most of these letters asked for real down-to-earth basic RTTY information. These fellows meant the theory of operation, too; not just, "... where can I buy a machine, converter, etc." This greatly renews my faith in humanity (ham), which gets shook every time I listen to one of our *hf* fone bands.

In deference to you, the coming RTTYer, we will start henceforth, meaning immediately, to give you the facts of (RTTY) life, leaving out for the present such magic words as bauds, telegraph bias, polar relays, fortuitous distortion, etc. So, you oldtimers bear with us.

An RTTY Station

"How do you hook up a machine to your transmitter and receiver?" That is usually the first question. The Block Diagram shows this hookup in its most simple form. Later we will tell you how to improve it. For now, let us examine the blocks, first of all assuming that we are operating FSK (frequency-shift-keying) on a *hf* band such as 80 meters with standard 850 cycle shift, and that the converter is of the audio type. (More about converters later.)

To briefly run down the connections, starting at the receiver, the audio output of the receiver feeds the converter. The output of the converter is in the form of direct current which is pulsed by the received signal. This *dc* then operates the receiving selector magnets of the printer part of the machine. The keyboard is electrically separated from the selector magnets and, through a normally closed "BREAK" switch or button, goes to the frequency shifting circuit which is built into the *vfo*. This gimmick shifts the radio carrier back and forth 850 *cycles* in accord with the teleprinter code as you operate the green keys. A telegraph key, connected



Block diagram of an RTTY Station

Frank White, W3PYW, operating W3CZE

K9CNG, Vandalia, Illinois

across the BREAK switch, is used for identification by International Morse Code, as required by the FCC. (You can also identify on CW.)

"How do you know what you are sending?" Very simple. Just tune in your own transmitter. Now, I know that this sounds a bit impractical to some of you. A lot depends upon your receiver, we will admit. It must not block or shift tuning on a strong signal. You must be able to tune in your own signal just like any other. Blocking can be prevented with most receivers by using coax feeder and a *good* coax relay, such as the *Dow* DK-60, which not only disconnects the receiver from the antenna but shorts the receiver coax feeder as well.

So, there is your RTTY station. The receiver you can use as bought, in most cases. It should, by the way, have a bandwidth or selectivity of about 1.0 to 1.5 *kc* for RTTY. The converter or terminal unit you most likely will build, as a *good* commercially built TU can cost several times the cost of the machine. The transmitter you can usually use as is, except for the *vfo,* which must be modified by adding the frequency-shifting circuit. This is quite simple, relative to the TU, and consists of a dual-diode (or two silicon diodes) and a handful of small parts.

Tune in next month and we will begin to explain how all this stuff works.

20 Meter RTTY

As noted in the April RTTY Column, we lost our F1 privilege in the upper 50 *kc* of the 20 meter band March 10th, so we have had to move elsewhere in the band. It has been suggested that we operate just below 14,100 for several reasons, including those mentioned by Ye Editor in his April Editorial. A listening check, made in April from here in the midwest shows most RTTY just *above* 14,100! A recent letter possibly shows why: RTTY Editor: ". . . while I can see from the Honorable Editor's editorial that it will ruffle his feathers, I favor a frequency around 14,115 or 14,120 *kc* for RTTY. Since the change, I've been checking around for a likely spot and that seems to be about the best space in the spectrum as far as 20 is concerned. Of course, the first time an RTTY station parks on K2IEG's DX, there will probably be no more RTTY in *CQ*, but regardless of his feelings I'm going to work there anyway. I sure can't see why it could be considered unethical to operate above 14,100 in fact all the way to 14,200! Personally, I've never seen a document of any kind which says (only) 14,000 to 14,100 is the "CW band" and until I do I'm going to help occupy the rest of it." Signed, "Red Henning, W5BMI." *Don't worry Red; Barry isn't that narrow minded!*

Across the Nation

W6CQK and W6NRM are operating a leased line between them for TTY, with the feature of W6NRM being able to key Jack's rig. NCARTS, Inc., had a dinner March 11th with George Ice, K6CMT, a filter design engineer at Lenkurt, as the guest speaker.

MARTS, Inc., was 3 years old March 31st. *(Congratulations!)* They have put out over 100 machines in the western Missouri, Kansas, Oklahoma, and Arkansas area.

Wisconsin is having a boom in RTTY, especially in the Milwaukee area. According to Dick, W9ZPV, most of the machines released will be on 2 meters, on the CD frequencies of 147.18 and 146.94. This interest has been activated by a new concept of an emergency plan that will use RTTY as a net control of all other nets.

K1CLF, Presque Isle, Maine, has a Model 28 and reports that K1CQY, about 250 miles south, is the nearest RTTYer. W1AFN, Boston, Mass., has a Model 28 for sale, as well as Model 14 tape gear.

WØOKH, Phillipsburg, Kansas, writes, "You might advise the gang to watch for AN/FRR-3 receiver bays marked 'modified.' In mine this turned out to be *two* 40-meter bands and no 80!"

K9CNG, Vandalia, Illinois, says, ". . . we added a Model 28 to the line here. Also have a 14 typing reperf, Model 15, Model 19, and 14 TD. We FSK the 458 *vfo* of the CE20A and feed it to the CE6OOL."

W4RWM is Secretary-Treasurer of the Florida RTTY Society, Box 6047, Daytona Beach, Florida. An extremely good club bulletin is put out, containing not only news of the activities of the Florida group, but informative technical data as well.

WØBP, the Boyd (Beep) Phelps Memorial Station at Minneapolis should be on the air by the time this appears in print. It is hoped that the Sunday Beepcasts will be resumed as soon as possible.

Comments

For those who think that they "can't afford" RTTY, let me quote from a letter recently received from a fellow ham who shall be nameless: "I've only been on RTTY about 3 months, so you can see I'm still a novice at this stuff but have sure enjoyed it a lot so far and am willing to learn. Am strictly on a shoe string as I only spent around $30, including the machine and its freight bill. Of course, the old junk box was handy and I chiselled here and there but I made it ok. Guess I had beginner's luck both receiving and transmitting. Built the W2JAV converter (*CQ*, April '58), hooked it up to the receiver and printer, turned it on, and all I had to do was kick the circuit reversing switch and I was in business. And, I haven't touched it since, as far as the circuit is concerned."

This fellow, I would like you to note, got his "beginner's luck" by *building,* not by buying, long before he got interested in RTTY. Remember, *RTTYers build!*

73, Byron, W2JTP, KØWMR

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street, Lynbrook, New York

SSB DX HONOR ROLL

T12HP	205	PY4TK	150
W6UOU	202	WØCVU	150
W4IYC	199	W2TP	150
TI2RC	195	W2VZV	150
VQ4ERR	192	K2HEA	145
W6PXH	185	W3MAC	143
W8EAP	175	ON4DM	141
W8YBZ	175	W5RHW	140
W3SW	175	K2FW	139
W8PQQ	175	W1GR	137
WØQVZ	171	W8YIN	137
W6RKP	169	W1OOS	130
W6BAF	167	K6ZXW	130
TG9AD	166	W9QNO	129
ZL3IA	165	K6LMS	129
K2MGE	165	K6LGF	129
VE3MR	162	W5KFT	128
VK3AHO	160	KØCTL	125
K6GMA	160	W2CFT	124
K9EAB	158	W1EQ	123
W6WNE	156	W5DA	123
WØFUH	156	W1TYQ	122
HB9IE	152	W2OTZ	118
HB9TL	151	W3VSU	118
W2VEU	150	VE1NH	116

Ted Henry, W6UOU, First W To Achieve "Worked 200 SSB"

A look at this month's Honor Roll shows that Ted Henry, W6UOU, is the first *American* station to achieve the "Worked 200 2-way SSB Award". Although the competition was fierce, with a number of topnotch American SSBers vying for the honor, Ted came through firstest with the mostest confirmations. Congratulations, Ted! In addition to being a first-rate DXer, Ted has been on the other side of the fence, dispensing contacts from rare islands in the Pacific several years back, and has provided his now famous "Little Argonaut" SSB rig* for the use of other rare DX stations such as I5GN and FB8CJ. We are indeed pleased to reverse the seasons and, as a special Christmas in June present, include a photo of Ted and his family: Meredith, W6WNE, an accomplished DXer in her own right; son Ted, W6YEY; and daughters Kathy and Sharyn.

The Henrys: standing l. to r. Ted, W6YEY; Kathy; Sharyn; seated l. Meredith, W6WNE; r. Ted, W6UOU.

You will note on the Honor Roll that we have included the calls and scores of the top 50 SSB stations in the world with the largest number of confirmations. If your call is not listed or if your total should be increased, be sure to drop us a card and let us know where you stand.

20 Meter SSB Operation—Treat Or Torture?

The announcement that the top 50 *kc* of the 20 meter band were to be opened for American phone operation on March 10 occasioned great rejoicing among W/K stations who saw an end to the QRM which had plagued the top end of 20 meters as SSB became more popular. With additional spectrum available, SSB operation could once more become enjoyable if the additional frequencies were used to the best advantage.

One month later (as we are writing this), the QRM, still undiluted, is squeezed into 50 *kc*. En masse, the sidebanders moved as a group above 14.3 *mc*—merely transferring the QRM 50 *kc* higher and leaving an inviting void for AM stations to fill. The cast is still the same; only the scenery has changed. No, the cast is not quite the same; many stations who had avoided 20 meters previously have now put in an appearance and the QRM is worse than before. After spending many years developing the frequencies for SSB use below 14.3 *mc*, we are letting this operating space get away by default. Once lost, it will take years to regain.

The benefits of the increased frequency allocation can only be realized by *adding* these 50 *kc* to our operating spectrum, not by using them as substitutes. The frequencies below 14.3 are still there for SSB use but there is no guarantee that they will be available to us if we do not continue to make use of them for SSB operation. Reduc-

*Adventures of the "SSB Argonaut". T. Henry, W6UOU, *CQ*, May 1960, p. 40.

tion of QRM is possible only if we spread out, taking maximum advantage of available phone frequencies. It is apparent that more amateurs are going sideband and these newcomers gravitate to the frequencies where there is the most activity, doing their bit to add to the hubbub. Some of them might not even know that sidebanders once operated below 14.3 *mc!*

It is true that AM stations have as much right to these frequencies as do the sidebanders; it then follows that sidebanders can operate anywhere in the phone band. If this be the case, can you imagine the confusion on the 20 meter band? Let us be sensible and admit that each mode should have an area of its own. SSB and AM are *not* compatible particularly when strong signals are involved! It is usually impossible to null out a strong carrier plopped right on a SSB QSO nor is it pleasant for the AM stations to operate when a strong SSB station is making hash out of the AM signals! We see no reason why AM operators should QRM the high end of 20 meters just as we cannot condone sidebanders who fire up at the low end of the band. Adding to the existing QRM does not make sense since there is no advantage to be gained for either party.

What of the DX operators who are coming on SSB in increasing numbers? When the top 50 *kc* were opened to the W/K stations, the DX SSB stations retreated hastily before the flood but are cautiously returning, one by one, to try the water. Whether you like to chase new DX or enjoy ragchewing, we all can agree that 20 meters is a fine DX band. Despite their initial unhappiness, most of the DX stations are discovering that they can still engage in satisfactory ragchews with the W/K stations on a relatively clear frequency with their low power. However, experience has shown that, no sooner does one call or get called by a DX station, then another W/K station comes on close to the frequency—testing, calling CQ, or moving a QSO to the frequency occupied by the DX station and his contacts. With all the space available for our use, doesn't it make sense to make our ragchewing contacts below 14.3 *mc?* Your contacts will be free of the QRM caused by the many stations calling DX and the band will be utilized to its maximum.

It can still be fun to work DX as well as chat for hours with your local friends, but both can't be done well on the same frequencies without the attendant difficulties. There is plenty of space to operate in now without crowding. Make use of the *additional* frequencies by spreading out! Listen on the frequencies before calling or testing! Operate your station as you want the other fellow to operate his!

9th Annual Sideband Dinner

Sponsored by the Single Sideband Amateur Radio Association, the 9th Annual Sideband Dinner on March 22 at New York's Statler Hilton Hotel attracted over 2500 sidebanders from all parts of the country and many parts of the world. From 10 A.M. until the Banquet, the record breaking SSB group examined the latest in SSB equipment and exchanged greetings with hundreds of friends met on the air. 850 remained for the dinner itself at which Bill, W2SKE, and Wally Watts, W4VI, were the principal speakers. Among the winners of the main prizes were Bob, W2LWK; Harry, W2TUK; and Ray, W4BJ. To even partially enumerate some of the familiar calls there would be an impossibility. Suffice it to say, that many of your friends converged upon New York on March 22 and participated in what unquestionably has become the highlight of the year for sidebanders.

What's the front to back ratio, Gus?

Enjoying the Sideband Dinner: Musty, W2TP, Earl, W2MM, and Robby, W3RE.

The boys from 7205: Adolph, W2KHE; John, W2PXU; and Lew, W3MRY.

75A4 Modification

Every once and a while a modification comes along that really makes a major improvement in a piece of station equipment. Our commendation this month goes to Stan, W6QFE, and George, W6PKK, who have come up with a change in the circuitry of the 75A4 that deserves consideration. Changing the second mixer, a 6BA7 to a 6U8A, increases the signal to noise ratio appreciably, sharpens an already sharp receiver and ends the annoying pumping of the *avc* when the *rf* gain is run wide open. We have made the modification at our shack and, along with others who have done the same, found it to be an improvement in an already fine receiver.

The job can be done in about two hours by following the step by step directions below. The original tube socket may be left in place or a new one inserted with the socket turned 180 degrees so that the rewiring job is made easier. Several of the component leads will have to be lengthened or new ones added. If you replace the socket, make a note of where each wire was attached to the original socket for proper replacement.

1. Remove V5, 6BA7
2. Remove bottom plate and ANT. TRIM. rod.
3. Disconnect all connections from tube socket V5 except;
    a. pin 4.
    b. pin 5, also remove ground.
    c. pin 6 remove ground.
4. Remove R25 and C60, not used.
5. Remove R23, not used.
6. Remove R24, not used.
7. Carefully remove C58 from pin 2, leaving the other end connected.
8. Change C59 from pin 6 to ground. The other end remains on pin 3.
9. Connect R114 to pin 2, reconnect pin 5 to ground.
10. Add new 110K ½W resistor to tie point where R25 was connected and connect other end to pin 3.
11. Add new 47K ½W resistor from pin 3 to ground.
12. Connect the wire which was removed from pin 9 to pin 6.
13. Connect wire from PTO which was removed from pin 2 to pin 7.
14. Add new 1K 1W resistor from pin 7 to ground.

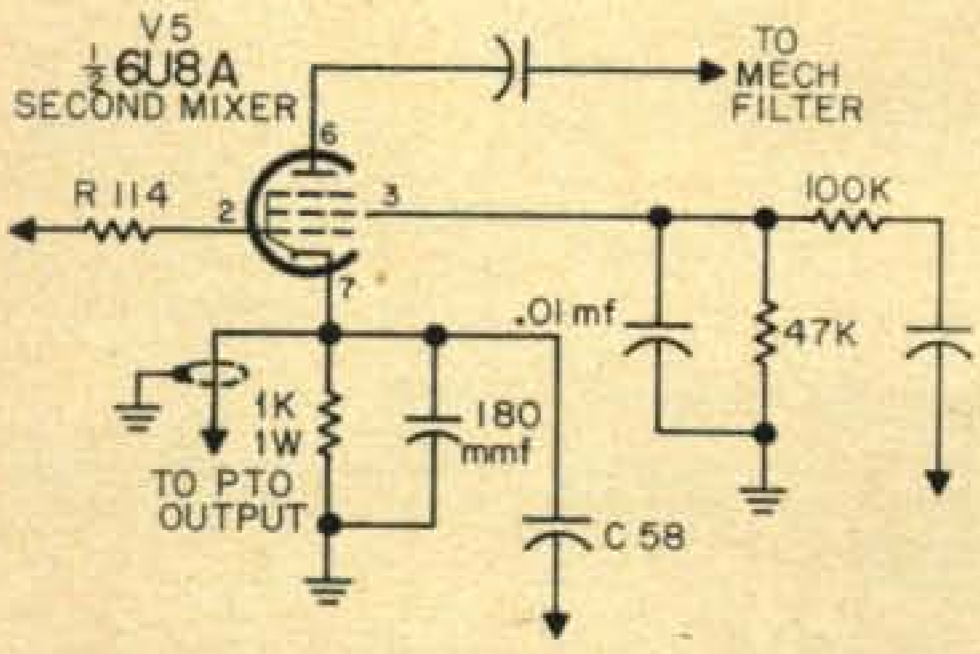


Fig. 1—Modified area of the 75A4. Text explains the procedure and results.

15. Add a new 180 mmf condenser from pin 7 to ground.
16. Connect C58 to pin 7.
17. Replace ANT. TRIM. rod, bottom plate and insert 6U8A as V5.
18. Calibration will be off 1 or 2 *kc;* correct as per instruction book.

No loss of gain was experienced by making the change; in fact, we have had reports of anywhere from 6 to 10 *db* additional gain after the change was made. Now we are able to tune out a 50 *db* over S9 signal in less than 4 *kc*, dropping it below S9 at about 3.5 *kc* from the transmitted frequency. A 6678, ruggedized 6U8A, may be used as V5.

New parts needed: 1—47K ½W resistor
1—100K ½W resistor
1—1K 1W resistor
1—180mmf capacitor
1—6U8A

SSB Around The World

Bob, TG9AD is now on vacation in Europe with the family, meeting some of his overseas SSB friends . . . Sue, ZS5OP, is a most welcome addition to the ranks of XYLs on SSB. Licensed for 14 years, Sue has been on SSB for the past year and a half with her OM, Bert, ZS5OM . . . Goran, SM6SA, has been faced with a terrible choice these past few months: he doesn't know whether to take advantake of the Spring weather by spending more time on the golf course or stay indoors and enjoy the excellent reports he's been getting with his new 100V-600L combination. The only suggestion we can make is that he put his new rig in a golf cart and operate mobile between strokes! . . . Jan, OK1JX, informed us recently that there are now six SSB stations in Czechoslovakia . . . During his first two months on SSB. Ib, OZ5KQ, worked over 100 countries with his OZ3EA exciter and an 813 final. Ib is percussionist with the Danish Symphony Orchestra and recently played host to Rauol K2AOS, who visited Copenhagen to make plans for recording the Orchestra. Ib, by the way, is very much interested in contacting the SSB gals with a view toward achieving his YLCC certificate . . . Ben, F7AH, ex-W4IED, an Air Force Colonel stationed at Fountainbleu recently joined the SSB group with help from Norry, F7GZ while Rene, OE1RZ, became so enthusiastic the first day he put his HT37 on the air that one could hardly keep up with his rapid comments . . . Joss, ZS6L, is running an SB10-Apache combination and keeping weekly skeds with K4CKZ . . . Looks like Bob, VK3SK and XYL, Alys, are getting closer and closer to the States; they visited Moshe, 4X4FA, in early April and contacted their good friends, Art W2CYK, and Madeleine, W2EEO, from Israel . . . George, G3AWZ, puts out a tremendous signal from England with just 140 watts PEP and a 3 Element beam. Day or night, no matter what the conditions are, George can always be heard ragchewing with his many friends . . . John, ZE4JN, will be one of the main speakers at the West Gulf Convention in Dallas on June 18-19. John will be a houseguest of Doc, W5RHW, in Houston and then plans to travel up the East Coast meeting SSB friends.

Certificates And Stickers

To clarify the requirements for the SSB DX Certificates and stickers—the cards submitted should clearly state "2-Way Single Sideband." There has been some discussion about Double Sideband cards being eligible for these awards and it has been given careful consideration. We feel that, since Single Sideband is being used by almost all sideband stations and since the two systems are radically different technically, there are sufficient grounds for separate classification of the method. One of the major benefits of SSB is the frequency conserving signal it puts on the air and we feel that Double Sideband, with its wide bandwidth and receiving phasing problems, should not be encouraged for amateur use. In fairness to operators who have worked

[*Continued on page 104*]

PROPAGATION

George Jacobs, W3ASK
11307 Ciara St., Silver Springs, Md.

The New Look, Part 2

Last month this column contained the first part of a "new look". Greatly expanded DX Propagation Charts were introduced, covering the two month period May-June. This month, the column introduces the second part of the new look—a greatly expanded Short-Skip Propagation Chart and special charts for the new states of Hawaii and Alaska. Both of these charts cover a *two month* period, June and July, 1960. Tailored more to the needs of the lower power amateur and the Novice, these charts are based upon a CW *effective radiated power* (ERP) of 75 watts. *ERP* is the power fed into an antenna, multiplied by the gain of the antenna in reference to a half wave dipole a half wave above ground. A CW effective radiated power of 75 watts can be assumed to be roughly equivalent to an ERP of 500 watts AM, or 150 watts SSB. For each 6 *db* difference between the *ERP* actually used and these references, adjust the probability indices following the time of band openings shown in the charts by 1.

Probability Indices

The numbers in the parenthesis shown in the charts following the time of forecast for a particular band opening are *probability* figures indicating the total number of days the circuit is expected to open during *each* month of the forecast period according to the following:

(0) Less than 3 days
(1) Between 3 and 8 days
(2) Between 9 and 14 days
(3) Between 15 and 20 days
(4) Between 21 and 25 days
(5) Over 25 days

Where two indices are shown within a parenthesis the first applies to the shorter distance range shown in the Short-Skip Chart; the second applies to the longer distance.

Last Minute Forecast

As part of these new type of forecasts (for both the DX and Short-Skip) an attempt is being made to relate band openings with specific days of the month. Table 1 defines the following five levels of circuit quality:

TABLE 1
Circuit Quality Figures

A—Excellent circuit, strong steady signals.
B—Good circuit, moderately strong signals,

[*Continued on page 106*]

June-July, 1960

CQ SHORT-SKIP PROPAGATION CHART

Band (Meters)	Distance In Miles 50-250	250-750	750-1300	1300-2300
6	---	---	8A - 6P (0-1)*	8A - 6P (0-1)*
10	---	10A - 6P (0-2)*	8A - 6P (2)* 6P - 12M (1-2)* 12M - 8A (1)*	8A - 6P (2-1)* 6P - 10P (1-2)
15	---	7A - 10A (0-1)* 10A - 4P (0-2)* 4P - 10P (0-1)*	7A - 10A (1-3)* 10A - 6P (2-3)* 6P - 9P (1-3) 9P - 7A (1)*	8A - 4P (3-4) 4P - 7P (4-5) 7P - 12M (2-3) 12M - 8A (1)*
20	---	6A - 11A (1-2)* 11A - 3P (1-3)* 3P - 8P (1-2)* 8P - 6A (0-1)*	6A - 11A (2-4) 11A - 4P (3-4) 4P - 9P (3-5) 9P - 1A (1-3) 1A - 6A (1)*	6A - 10A (4) 10A - 4P ([illegible]-3) 4P - 9P (5) 9P - 1A (3-4) 1A - 6A (1-2)
40	7A - 9A (1-2) 9A - 11A (2-4) 11A - 8P (3-5) 8P - 10P (2-3) 10P - 7A (1-2)	7A - 9A (2-4) 9A - 5P (4-2) 5P - 10P (5) 10P - 2A (2-4) 2A - 7A (2-3)	5P - 7P (5-4) 7P - 2A (5) 2A - 5A (3-4) 5A - 8A (3-2) 8A - 5P (2-1)	5P - 8P (4-2) 8P - 5A (5-4) 5A - 7A (3-1) 7A - 5P (1-0)
80	5A - 9A (5-4) 9A - 3P (5-3) 3P - 7P (5-2) 7P - 10P (5-4) 10P - 5A (5)	5A - 7A (4-2) 7A - 6P (2-1) 6P - 9P (3-2) 9P - 5A (5)	8P - 10P (2-1) 10P - 4A (4) 4A - 7A (4-1)	8P - 10P (1) 10P - 4A (4-3) 4A - 6A (1)
160	7P - 9P (3-2) 9P - 5A (5) 5A - 8A (3-2)	8P - 10P (2-1) 10P - 3A (5-3) 3A - 6A (2-1) 6A - 8A (2-0)	9P - 4A (3-2) 4A - 6A (2-0)	9P - 4A (2-1)

* Predominantly Sporadic-E Opening.

ALASKA

Local Standard Time

	10 Meters	15 Meters	20 Meters	40/80*Meters
EASTERN USA	NIL	4P - 7P (2)	6P - 8P (1) 8P - 10P (2) 10P - 12M (1)	NIL
CENTRAL USA	NIL	6P - 9P (1)	7P - 9P (2) 9P - 1A (1)	NIL
WESTERN USA	NIL	5P - 9P (2)	6A - 10A (3) 10A - 4P (2) 4P - 6P (3) 6P - 8P (4) 8P - 6A (1)	10P - 7A (2) 7A - 9A (1) 2A - 7A (1)*

HAWAII

Local Standard Time

EASTERN USA	2P - 4P (1)	6A - 12N (1) 12N - 3P (2) 3P - 5P (3) 5P - 9P (2)	7P - 10P (4) 10P - 12M (3) 12M - 4A (2) 4A - 6A (1)	8P - 1A (3) 9P - 12M (2)*
CENTRAL USA	3P - 7P (1)	5A - 2P (2) 2P - 7P (3) 7P - 10P (2)	3A - 6A (3) 6A - 4P (2) 4P - 6P (3) 6P - 10P (5) 10P - 12M (3) 12M - 3A (1)	6P - 8P (1) 8P - 2A (4) 9P - 1A (2)*
WESTERN USA	8A - 8P (1)	8A - 10A (2) 10A - 7P (3) 7P - 12M (1)	6A - 8A (4) 8A - 3P (3) 3P - 8P (5) 8P - 10P (4) 10P - 6A (2)	7P - 4A (4) 8P - 3A (3)*

SHORT-SKIP FORECAST INDICES

Circuit Forecast To Open:

(0) Less than 3 days a month during forecast period.
(1) Between 3 and 8 days a month " " "
(2) Between 9 and 14 days a month " " ".
(3) Between 15 and 20 days a month " ".
(4) Between 20 and 25 days a month " "
(5) Over 25 days a month during forecast period.

Where two indices are shown within a parenthesis the first applies to the shorter distance range shown in the Short-Skip Chart; the second to the longer distance.

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

The CQ Short-Skip Propagation Charts are based upon a CW radiated power of 75 watts from a half-wave dipole a half a wave above ground. The Charts are valid through July 31, 1960. These forecasts are based upon basic ionospheric data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

VHF

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

Sam Harris, W1FZJ
P. O. Box 334 Medfield, Mass.

FLASH *Effective June 6th, A1 Emission only, will be permitted in the segments: 50.0-50.1 mc and 147.9-148.0 mc.*

In case you think that all the MARS members do is operate nets with foreign (to hams) phonetics, you might cast an eye on a couple of the information sheets which they circulate.

The first consists of the design data for a six meter beam. Note that the critical dimensions (fig. 1 & 2) are given but the actual construction is left to your ingenuity. The beam dimensions are credited to A6NLZ. All I can say is: "If this antenna is in any way connected with the fantastic signal he puts on six, it must be worth trying."

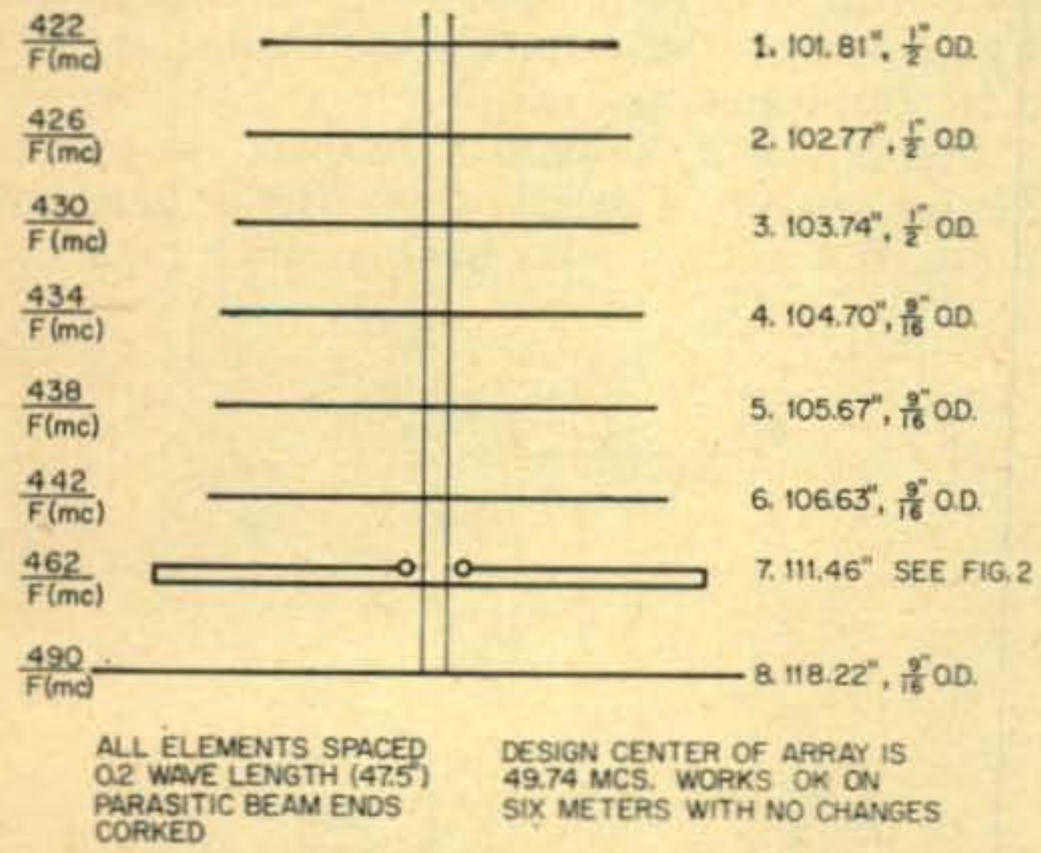


Fig. 1—Design data for a 6 meter beam. This was circulated by MARS and submitted to them by A6NLZ.

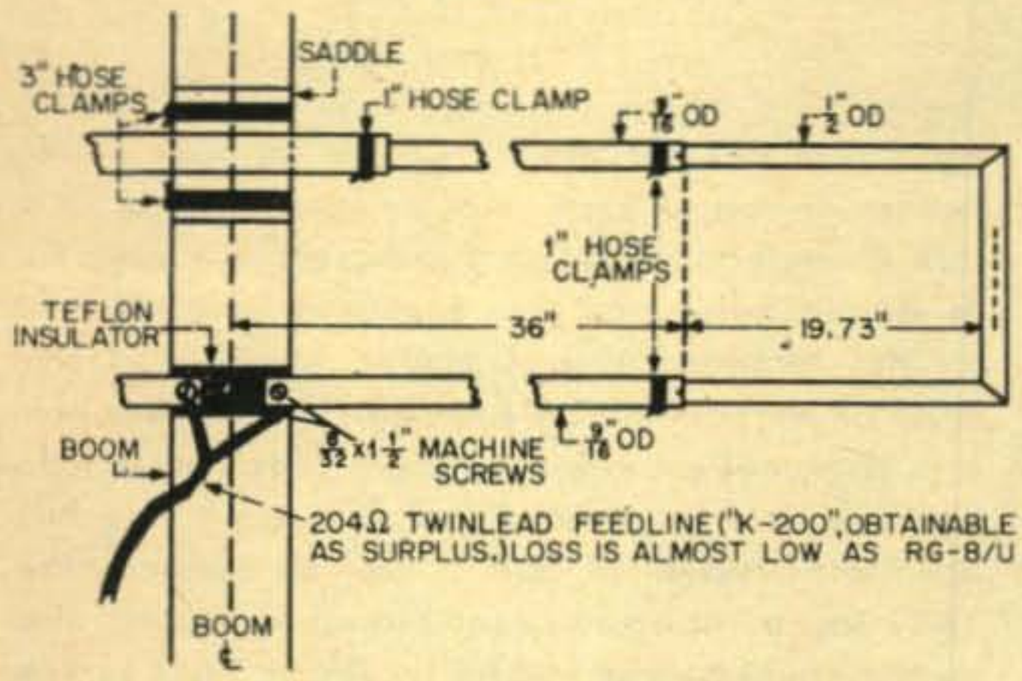


Fig. 2—Driven element detail.

Item two from MARS consists of a very handy *rf* choke design table entitled: "Make Your Own *rf* Chokes," as follows:

Choke Winding Data

10 meters—1½" winding of #30 E. 5/16" diameter
6 meters—44 turns #30E 5/16" diameter
2 meters—17 turns #22E 5/16" diameter
1¼ meters—16 turns #22E 5/16" diameter

I hasten to point out that these are only two of a myriad of information sheets available to MARS members. I don't know if you have to join MARS to obtain them, but you might contact either your local MARS director or contact W3OII, R. P. Gooding, for further information.

VHF Transmitter

One of the most versatile pieces of surplus gear for use on the *vhf* bands is the T-23/ARC-5. This gadget is a four band transmitter which originally covered the frequency range from 100 *mc* to 156 *mc*. Despite the several conversion articles for the T-23 which have been published, the number of units available remains high and the price is still very low. The T-23 can be used on two meters with no modifications. It can be modified to provide output on 6 meters, 2 meters, and 1¼ meters with only a small amount of effort. As mentioned in a previous column, it can also be used as an SSB converter for these bands.

W1FRR, Fred Collins, has just completed the modification of his T-23 and has volunteered the following useful information. Figure 3 is a schematic of a power supply suitable for use with the T-23.

In order to simplify matters, 28 *vdc* was used on filament and relays. No wiring changes were

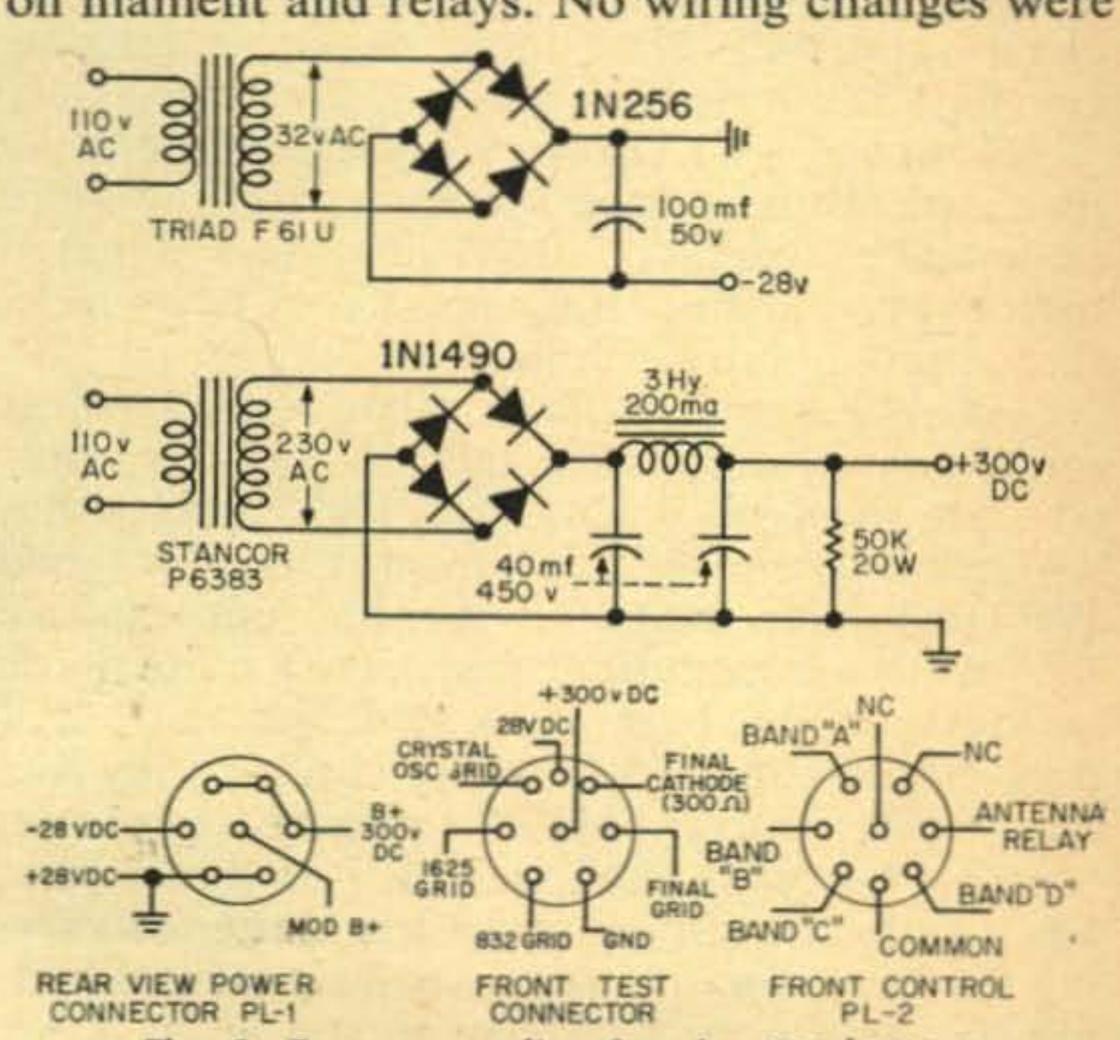


Fig. 3—Power supplies for the T23/ARC-5.

made inside the unit. The TR relay is actuated by connecting a jumper from the antenna relay pin on the front apron to the common pin (PL2). (Pin connections for all plugs on the T-23 are diagrammed in fig. 3.)

Band changing is achieved by jumping the desired band pin to the common. The motor should stop automatically when the proper band is reached.

Before the unit is tuned up, the desired crystal should be inserted in the crystal socket under the chassis. For 2 meters an 8 *mc* crystal should be used. The crystal sockets are marked with channel letters A-D.

In tuning up the unit, the following points should be measured on the test plug, also on the front apron.

1. Crystal oscillator plate is tuned by adjusting slug #2 and measuring pin 5 which is the grid current of the following 1625.

2. 832 driver grid is pin 4 and should be tuned for maximum by adjusting slug 3A and 3B.

3. 832 final grid is pin 2 and should be tuned for maximum by adjusting slug #4. Measurement 1, 2, and 3 are made across 50 ohm resistors built into the T-23, and if an 0-1 millimeter is used, it should read ½ to full scale depending on internal meter resistance.

4. The 832 final plate and antenna loading are accomplished from the front panel. The final should be dipped and loaded to approximately 20 volts as measured from pin 1 to the common which is across a 300 ohm cathode resistor.

Next month we will give the coil data for getting the T-23 on six meters. A control box will also be discussed.

Crystal Mixers Vs. Vacuum Tubes

Henry Cross (W1OOP) has some pertinent comments for converter design on 432 *mc* as follows:

"At frequencies below about 200 *mc* there is no particular point in using a crystal diode mixer because tubes perform quite well, are relatively cheap, and will stand fairly strong interfering signals without making spurious products."

"However, as frequency increases, the noise in a typical mixer tube increases, and the input impedance decreases, until at a few hundred megacycles the input impedance may be no more than a few hundred ohms."

"At 432 *mc*, the diode mixer may have as much gain as many tube mixers (i.e., less loss!) and an average 1N21C or 1N25 mixer has better noise figure than most tubes. A good WE416B (not used, not surplus, not exposed to *rf* from a transmitter) may have a noise figure as low as 5 decibels, I am told, but the best I ever did was about 5.6 *db*. By contrast, my 432 *mc* crystal mixer—417A preamp converter (coming out at 12 to 16 *mc*) hit 7 *db* the first try, and a little adjustment, mostly a matter of varying the loop coupling on a weak signal and finding the right crystal current to run at, gave me about 6 *db* with some 1N21E crystals and as low as 5.4 *db* with others. I used one 416B in a contest in the old converter; two crystals, both still good, have lasted me three years in the present one. The thing that really bothered me with the 416B's is that every time I went to check them they were down a couple of *db* from a new tube—how long had they been that way?"

"Figure 4 shows the reason that a diode mixer

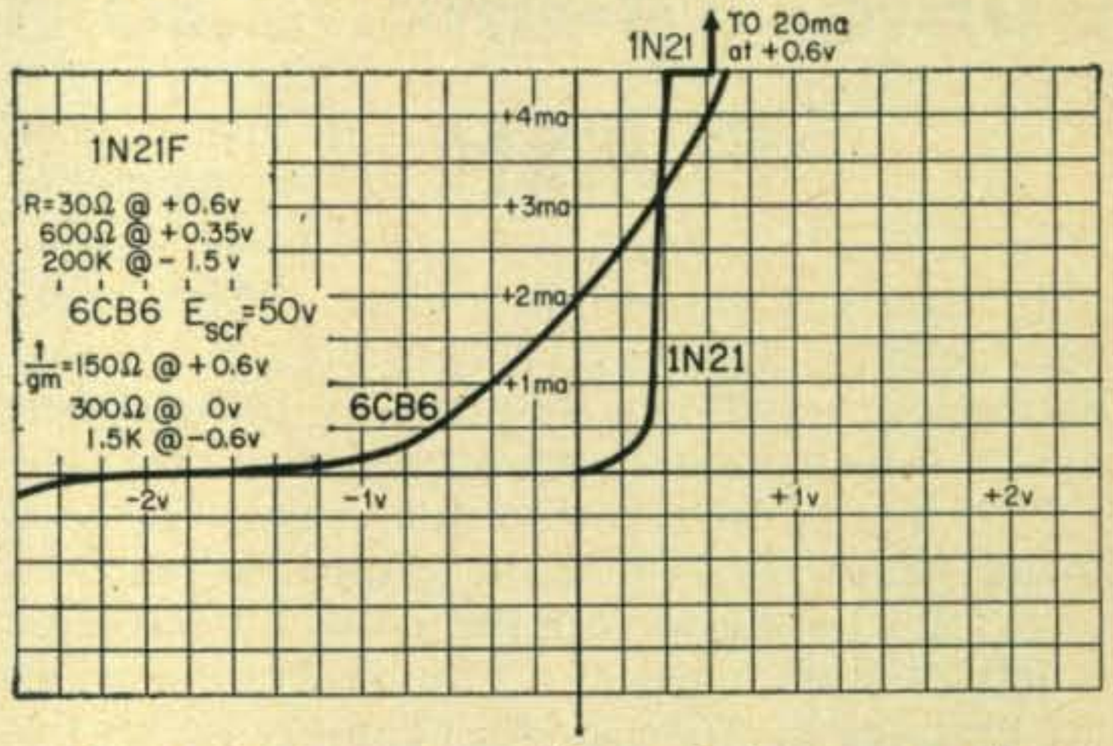


Fig. 4 — Point-contact silicon diode versus tube mixer.

mixes with very little oscillator power, and also why it will make sum-and-difference or harmonic responses so easily."

"Figure 5 is a sketch of how I like to make a 432 *mc* mixer. The cavity I use is generally square, but people who have copper pipe in a

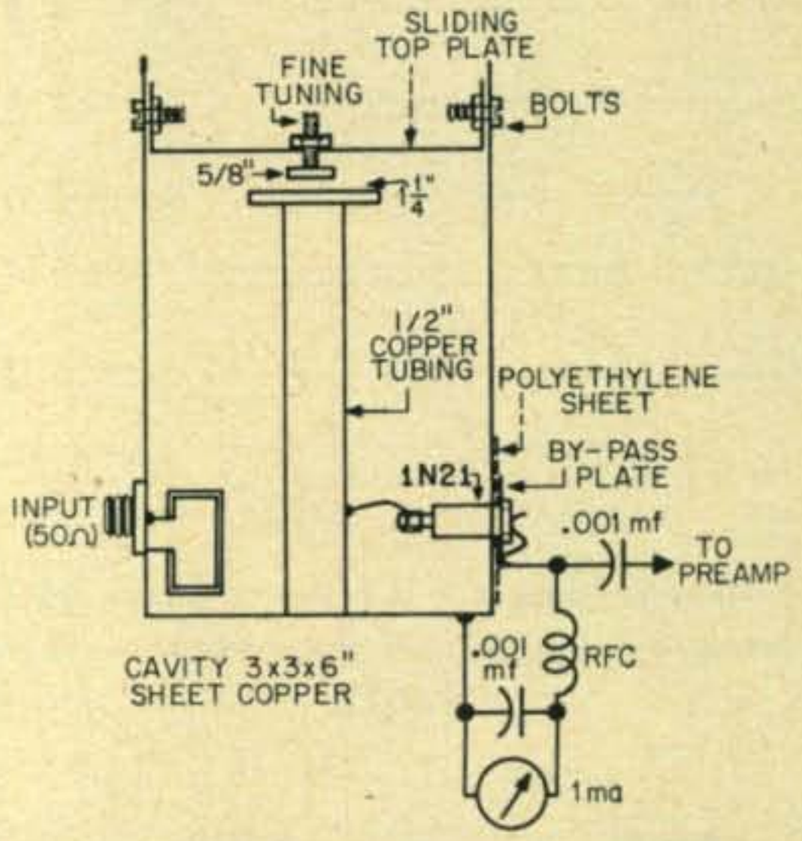


Fig. 5—A 432 mc mixer. Cavity may be made square or copper pipe may be used. From 2 to 5 inch diameter will do fine. The top plate is mounted in slotted holes and fine tuning is accomplished by the threaded disc. Optimum input loop size must be determined by experimentation. Increase it in size until enough coupling is obtained to give best results on a weak signal. The input loop has been constructed so that it can be rotated. The 1N21 tap point on the center conductor must also be determined experimentally. The 5/8" fine tuning disc may be a Lincoln penny.

suitable size (anything from two to five inch diameter will do fine) can use that. Brass is all right for the outer conductor, or even copper plated steel, but I like copper water pipe for the inner conductor. The sliding end piece will take

care of the question of what length should the pipe have been. The preamp could be a good 50 *mc* converter except that it is much smarter to build the preamp up on the same chassis as the mixer tank and the L O chain. The crystal runs to a tap pretty high up on the preamp input coil, and this is found by experiment. For some other ideas, you are referred to the 1296 converter in the January 1958 *CQ*, page 48.

Cowtown 6 Meter DX Club

At the February 21st meeting of this group election of officers brought about these changes: K5TKR-Jim-President; K5VFA-Fred V.Pres.; K5TIQ-Pat-Sec. & Treas.; K5ABM-Estelle-Social Chairman.

Number of contacts needed for club certificate have been changed as of March 15, 1960; local stations within 100 air miles of Ft. Worth, need only 10 contacts instead of 15; skip stations or stations 100 air miles or more from Ft. Worth need only 6 contacts instead of 10. A list of stations worked, date and time of contact should be sent to—Pat Pickle, K5TIQ, 3800 E. Orchard, Ft. Worth 19, Texas.

Mail

Utica, New York. Norm, K2KLV, holds forth for Utica with the following: "Tremendous opening on 6 last night, March 31st; first station was a W8 at 1630 E.S.T. By the time I went to school on April 1st, they were still at it. Had heard W1, 2, 3, 4, 5, 8, 9, Ø. First big one this year at this QTH."

"I am the only active station in Utica on 6 but three others are interested in coming on. Rome, N. Y., 12 miles west has more than 20 stations on six. Some high power long Johns, like K2IXN."

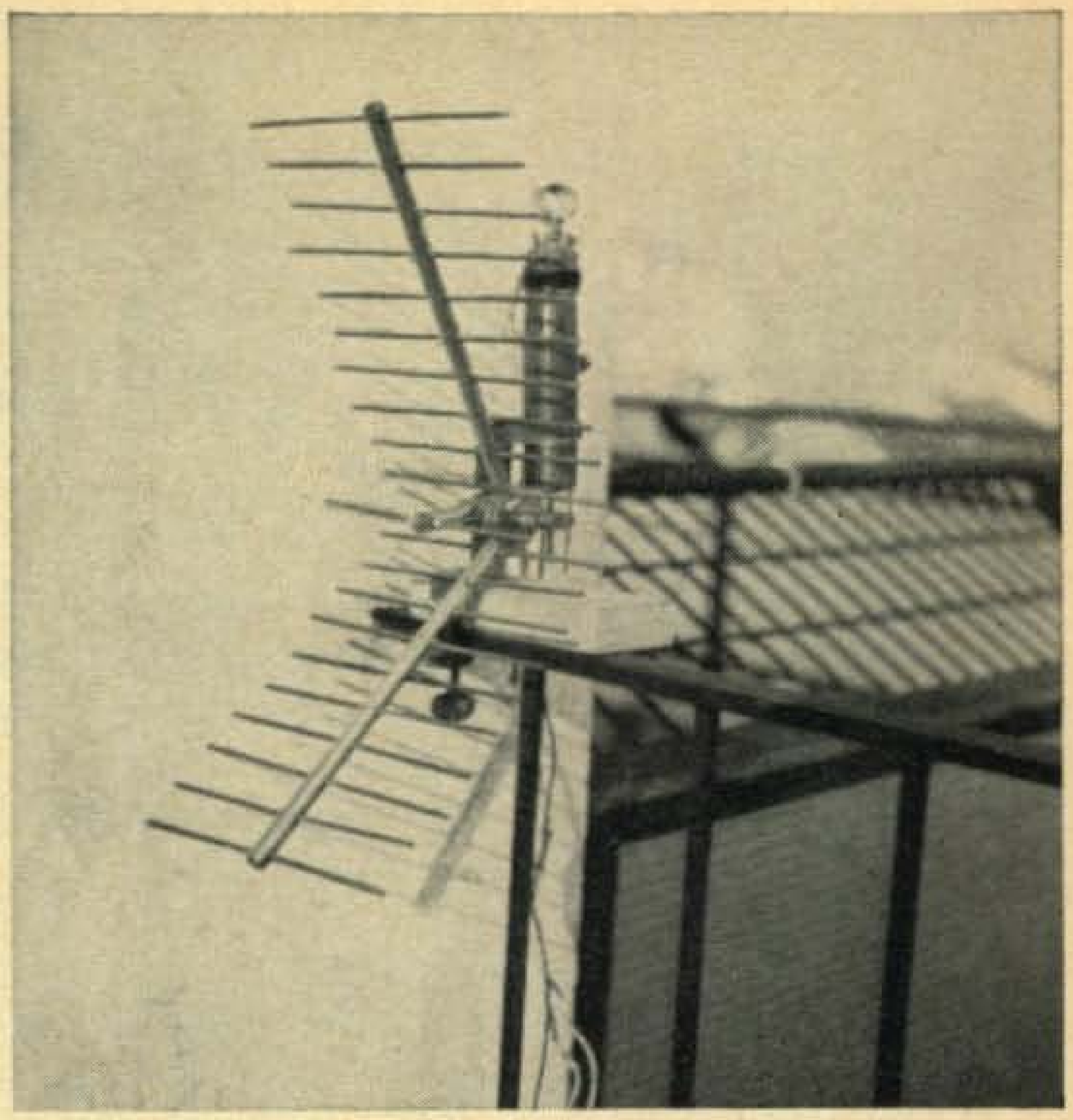
"QTH is bad for working six, I can only work west and heard all aurora stations with the beam west. I am running 10 watts to the antenna from my 680A. More drive can be attained by using 6L6 oscillator instead of 6V6. Have a five element beam up 35 feet, using home brew converter into NC98." *Nice to hear from you and Utica, Norm. Keep up the "push" for more activity on six and two meters.*

Yakima, Washington. From way over thar and from John Fredericks, K7GGJ, we hear: "VHF news from this area is very thin at this time, although I do hope things will pick up soon. There are only a few active stations on 6 meters now besides myself, one of these being W7ZRV. He has a TBS-6 transmitter at 120 watts and an HQ110.

"I have been doing some work on 432 *mc*, but because of lack of activity here in Washington the results have not been too conclusive."

"The Yakima Amateur Radio Club has been fairly active on 2 meters FM, but again, it hasn't been as good as it should be." *Send us more news from Yakima, John, we're all interested.*

Willoughby, Ohio. News concerning San Diego comes to us from Fred B. Cupp (K8ACE): "I've just returned from a trip to San Diego, and thought I'd drop you a line about the fine reception given me by the boys in that area."



A corner reflector for 1250 mc at I1ER.

"I was operating a portable rig on six meters, running 5 watts input to a hookup wire dipole hanging out the window of my room on the ninth floor of one of the downtown hotels. In the seven weeks I was out there I made about 40 new contacts, and got into the Los Angeles area three times. I also had the pleasure of meeting some of the gang, K6QOR, WA6HKE, WA6CTL, WA6DTH and K4BEY/6." *How'd that 4 sneak in there?*

"The rig was a homebrew 'Briefcase' type, with a converter into a super-regen detector for the receiver. Common audio circuits were used for the receiver and to Heising modulate the transmitter. Before any more trips to San Diego, I think I'll have to water cool the rig because the gang in S. D. are a real bunch of rag-chewers." *Glad to know you had such a pleasant reception Fred. Have to see if we can't arrange a trip out that-a-way.*

Manchester, Vermont. Good news from Vermont and Nandi Thomas (K1GBF): "Thought I'd drop you a line to let you know that there is another Vermonter on six. Been on for about a month and I'm sure having a lot of fun."

"Caught some of the aurora on April 1st and 2nd, and passed out about twenty-five Vermont contacts to W1, 2, 3. Heard some W8 and W9 activity but had a surplus crystal in and a W3/7 on phone kept plowing me under."

"I will try to be on during all openings possible and will be working on 50.035 or 50.120."

"Got a 6N2 running with an Apache at 100 watts phone, 150 watts CW. Receiver is an NC-109 with either a Tecraft or a homebrew converter. 5 elements 35' up do the rig justice.

[*Continued on page 108*]

Novice

by **DONALD L. STONER, W6TNS**
P.O. Box 137, Ontario, Calif.

I hope that my readers do not object to the emphasis placed on DX during our get togethers each month. After reviewing the columns for the year 1959, it was noted that considerable space had been allocated for this subject. However it has been my experience that most Novices enjoy chasing the elusive DX. For one thing, it helps make practicing CW just that much more fun. And no one can deny that digging around in the QRM for DX, and snagging it, improves an operator's skill.

Recently I received a stimulating letter from Allan Herridge, G3IDG, on this subject. His observations, from some 3,000 miles away, will benefit the readers of this column, DX hounds and others.

On the subject of DX, Allan says, "I'm sure that most Novices don't realize how many of them can be heard on 21 *mc* over here. It's not at all a question of hearing them, but of sorting them out. On surplus crystal frequencies it's nothing to find Novices stacked several deep, only staggered slightly by the grinding inaccuracies of their various crystals."

The solution seems to be not to rely on frequencies where hundreds of others will also be operating, but to spend a few extra cents on a crystal ground to an individual frequency.

Those nearest to 21.1 *mc* will, being closer in frequency to the DX station, be most likely to work it. To offset this advantage is the fact that lots of Novices will already have realized the fact and the area just above 21.1 *mc* is inclined to be crowded. Some non-US stations also spill over into the Novice section too, especially during contests.

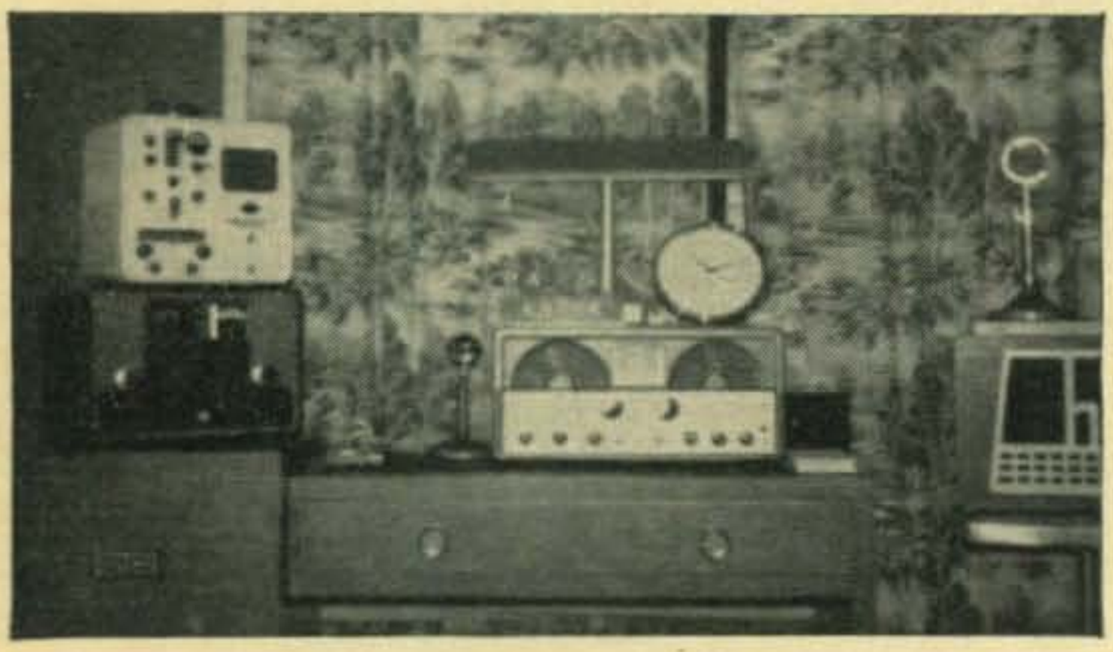
Likewise the Novice near to 21.25 *mc*, who calls "CQ-DX" is unlikely to find it. Very few DX stations will look that high in the band. I also advocate fewer CQ-DX calls and more listening. To hear the 21 *mc* Novice band under good conditions is a revelation here in G-land. You hear station after station calling CQ-DX for minutes on end! So, please, fewer CQ-DX calls, make 'em shorter when you do use them, and listen more. Listen carefully too! I replied to a KN4 who called CQ-DX only to have him go back to a WV2. If that is DX, what am I?

Ask the boys to be more careful in filling out cards too. Some of them, in their excitement, get my call mixed with the address of the station below in the *Call Book*.

We DX stations like to know what antenna they use too. Many Novices will tell what transmitter and receiver they have, but not a word about the antenna. After all it's the antenna which does all the work! The antenna in use seems to be the deciding factor; three element beams winning out over the long wires.

In your column in *CQ* don't refer to a station having worked G3, G5, or G6–it's misleading. We don't have geographical call areas over here and several lads have stated on their cards to me 'You're my first G3'. So what?"

So that's the sum and substance of Allan's letter, fellows. All his suggestions are excellent and should be heeded by all. However, there is one point in Allan's letter that I would like to comment on. *CQ Magazine* offers an award which not too many DX stations are aware of.



This neat installation belongs to Wayne Witkowski, KN9TOK, 3202 West 55th St., Chicago, Ill., who has a WAS of 30/25 on 40 and 15 meters. Wayne would like a sked with KH6 and KL7 land. Look for him on after 1600 CST.

Fred, WV6HEI, forgot to send along his QTH, but did enclose this snap of his operating position. The table was constructed out of ¾ inch plywood by Fred, and has a glass top. Fred's WAS stands at 34/31 including the 49 and 50th states, plus three VE's and Ivor, VK3XB.

The award is called WPX (Worked All Prefixs) and is available for CW, Phone, and SSB. To a Novice, working towards this award, a G3, G5, or G6 contact is just as valuable as a new country. However, as Allan points out, the call does not denote a geographical location. Actually a G3 and a G6 could be next door neighbors!

Who's DX?

Allan's letter provides an excellent transition into this monthly feature of the Novice Column. The following stations were received and called by G3IDG in the period between Aug. 30, 1959 and March 20, 1960 without results!

KN1JFF, JGM, JKC, KAC, KDP, KDR, LGM, LKI, LLU, LUX, LWZ, LXB, MBQ, MCO, MFA, MGX, MJD, MJY, MKF, MWU, WV2DXH, FBI, FBV, FHU, FOW, HAU, HNH, HOZ, HVS, HWU, IDM, IKC, IMR, IPB, IRG, JNR, KBX, KN3HUD, JGP, JIZ, JLM, JUA, KIU, KKS, KUL, KUM, KN4FJW, FNF, FOW, JSU, MAW, MPE, NAO, PYV, QDK, QYV, KN8NWS, PAS, PBX, QIO, QML, RSF, KN9PYV, RJN, SQT.

Allan also reports working and QSL'ing the following stations without reply: WV2GXW, KN3KIU, KN4HJJ, KNØTCF. How about a QSL fellows? Allan also requests that stations do not write for skeds due to his erratic working hours.

Ivor Stafford, VK3XB, 16 Byron St., Box Hill South, E.11., Victoria, Australia, writes to say the foreign broadcast stations are steadily encroaching and he has only about 2 hours of fairly clear band, from 0300 EST to 0500 EST. The following stations were heard on 40 meters and italics were worked; below Nov. 1, 1959 and March 21, 1960:

KN1CNW, *KVJ*, *LNA*, LOM, MBF, MIR, MKJ, *MKR*, MZB, MZD, NDQ, NJI, NNJ, WV2*FIJ*, FPT, *FXJ*, HJE, *HZR*, *ITU*, *IUB*, IWH, IWS, JLT, JMV, JRQ, KBE, KIV, KSP, TTB, KN3*GYD*, HLD, *IOI*, ITD, IWK, IXM, *JCJ*, JJA, *JLG*, *JOT*, JUD, KKG, *KTU*, *YTU*, KN4EKQ, FLL, FNH, *FOP*, FVO, FWJ, *FZP*, HVF, *IFK/9*, IQL, JAB, DW, JPD, JUK, KCQ, KDD, KDL, KFF, *MLD*, MUK, OMG, PET, PNM/KL7, PVL, *PYV*, QIP, RTT, TAH, VFC, KN5AEE, UZU, WUX, YAK, YKO, YKV, YZW, ZAY, ZCT, ZFI, ZJV, ZNO, ZOO, WH6DBY, DFW, DHS, *DJV*, *DKV*, *DMU*, DOM, WL7*DDW*, DJU, WP4AUW, WV6DLW, DNO, FEV, *FFV*, FJD, FTX, GNP, *GWM*, HCU, HFZ, *HNW*, HZB, IVM, IYL, IYU, JAC, JCF, JIN, JJD, JUO, JVD, JXE, KEQ, KHG, KOK, KSP, SCU, KN7AXP, *HSE*, IFI, IHB, IOL, IUR, IWD, JAK, *JYS*, KJL, KST, KPX, KUE, *KPT*, KXG, LCM, KN8OKR, *OIM*, *OOK*, *OUA*, OVA, OZS, OZU, PAN, *PYS*, QER, QIU, *QKC*, *QXB*, RAV, RCD, SAQ, SBU, SRB, KN9HKB, RJJ, RZP, *SDF*, SZT, TDC, VCC, *VKM*, VXX, KNØ, SNF, UIC, UKK, UKN, UTY, UUE, *VMY*, VQE, WSB, YET, *YFD*, YHC, YQU, YXB.

Ivor is still looking for the states of N. Dakota, Montana, Idaho, Utah, Maine, N. Hampshire, and N. Carolina. He will be happy to make skeds with stations in these states. Drop him a line by airmail and you should get a reply in two weeks.

Now let's hop up North and see what's cooking on Okinawa at the QTH of Tom, KR6ZT (Novice), OARC, APO 331, c/ postmaster, San Francisco. Tom reports hearing the following on 15 meters.

Feb. 20, 0300-0500 GMT: WH6DKI, DMU, WV6EGC, FEU, *FUD*, GIN, IQY. Feb. 21, 0100-0400 GMT: WV6, HDY, HTJ, IEA, JRH, KN7HYC, JVW, KFT, KMN. Feb. 22, 0100-0400: WH6*DJV*, WV6FCG, FJD, FKA, GRC, *IGC*, IPY, IQY, JFS, KN7INM, KN8OHG. Feb. 27, 0100-0200: WL7LJI, WV6HVH, KN8OLL. Feb. 28, 0100-0400: WH6DJV, DNA, WV6FEV, FIH, *FKH*, GVT, HGP, IPY, IQM, JRH, KJO, KN7HYC, IWD, IZL, KEV, KRK, KN8OSS, KNØ*TZW*, VSJ, WHD. Mar. 5, 0330-0500: WH6DMU, WV6GBZ, *FJD*, KN7IVU, *IWD*. Mar. 6, 0030-0400: KN3KAI, WH6DJV, WL7DJI, WV6FEV, *FJD*, FOO, GTI, GUP, GVW, HAE, HDY, HGP, IRO/KLC, JAP, JRH, KAW, KN7KAH, KAI, KN8QXB. Mar. 13, 0030-0330: KN4USM, WL7DJI, WV6FBA/6, FCA, FEV, FOO, FVC, GDM, GVE, GWM, HAE, HGP, ICG, IPY, IRF, IRJ, IQM, ITG, IVP, JUI, VVH, KCL, KN7JOA, JYU, KJN, KMN, KPM, KN9RTX, KNØTMF, USL, VQM, VVV.

Tom also reports there are several other Novices on Okinawa (Z suffix) and they are scouting for Novice contacts.

[*Continued on page 108*]

Spud (KH6DMW) and Lynn (WH6DMV) operate this hamshack over at Barber's Point in Hawaii. The XYL Lynn has a WAS of 28/25 but would like skeds with the New England area. They report hearing KN1MTN particularly loud at their QTH. Look for Spud and Lynn on 15 meters. For skeds, write them at VP-22, Navy #14, c/o FPO San Francisco, Calif.

Eddie Felter, KN3IYK, Tilghman, Md., looks pleased because of his WAS of 38 which includes KL7 and WH6, not to mention his DX of XE3, LA6, OH7, G3, DL6, and UA1. Eddie operates in a trailer, his dad travels a lot and Ed has been portable in all the call areas!

SURPLUS

by KENNETH B. GRAYSON, W2HDM
Care of CQ 300 West 43rd Street, N. Y. C. 36, N. Y.

Last month we covered the conversion of the R-48/TRC-8 receiver to AM and 220 *mc*. This month we will continue the conversion to two meters. This part of the conversion is definitely not for the squeamish. There is some butchering to do and that will take a strong arm and stomach, but it is worth it.

The original design called for the tuned circuits in the form of tuned lines within cavities. The end of the line was tuned through the range by means of a very fine variable capacitor. This came to light when the bottom shield of the *rf* circuits was removed. The problem became almost impossible, unless we did something to the cavities. The circuit is basically a coaxial line, which exhibits the characteristics of a parallel tuned circuit (quarter-wavelength) when one end is grounded. The padding of the circuit with additional capacity to get it down to two meters did not solve the problem. It was mainly due to the very low resulting impedance due to the short length of line and the lower gain obtainable. Also the oscillator wouldn't work. Obviously something else had to be done. The inner conductor of the cavity was hollow and through it came the various *dc* and filament leads which proved to be another problem. The answer was to go to lumped components (coils) and this meant ripping the cavities open. The actual cavities are made like egg-crates. Small tabs fit into holes in the top plate and were soldered. We solved the problem by using a pair of vise-lock type of pliers and twisting the tabs. Then we used a husky screw driver as well and pried the whole top off. This could be eliminated if a hand grinder were available to grind the tabs off, but the results are the same. Only the top plate need be removed though, as the side plates will form shields for the rest of the circuitry. It may be necessary or helpful to completely remove the *rf* unit from the receiver chassis. In case you decide to do this it would be desirable to label where each wire goes as this will save you a lot of circuit tracing later.

When the cover plate is removed, the inner conductors in the cavities will be exposed. These are soft soldered in place to the capacitor and cavity wall, and can be twisted out without breaking anything. Note that the variable capacitor is connected to the center conductor in each cavity by means of a wire and this may come out with the center conductor. It will be necessary to make sure that this is replaced. When you have removed the cover plate, replace the *rf* unit back into the chassis if you have removed it, and replace the wires you have removed. Then we can get on to the electronic part of the conversion.

We tried several types of tuned circuits, finally coming up with the tuned line input circuit, and lumped coil type of mixer and oscillator circuits. All coils are made of number 16, tinned copper with no insulation. A piece about two feet long will be more than enough to do the entire job.

When the cover has been pried off, the coaxial lead will come with it. Remove it from the cover carefully since it will have to be used again. Now, bend a piece of the wire 3¾ inches into a "J" shape, with the long leg of the "J" 2¾ inches long and the little leg ⅜ inches long. The corners should be square. Assemble a solder lug under the stator mounting screws of each section. Solder the "J" so that the short leg is against the bottom of the cavity and the long leg is as close to the variable condenser stator and on the lug. It will probably be a good idea

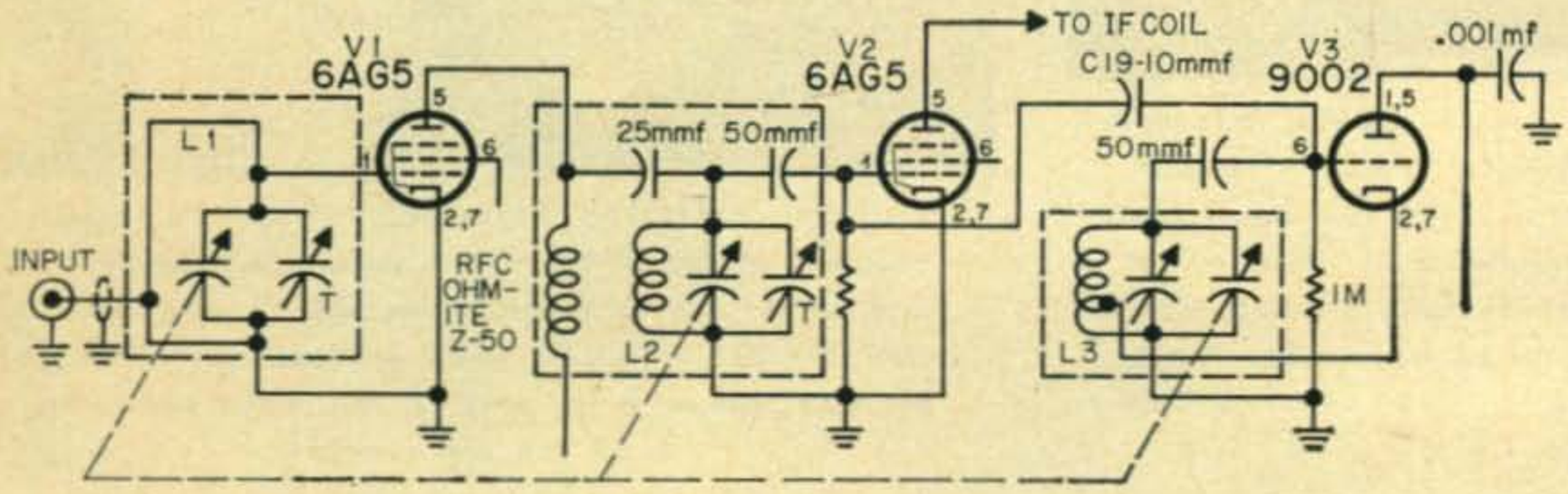


Fig. 1—Circuit area of the AN-TRC-8 to be modified for conversion to 2 meters. Only the changes are shown. All other wiring remains the same.

and on the lug. It will probably be a good idea to tin the cavity with a blob of solder before final soldering of the "J" so as to make a good mechanical connection. Solder a piece of wire from the grid of the *rf* tube directly up to the "J" wire for the grid connection and solder the edge of the coaxial termination to the cavity. The "V" shape piece at the end of the inner conductor of the coax can be removed or modified so one leg is touching the "J" at a point one inch from the bottom of the "J". Use a grid-dipper to tune this circuit. Temporarily connect a 47 or 51 ohm resistor to the coax input on the front panel and set the grid dipper to 150 *mc*. Adjust the variable to the full open position and adjust the trimmer to obtain the dip at 150 *mc*.

The mixer should be at a much higher impedance than the input circuit and a coil is therefore used. Use a one half inch diameter form (a dowel, or other type of rod) and wind a two turn coil. Bend the ends of the coil out and trim them off after a quarter of an inch. Space the winding to ⅜ inch and solder from the solder lug we added to the bottom of the cavity. Connect a 25 mmf mica or disc capacitor from the plate of the *rf* amplifier tube to the top end of the coil. It will be necessary to provide a path for the plate current within the cavity since this was originally in the center of the tuned line of the cavity. The use of a small *rf* choke solved this problem by connecting an *Ohmite* Z-50 choke from the plate to the terminal strip at the end of the cavity. This terminal strip is used as the *rf* amplifier B+ tie point and neatly solved the problem of making the meter work properly without a lot of digging into the equipment. A 50 mmf mica or disc capacitor is used to connect to the mixer grid. It is wired into the coil one-half turn down from the top of the coil. The other end goes directly to the grid through the access hold in the cavity.

The oscillator is identical to the mixer, except that the coil is three turns. The cathode tap is one-half turn from the ground end of the coil. A 50 mmf mica or disc capacitor is connected from the top of the coil to the grid. The 10 mmf ceramic capacitor (C-19) used for coupling the oscillator into the mixer is rewired so it is now between the oscillator grid and the mixer grid. The oscillator filament should be rewired so that pin 4 goes directly to ground. Solder a 0.001 mf disc directly from the plate of the oscillator to ground as a plate by-pass required in this type of oscillator.

With the tuning capacitor fully open, the oscillator should be brought to a frequency of about 122 *mc*, and the mixer circuit tuned to 150 *mc*. This is best done with a grid-dipper, with the oscillator checked again by the grid dipper being used as an absorption wavemeter. As we mentioned last month this is a superheterodyne with an *if* of 28.1 *mc*. The dial can be calibrated by tuning in known signals or by using a crystal marker of the band edges and known frequencies within the band. While we were more than pleased with the results of the 220 *mc* conversion, we were unimpressed with the operation on 144. This is partly understandable since the bandwidth is much too broad for satisfactory operation on two meters. Then too, on two meters, the design of the *rf* section leaves a lot to be desired since the optimum loading and adjustments cannot be made as satisfactorily in a conversion as on original equipment. The most redeeming feature of the receiver is that it is well built and can serve as a standby receiver with squelch operations for net control, etc. The *if* is much too high to make any conversion at a lower band. More than likely this would be best converted to 420 or 465 citizens band (NOT LOW CITIZENS BAND).

Surplus News

Every so often we get a chance to drop in on some of the suppliers of surplus equipment, as well as the actual surplus sales of equipment. John Meshna Jr., 580 Lynn St., Malden, Mass. has a few gems that should be worthwhile to all surplus hounds. He tells me of a unit he is getting in from England. It is a small unit that can be made into a six meter converter with little effort and at a price which should be interesting to all.

Algeradio, 37 Greenwich St., Hempstead, L. I., N. Y. has a basic foundation from the LM frequency meter. It is lacking only the variable capacitor and drive, but includes the coils, etc. For ten dollars you can have all the replacement parts you would ever need for the LM or any other good *vfo*. Algeradio gets a lot of stuff in from time to time, like the RAO receivers we wrote about. He can also supply parts for special power supplies and the like.

Rex Electronics, 88 Cortlandt Street is another source of stuff, including the APX-6 and other such units. Most of the stuff is new or very good surplus and his stock of components is unbelievable.

Barry Electronics, 512 Broadway, New York City is another source of components and tubes. Get on his mailing list and you will find out about deals like the mobile power supply for a high power rig for under twenty dollars.

Mail

C. F. McRae, 407 Englewood Avenue, Kenmore 23, N. Y. is looking for conversion data on the **BC-788C**. W. E. Dean, Box 16, Martin, Michigan is looking for a conversion for the **BC-223A**. W. S. Bailey, 7122 Heathfield Road, Baltimore 12, Maryland needs a manual on the **R-45/ARR-7** and the **ART-13**. Also in need of a book on the ARR-7 is PFC G. Endres, RA12566405, US Army General Depot, Verdun, APO122, N. Y. D. T. Chandler writes that he has a few **BC-314** and **BC-342** manuals at a nominal price (also a couple of **BC-610** books). His address is 5116 South Woodlawn Ave., Chicago 15, Ill. G. O. Emory, 10 Orange Street, Woburn, Mass. has a **GF-5** Navy Aircraft transmitter and is looking for a conversion or a handbook. Fordham University A.R.C. (K2FO), Box 510, Bronx 58, N. Y. has a few **BC-191, 312, 342** and **SCR-511** manuals for sale. W. Schmiedel, 844 7th St., Allentown, Pa. wants to get hold of a manual on the RCA-**ACR-111** receiver. C. Smith,

[*Continued on page 113*]

semiconductors

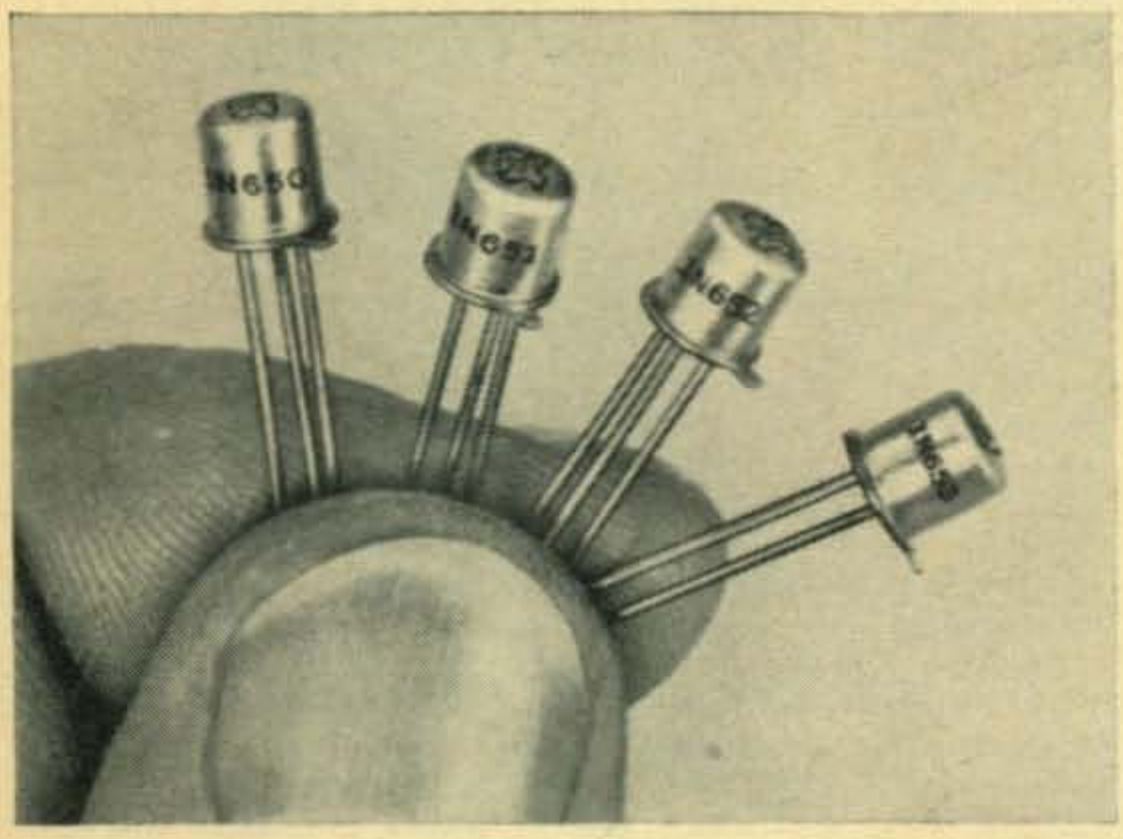
by DONALD L. STONER, W6TNS
P.O. Box 137, Ontario, Calif.

The New York IRE show brought many new developments and as always those in attendance were amazed at the progress made in the semiconductor field during the past year.

One of the most interesting devices was *Pacific Semiconductors* kilowatt *vhf* transistors. These water cooled beauties surprised quite a few people, including your conductor. I didn't think it could be done! *PSI*, leader in the field of exotic transistors and diodes, also showed their micro-micro transistors which were described in the column last month. They resemble a grain of sand, with leads attached. Pacific Semiconductors also showed a completely transistorized broadcast transmitter, using the new PT-900, which is capable of 125 watts dissipation and operates up to 50 megacycles.

RCA had a variety of animated displays, including an oscilloscope demonstration to show the electrical comparison between germanium and gallium arsenide tunnel diodes. Scope traces showed the increased power handling capacity of gallium arsenide tunnel diodes.

Another working display demonstrated the adaptibility of tunnel diodes to small space requirements of micromodules. A cube measuring only three-tenths of an inch included two tunnel diode circuits—a 100 *kc* multivibrator and a binary divider. The tunnel diodes were placed on a standard 0.31 micromodule wafer.



More tunnel diodes! This group is produced by Texas Instruments and employs gallium arsenide.

At the *RCA* booth could be seen a demonstration high frequency transmitter which provides ½ watt output at 70 *mc*. An interesting new transistor, called the double emitter transistor was also shown. This device is intended for frequency conversion applications in superheterodyne receivers and performs simultaneously as an oscillator and mixer. Thus the mixer portion may be gain controlled by the *agc* circuit without affecting the oscillator portion. This transistor will have many other applications for isolation in duo-purpose stages.

Another interesting display was *RCA's* transistorized auto radios and AM-FM portables which used the new compensating diode described in this column several months ago.

Back on the tunnel diode "kick", *Texas Instruments* got on the "band wagon" with their 1N650 series of gallium arsenide tunnel diodes, which are intended for high speed computer logic circuits, amplifiers, oscillators, and general computer purposes. The 1N650 series, packaged in the lightweight standard JEDEC TO-18 case, provides guaranteed peak currents up to 10 *ma* ± 2%, large voltage swings, high peak to valley ratios (greater than 15 to 1), guaranteed forward voltages up to 1.1 volts ± 5%, and high temperature operation up to 150°C. These diodes are in full production at *TI* and are priced competitively with germanium tunnel diodes.

The *vhf* boys will be interested in *TI's* new gallium arsenide varactor diode. The XD500 is encased in a reversible polarity, double ended, ceramic microwave package. The XD-500 offers a junction capacitance of 0.1 mmf minimum to 1.0 mmf maximum at zero bias, a "Q" of 3 measured at 2 *kmc* at —2 volts. When referenced to —6 volts at 2 *kmc*, the "Q" is typically 45. The cut-off frequency is 60 *kmc at* —2 volts and 110 *kmc* or greater when measured at breakdown voltage. The shunt capacitance variation of the XD500 var-

Contrary to earlier reports in this column, General Electric is currently selling gallium arsenide tunnel diodes. This unit is packaged in the standard JEDEC TO-9 case and is rated to 1,000 mc.

actor follows the minus ½ power law, and extremely low inductance with a 0.4 mmf package capacitance measured at 100 *kc*.

General Electric, reported earlier in this column to be bringing out their gallium arsenide tunnel diodes this fall, have announced immediate availability of two models differing in peak currents. The higher current unit has a typical peak current of 22 *ma* while the other device is rated at 10 *ma* peak current. These units are priced at $55.00 and $85.00 respectively. Capacitance for both devices is typically 1.5 picofarads per *ma*. The typical peak to valley current ratio of both devices is 15 to 1, which compares with the typical 10 to 1 ratio of germanium tunnel diodes. Later gallium arsenide tunnel diodes are expected to have peak to valley current ratios in excess of 25 to 1. In their advanced research labs, scientists have successfully made gallium arsenide tunnel diodes with peak to valley current ratios of 60 to 1! The new tunnel diodes are housed in the TO-18 standard transistor package. *GE* engineers point out that the high frequency capability of the device in this package is about 1,000 *mc*.

New Term

In the preceding paragraph you may have noticed the word "picofarad". Recently the National Bureau of Standards announced it was adopting this term as standard, and understood to mean micro-microfarad.

Our overseas friends have used this connotation for years. Those of us who have heard the term used over the air are almost as amused as the overseas stations are by our use of the terms "mickey farads, mickey mikes" and the like. Since the term has been adopted as standard, and represents an obvious simplification, I suggest the amateur fraternity follow suit and use microfarads (mf) and picofarads (pf).

Reader Circuit

Thanks to Howard Deller, W1GBS, 34 Chartier Dr., Fairview, Mass. for supplying information on his method of stabilizing the voltage used to power a mobile transistor *vfo*. The method conjured up by W1GBS is shown in fig. 1. He felt that if one zener diode is such a good regulator, two in cascade should be even better. To show the improvement, Howard tabulated the results of a bench check to simulate the actual variation of an automobile system, while working into a 3 *ma* load:

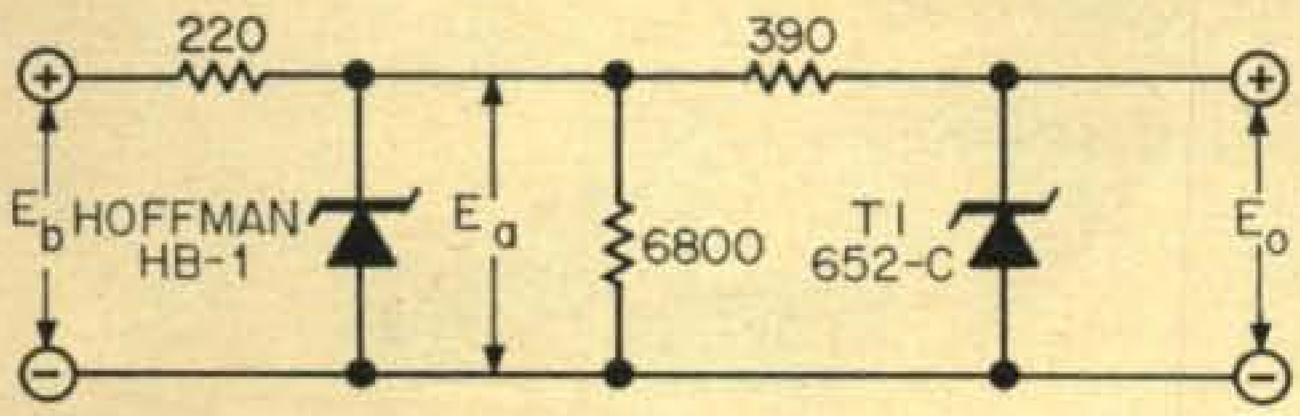


Fig. 1—Regulator circuit (cascade) for transistor vfo circuits suggested by Howard Deller, W1GBS.

E_b	E_a	E_o
10 v	8.25 v	5.75 v
10.5 v	8.6 v	5.75 v
11.0 v	8.8 v	5.75 v
11.5 v	9.2 v	5.8 v
12.0 v	9.25 v	5.8 v
12.5 v	9.3 v	5.8 v
13.0 v	9.4 v	5.85 v
13.5 v	9.5 v	5.85 v
14.0 v	9.6 v	5.85 v
14.5 v	9.6 v	5.85 v
15.0 v	9.7 v	5.9 v

Thus for a 5.0 volt change in input voltage, the output only varies by 0.15 volts. I might add the comment that if 1.0 or 3.5 watt zener diodes had been used, the lower dynamic impedance would improve the regulation by a factor of 100 (10 for each diode) which would provide less than 0.0015 volts variation in E_o.

QRP Corner

Most readers have forgotten about this section of the Semiconductor Column, or else no one is working with QRP. However, Jerry Fortier, W7IDI, up in Seattle, took pen-in-hand to tell us of his prowess on the six meter band with his version of the "Little Nic" transistor transmitter (Feb. *CQ*, p. 56). Jerry says, "I built her up and went on the air Feb. 23, 1960 running 12 volts at 8 *ma* on the final (2N384). I racked up a total of 9 contacts the first night, located about 7 miles from Seattle and 20 miles from Tacoma. My first contact was K7BAG, Chuck, who gave me a Q4-S5 report. However, he is on the other side of a hill. I made several contacts in Seattle and then swung the beam (8 el. at 53 feet) south—K7ASY in Tacoma gave me a Q5-S9 report. K7GSE (2 miles away) gave a 5-9 plus 40 *db* report! K7ENS, Tacoma reported 5-9 plus 10 *db*. The big thrill followed. It seems K7GSE was in QSO with Walt, W7PVZ, in Tumwater, Wash (abt. 45 miles away). I gave a break-break when Frank, K7GSE, was talking and to my surprise Walt heard me! Signal reports were Q5-S5 with very good audio."

"My rig differs from the original in that I double in the final—didn't have a 5th overtone 50 *mc* crystal. I used a 2N371 as an oscillator on 25.1166 which doubles to about 50.23 *mc*."

Let's see more "Little Nic's" on the six meter band, gentlemen, Jerry has shown what can be done with QRP equipment!

Bargain Corner

While glancing through the new Allied Radio Flier (#193) I came across an excellent bargain in Philco surface barrier transistors. Allied stock number 9E941 is a T-1767, $E_c = 5.0$ volts, $I_c = 5$ *ma*, dissipation = 9 *mw*., $f_{max} =$ 75 *mc* and is priced at 88 cents! I tried several of these and they all oscillate on the six meter band. Allied's 9E942 is a T-1768, $E_c = 4.5$

[*Continued on page 114*]

Citizens Radio

Lee Aurick, W2QEX/2W2870

With this issue the Citizen Band column is brought to a close. For the past year we have tried to inform you of the many new equipments of potential use to hams. Some of the gear was from manufacturers new to the communications field and we sincerely hope that they will remain and make a contribution to amateurs by turning out new ideas and units for the growing ham market. From the great variety of ideas we have seen there can be little doubt that many of these companies will find plenty of customers for their wares. An increased technical sophistication has made amateurs more demanding of performance and reliability, and no one has a monopoly on these important considerations. Here's an open invitation to all C/B manufacturers . . . give us well designed ham gear made with quality components . . . at a fair price. Then watch the sales curve climb.

The following units have been thoroughly tested by your reviewer and are presented here in this final C/B column last, but certainly not least. They represent a variety of philosophies as to tuning, number of channels, and operating convenience. With this in mind, you pay your money and take your choice.

Transpace Model C-27A

Manufacturer: Transpace Inc., 12902 Foothill Blvd., San Fernando, Calif. This unit boasts six channel crystal-controlled operation, and a three-way power supply (6-volt, 12-volt, and 115-volt *ac*) which contribute greatly to the convenience and flexibility of this unit. You may choose the channels when ordering, and an illuminated direct-reading indicator shows the channel in use.

The receiver is a single-conversion superhet, and includes ANL and squelch. Sensitivity: 1 microvolt (for 6 *db* sig to noise plus noise); Selectivity: —37 *db* (10 *kc* adjacent channel); Audio output: 3 watts (max) into speaker; Audio response: ± 1 *db*, 200 to 7,000 cycles; Squelch Sensitivity: opens on .5 microvolt signal or less; Image rejection: —60 *db*.

A transmitter power output of 3 watts is claimed when coupled to a 50 ohm load. An interesting feature: the pi-network tuner is common to both receiver input and transmitter output. A *tvi* filter is built into the antenna output circuit. Now operating in your reviewers "glove compartment," this unit has consistently demonstrated a mobile to base range of more than 12 miles. The ceramic microphone provides excellent comunications quality. Tube complement: 1-6AN8; 1-6U8A; 2-6BA6s; 2-6BN8s; 2-6AQ5s.

Lafayette HE-15

The receiver is a superhet with *avc* and incorporates a noise limiter which may be switched in or out of the circuit. A stage of *rf* amplification preceeds the detector to provide additional sensitivity and selectivity as well as to keep *rf* radiation to a minimum. The receiver tunes all 23 C/B channels. It is rated at 50 milliwatts output for 5 microvolts input.

The transmitter may be switched to any one of five preselected frequencies. Crystals for desired frequencies may be inserted very easily. The crystal microphone which is included features two positions. One position is used for normal "push-to-talk" operation, and in the other position the slide switch may be locked for

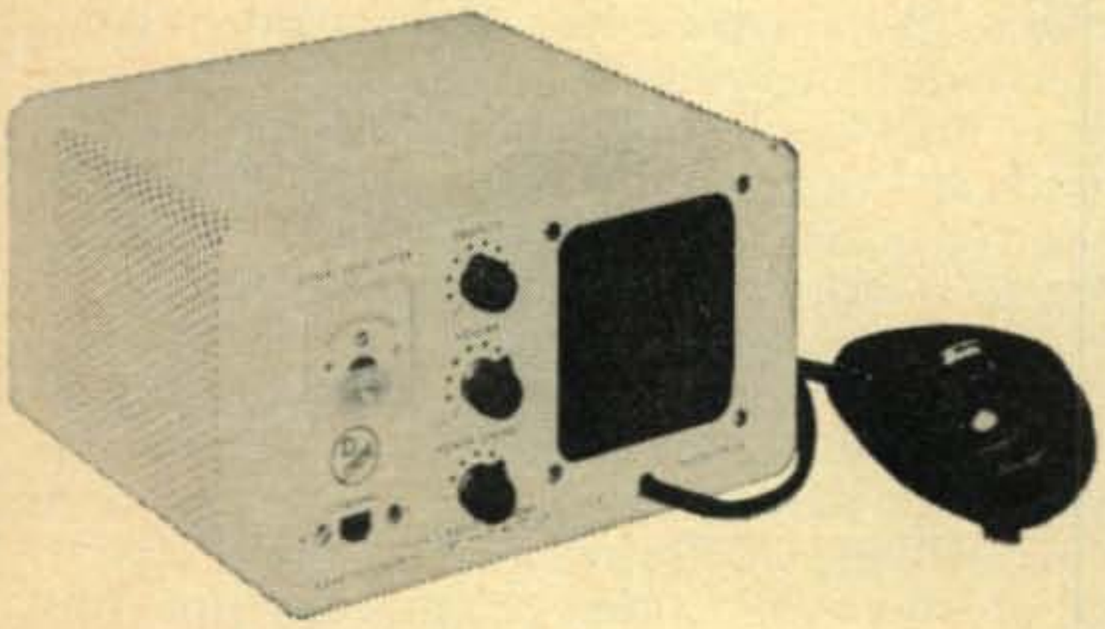
longer voice transmissions. The antenna will match transmission line impedances of 30 to 100 ohms, and no difficulty should be found in loading this rig into any of the C/B antennas on the market.

The HE-15 is equipped with one power supply for 115-volt *ac* operation, though accessory power units are available for 6 and 12 volt *dc* sources.

Tube complement: 1-6AL5; 3-6U8A's; 1-6V6GT; 1-12AX7.

Kaar "D" Phone

Manufacturer: Kaar Engineering Corporation, Box 1320, Palo Alto, Calif. This unit is available in three models; each for a different voltage supply source. Unusual features: meter on front panel indicates received signal level, and carrier output level; antenna-load control on front panel.



The receiver is a two-channel crystal-controlled superhet with squelch, *anl* and *avc*.

The transmitter is a two-channel crystal-controlled *mopa*. A carbon microphone is included as a permanently connected accessory. Tube complement: 1-6BJ6; 1-6U8A; 1-6BA6; 1-12AX7; 1-12AU7; 2-6AQ5; 2-6BJ7. Base station range to mobile has been about two miles with a good ground plane antenna at the maximum permitted height.

USL TR-800

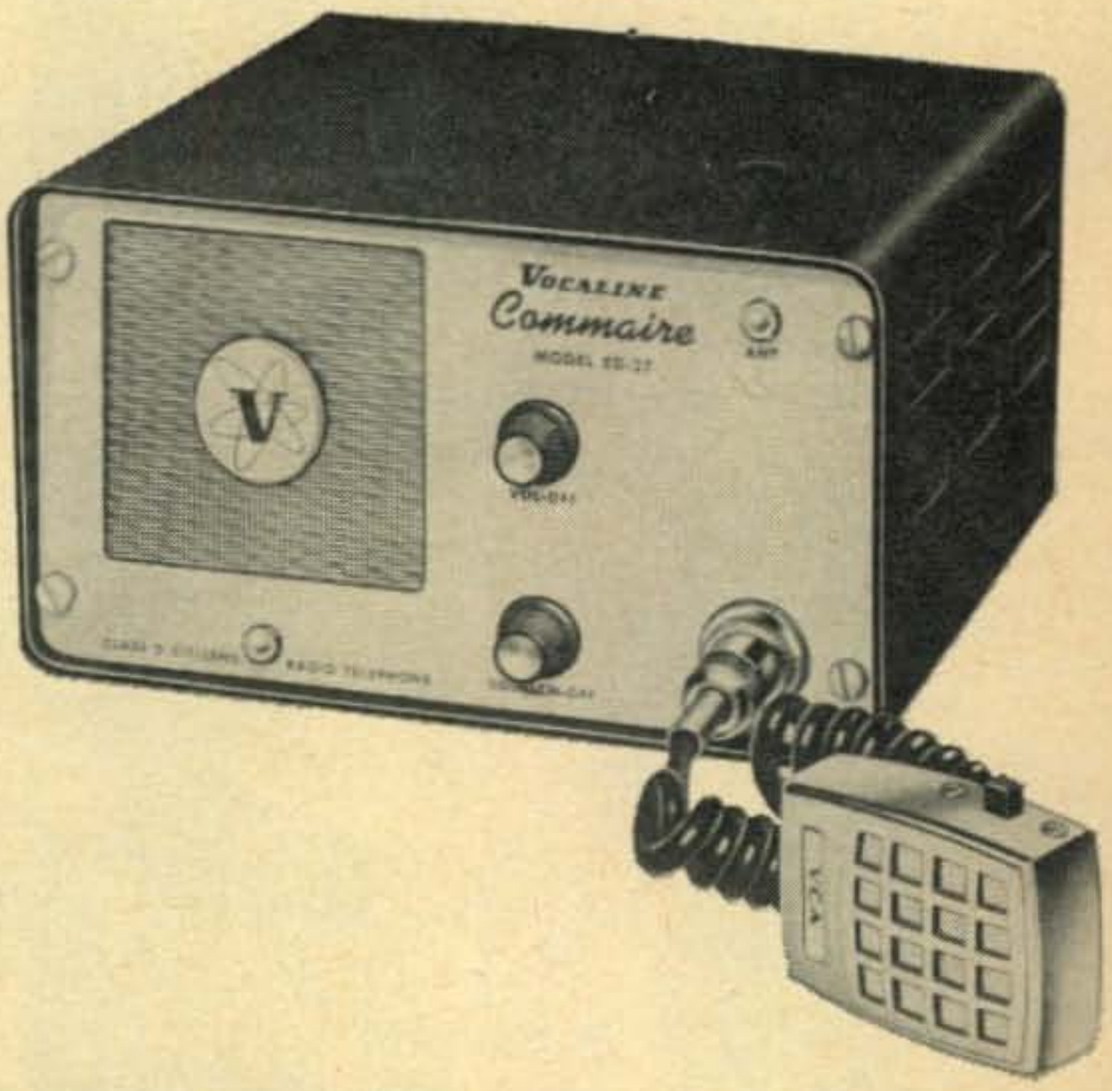
Manufacturer: United Scientific Laboratories, 35-15 37th Ave., Long Island City, New York. This unit is available only with 115-volt *ac* power supply. However, external power supplies may be purchased for both 6 and 12 volt operation.

The receiver is a tunable superhet that covers all 23 C/B channels. It incorporates *avc* and a noise limiter that may be switched off when desired. A "fine tuning" control insures ease of tuning and also operates the "fast tune" outer knob. No squelch is provided.

The transmitter accommodates five crystals; any one of which may be selected by the crystal switch. The transmitter will normally not require adjustment or tuning when changing channels. The crystal holders are easily reached beneath the front panel plate. The *Transmit-Receive* switch will normally remain in the receive position. When placed in the lower position the switch will return automatically to the receive position when released. In the upper position continuous transmissions may be made without holding the switch. Tube complement: 3-6U8As; 1-6AL5; 1-12AX7; 1-6V6-GT.

Vocaline ED-27

The ED-27 employs a double-conversion superhet receiver combining a noise limiter and a squelch circuit. Delayed *avc* permits maximum squelch sensitivity. The unit is designed for single-channel operation. The efficiency obtained with this transceiver is not without its complications. If you wish to change channels it will probably require a signal generator, a vacuum tube voltmeter, and the services of a competent technician. However, you may order the equipment with the channel you wish, and this slight disadvantage is more than compensated by the excellent receiver performance.



The transmitter boasts a genuine *rf* tube in the final amplifier; a 5763. No doubt the efficiency made possible by this tube is largely responsible for the whopping signal this rig puts out. A 6AQ5 speech amplifier drives a second 6AQ5 as a modulator.

They didn't spare the tubes either. The ED-27 uses ten tubes: 1-6BJ6; 1-6U8; 1-6BE6; 2-6BH6; 1-6AL5; 1-6AQ6; 2-6AQ5s; 1-5763. In addition, two selenium rectifiers are used for *ac* operation and two transistors function as a push-pull oscillator when powered by 6 or 12 volts *dc*.

My sincere thanks to everyone who has written during the past year. Your comments always have been most welcome, and each letter and card which required an answer has received one, as well as a few that did not.

With 73, Lee, W2QEX/2W2870

YL

by Louisa B. Sando, W5RZJ
212 Sombrio Drive, Santa Fe, N.M.

W6DXI with Sno-cat rig at Squaw Valley. Note W6BDE's call-letter mittens. (These were knit by W6PCN, who also made some for K6QCL, while W6QYL made a pair for W6DXI.)

YL ops beside the communications building at Squaw Valley during Olympic Games. L. to r., front: K6SBL, K6HOI, W6DXI. Rear: K6QCL and W6BDE.

13-year-old Patty Mitch of Milton, Pa., has been active since late March as KN3LHN. Look for her around 3735 kc. or 21.189 where she runs 75 watts with a Globe Chief. Her dad is W3LXN.

3rd International YLRL Convention

June! And the long-awaited 3rd International YLRL Convention the 17th, 18th and 19th, at the Hotel Commander, Cambridge, Mass. For months we've been telling you about plans the WRONE gals have been making for this momentous occasion. Check May *CQ* for convention details and program.

We hear the number of prizes is fantastic—it looks like everyone attending should go home with something—and it just might be that souvenir bedspread with replicas of all the YL certificates! (You don't have to be present to win; for tickets write Chata Swenson, W1RLQ, Box 193, Morningdale, Mass., 25¢ each or 5 for $1.00). For picture of spread see page 53.

Any YLs going from the Mid-west are invited to join those leaving from Chicago via New York Central's train #28, Thursday, 2:40 p.m., arriving in Boston 10:30 a.m. Friday. If 30 or more YLs can get together for this, NYCentral will provide a special car. Contact W9RUJ, Mary, for details.

W1ZEN, Onie, reports they have a few places in private homes for any YLs who could attend if they didn't have to think about the hotel bill. If that would help, drop a note to Onie, pronto.

This winds it up for now—CU in Cambridge!

VIII Olympic Winter Games

No doubt you all watched the terrific skiing, skating, ice hockey games and other events televised from Squaw Valley near Lake Tahoe, Calif., between Feb. 18-28, 1960, when some 1,000 athletes from 34 nations met in competition.

Five YLs were operating with the Communications networks during the Olympic Games: W6DXI, Gladys; K6HOI, Pat; K6QCL, Joyce; K6SBL, Fran, and W6BDE, Esther. In addition, K6TQO, Clare, operated during the first two weeks of Feb.

W6DXI and W6BDE were stationed at McKinney Creek, 17 miles south of the main area, where they held cross-country races all but two days of the gals stay there, Feb. 13-28, the ski events in the Valley coinciding with those at McKinney. The only two ops at McKinney, Gladys and Esther were on the job at 5:30 a.m. and covered it until evening. During races they

[*Continued on page 115*]

ANNOUNCEMENTS [*from page 24*]

to a hard to get County do not benefit towards the award, only those whom they have contacted.

5. Applications accompanied by eighteen or twenty-eight QSL's, as the case may be, should be submitted to N.S.A.R.A., care of P. O. Box 663, Halifax, N. S. Canada.

Optometrists

Several of the optometrists in the North Texas area who are amateur radio operators feel that it would be an interesting project to compile a list of all the O.D.s who are amateurs in the United States and surrounding countries. Dr. John Price K5RKF of Paris, and Dr. M. D. Monaghan K5RAB have undertaken to compile such a list. They are asking that each optometrist who is a ham operator send Dr. Price the following data:

1. Name
2. Amateur call letters
3. Address and phone number of office and home
4. Location of station and do you operate mobile?
5. Class of license (novice, technician, general, extra)
6. What bands and what time of day do you usually operate?
7. What are your specialties in operation? (CW, phone, SSB, FM, TV, RTTY, etc.)
8. Do you have a phone patch?

Also they would like to have two QSL cards from each ham if possible. One will be kept and the other will be sent to Ralph Barstow who is making a collection of QSL cards.

This information should be sent to: Dr. John E. Price, 302 First National Bank Bldg., Paris, Texas.

More Optometrists

K5 Let's Help Sight, official station of The American Optometric Association, will be heard during the annual meeting of The American Optometric Convention, June 25th through June 29, 1960, at the Atlanta Biltmore Hotel, Atlanta, Ga.

Committee members presently active are: Dr. A. E. Akes, K4BXV. Dr. J. Basil Haddad, and the association's distinguished president, Dr. P. N. DeVere (Ex-KN4UPB).

Operations according to committee chairman K5LHS will be on all bands and appropriate QSL cards have been printed.

All optometrists who are interested in assisting in the operation of this station are requested to drop a card to K5LHS, 223 North Third Street, Muskogee, Oklahoma who is Radio Convention Chairman.

Arrangements are being made to borrow equipment for the event and for the erection of a tri-band beam atop the Atlanta Biltmore, Hotel.

Short Course

A concise, compact pamphlet, "Short Course for the Novice License," has been issued by EICO (Electronic Instrument Co., Inc.) of 33-00 Northern Blvd., Long Island City 1, N. Y. The "Short Course" is available upon request at no charge, and may be used as handy reference or refresher material for potential amateur radio operators.

The four page brochure lists the entire Morse Code, and contains general information regarding FCC requirements for becoming a "Ham Operator." Many of the more common abbreviations in ham radio usage, popular Q signals, and radiotelephony call words are included as well. An entire section is devoted to questions similar to those found on the FCC examination prior to issuance of a license. Answers given, deal fully and clearly with important phases of amateur radio operation, and provide "brush-up" information on such electrical factors as the Ohm's Law, amplification, determination of power input to an amateur transmitter, in addition to other related facts.

K4NAA—May 24, 25 and 26

The Navy's Washington amateur radio station K4NAA moves from its historic site at Radio Arlington for three days, May 24, 25, and 26 to operate from the Sheraton Park Hotel, Washington, D. C., during the 1960 Armed Forces Communications and Electronics Association national convention.

The Navy will issue specially designed QSL cards for the three-day event. K4NAA hours of operation during the three-day convention are 1000-2200 EST daily. Emphasis will be placed on the 10, 15 and 20-meters.

Hams are invited to contact K4NAA during the operating period. Operating K4NAA at the convention will be Commander George Dixon, USN, K4OFB, Henry Davis, RMC, W5OFH, and Francis A. Jewett, ETC, USN (Ret.), W4NCE.

WWV ETC.

The United Kingdom and the United States have begun coordination of their Time and Frequency transmissions.

Coordination was begun early this year in order to help provide a uniform system of time and frequency transmissions.

Participating in the project are the Royal Greenwich Observatory, the National Physical Laboratory, and the Post Office Engineering Department in the United Kingdom, and, in the United States, the U. S. Naval Observatory, the Naval Research Laboratory, and the National Bureau of Standards. This program follows previous cooperative efforts of these agencies to achieve uniformity and simplification in procedures.

The transmitting stations which are included in the coordination plan are GBR and MSF at Rugby, England, NBA, Canal Zone, WWV, Beltsville, Maryland, and WWVH, Hawaii.

1,700,000 Transmitters

Radio transmitters in the United States of America, according to a year-end report by the Federal Communications Commission, in categories other than broadcasting now outnumber broadcast transmitters in use by 165 to 1.

In marking its 25th year of operation, FCC points out the increasing complexity of nonbroadcast services dealing with protection of life and property as well as those used for business and personal communications.

Latest count of users shows a total of over 570,000 licensees using more than 1,700,000 transmitters, plus almost two million authorizations for operators. In addition to broadcast facilities there are now more than 50 other categories of radio services.

Greater Atlanta Hamfest

The Atlanta Radio Club and the Confederate Signal Corp have joined forces to sponsor the Greater Atlanta Hamfest, June 4th and 5th. The festivity is being held in conjunction with the Southeastern ARRL Convention. The event is being held in the air-conditioned comfort of the Yaraab Shrine Temple in downtown Atlanta. Plan to be present both days.

For further information contact: Ed Lewis, W4MDS at 805 Cowan Ave., Hapeville, Ga., or Dr. H. J. Climo, KN4PRS at 55 Osner Dr. N.E., Atlanta, Ga.

Scouting Jubilee

Over 50,000 Scouts will be camping at the foot of Pikes Peak, Colorado Springs, Colorado, from July 22-28 at the Jubilee Jamboree. About 450 of them will be licensed hams.

KØBSA, the Jamboree Amateur radio station will be manned by Al Kahn, W8DUS; Perry Williams, W1UED, and Harry Harchar, W2GND. It will be on the air during

the Jamboree on phone, CW and SSB, adjacent to the novice "bands" and almost anywhere on phone.

Since the operation will be similar to DX-pedition, incoming traffic will be accepted only when there are no other stations calling. Traffic should be routed through the local area nets, including MARS, for delivery to the Jamboree.

Many Scouts not at the Jamboree, will be camping at local Camporees, several of which will include field day type operations. CQ BSA will be the call used to make Scout contacts.

CONTEST CALENDAR

Frank Anzalone, W1WY
14 Sherwood Road
Stamford, Conn.

May	28-29—Bermuda
June	25-26—ARRL Field Day
October	1- 2—VK/ZL Phone
October	8- 9—VK/ZL CW
May 21 - Dec. 21	—CRV Marathon

Bermuda

There is still time to enter the second week-end of the 10th birthday commemoration of the Radio Society of Bermuda. This is the contest for the fabulous grand prize of a free trip to Bermuda, plus a week's stay for two at a leading hotel.

It's a bit late to try and get in the running but if you are interested all the details were in last month's Calendar.

Your logs go to: *The Contest Committee, P.O. Box 275, Hamilton, Bermuda.*

ARRL

If you are young, full of vim and vigor and have a hankering for the wide open spaces, this is a good time to get it out of your system. Get the gang together and check *QST* for details. Me? I like the comforts of home, so, I'll work 'em from a comfortable easy chair with a tall cool one at my elbow.

VK/ZL

The boys "Down Under" believe in getting their annual party organized and announced well in advance. It's a pity other organizations do not follow their example. We will have full details in next month's Calendar.

CRV

This is a new one sprung on us by the Centro Radio Veteranos of Buenos Aires, Argentina. It's a marathon extending over a seven month period.

The object of the contest is for outside stations to work as many LU Radioveterans as possible, using all bands, phone or CW. So if you work an LU and he hands you a serial number, signal report plus power, you will know it's a Veteranos.

The rest of the rules follow the usual pattern used in International competition and certificates are awarded to top scorers in each country.

Your logs go to: *The Centro Radio Veteranos, Carlos Calvo, 1424, Buenos Aires, Argentina.*

QCWA

The Third National *QCWA* Party sponsored by the Northwest Chapter of Quarter Century Wireless Association, was so successful that it will probably become an annual affair held the 2nd week-end of February. It is estimated that 257 members participated in the last party. The top ten finished in the following order: (Call plus number of contacts) W5KC 89, W7LQ 85, W8ZL 80, W9CAS 75, W9UX 75, W4HZ/3 72, W7FL 71, W1WY 69, W3DWY 65 and W8DLD 60.

That's about it for this time, will try to dig up some scores of other activities for next month. Have yourself a pleasant summer.

73 for now, Frank, W1WY

William I. Orr, W6SAI, Joins Eimac Amateur Service Department

William (Bill) Orr, W6SAI, has recently been appointed Manager of the Amateur Service Department at Eitel-McCullough, Inc., San Carlos, California manufacturer of Eimac electron-power tubes.

Bill, world-traveled amateur radio authority, is editor of the internationally distributed "Radio Handbook" in addition to his duties at Eimac, and is a regular contributor to *CQ* and *QST*. He is author of the *"Beam Antenna Handbook," "VHF Handbook," "Quad Antennas"* and other amateur publications.

He received his first amateur license (W2HCE) in 1934 and has been licensed as W6SAI since 1938. He holds WAZ, DXCC (265 countries) and numerous ham awards.

Prior to joining Eimac, Bill and his family spent 14 months touring Europe and Africa, visiting 23 countries and meeting friends contacted over the air. Amateur operations were conducted in such spots as Finland, Sweden, Vatican City, Monaco and Andorra, in addition to a 1950 trip to the islands of St. Pierre and Miquelon.

Born in St. Louis, Missouri, Bill attended Columbia University, UCLA and gained his B.S. degree from the University of California.

Bill resides in Menlo Park, California, with his wife, Sunny, and their six children, five girls and one boy.

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For further information, check number 23, on page 126

The Ham Mart

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BOYS' LIFE magazine is offering special QSL cards for KØBSA contacts and SWL reports and is making available a WAS-BSA certificate for submitting 50 QSL cards for 50 Scout contacts in 50 states.

Eastern Pennsylvania

The Eastern Pennsylvania Section Picnic will be held June 19, Pavilion number 7, Hershey Park, Hershey, Pa. 9 A.M. till ? Registration $1.00 per amateur call should be made in advance to Katie Gibson K3BHU, Pine Grove, Penna. Prizes, Awards, Ragchewin', ARRL speakers. Bring the family and your lunch basket or buy it at the park.

Eastern Montana Hamfest

The North Eastern Montana Hamfest committee is making plans for their 7th Annual Hamfest which will take place on Father's Day, June 19, 1960.

All invited—for more information contact Violet Hustad, W7ECN, Box 21, Wolf Point, Montana.

Rochester DX Association

The Rochester DX Association is holding its annual picnic and get-together on June 11, 1960.

More information may be obtained by writing Ray E. Leigh, W2SNI, Sec'y, 1875 English Road, Rochester 16, N. Y.

MARS BULLETINS

Air Force MARS Western Technical Net

Sunday 2-4 PM PDST . . . 7832.5 kc, 3295 kc, 143.46 mc.

June 5—"Beginnings of Interplanetary Flight" . . . Dr. Aubrey Mickelwait, Head of Navigation Section, Guidance and Navigation Dept. of the Guidance Laboratory, Research and Development Division, Space Technology Laboratories, Inc.

June 12— Preferred Electronic Circuits" . . . Captain John Ellison, USN (Ret), Director USAF MARS Western Technical Net.

June 19—"The Able Series of Space Probes, Pioneer I, Explorer VI, Pioneer V" . . . Mr. Eugene R. Spangler, Head, Briefings & Reports, Research & Development Division, Space Technology Laboratories, Inc.

June 26—"Final Net Session for Current Season." The Western Technical Net will be in summer vacation during July and August. The Net will resume operation September 11, 1960.

Air Force MARS Eastern Technical Net

Sunday 2-4 PM EDST . . . 3295 kc, 7540 kc, 15715 kc.

June 5—"Orbital Satellite Communications" Mr. Henry Hoffmann, Jr., Chief, Information Processing Branch, Directorate of Communications, Rome Air Development Center, USAF.

June 12—"Some Aspects Of Extra-Terrestrial Communications" Mr. Albert Feiner, Laboratory Chief, Advanced Developments Laboratory, Rome Air Development Center, USAF.

The Air Force MARS Eastern Technical Net adjoins for Summer recess following the June 12th broadcast. Regular programming will resume on September 18th.

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Kit: $59.95 $6.00 down $5.00 per mo.

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For further information, check number 25, on page 126

RTTY VFO [*from page 63*]

temperature coefficient type, N750. The 2 *mmf* and the 5 *mmf* coupling capacitors to the shift and diode circuits are also ceramic capacitors, but are zero temperature coefficient types. The two .001 *mf* capacitors in series from the grid of the oscillator to ground are silver micas; and, the 100 *mmf* coupling capacitors, plus the .001 blocking capacitors in the doubler output circuit are ordinary mica capacitors. All .01 and .05 bypass capacitors can be either paper or ceramic. (I used both kinds.)

Silicon Diode

The silicon diode is the heart of the remote control circuit. Almost any kind of *silicon* diode can be used. I used a *Texas Instrumnts* 1N2070 because that was what was on hand. The *TI* 1N2069 should work just as well, and it is a few cents cheaper. The reverse bias on the diode is obtained through a 100 K resistor from the screen supply. This bias is varied by the remote 100 K pot at the operating position, which varies the capacitive effect* of the diode on the oscillator. The 2.2 K resistor prevents the bias from going all the way down to zero where some *rf* rectification could occur.

Shift Circuit

Narrow shift code for dual identification purposes, as required by the FCC, can be obtained by connecting a 1 K pot in series with the 100 K pot *vfo* control at the operating position. The telegraph key is then connected across the 1 K pot which is then set to produce anything up to about 50 cycle of shift as the key is operated. (This prevents machines from running wild while you identify with the key.)

The 6H6 shift circuit is the old reliable developed by W6ZH many years ago. You don't *have* to use a tube. A pair of *TI* 601C diodes will work just as well. The idea is to provide right-side-up shifting (mark high, space low) when keyed directly by the keyboard. While this is the most simple procedure, use of a polar relay will result in cleaner keying. Note that both keyboard leads are above ground.

Buffer and Doubler

Both the buffer stage and the doubler stage operate Class A so there is no keying problem for standby. For simplicity, again, the cathode ground return circuit of the oscillator is made by a pair of contacts on relay which is operated with the plate relay when transmitting and independently for frequency spotting.

Adjustment

A receiver tuned to 3620 *kc* is all you need to adjust this *vfo*. With everything, including the machine, connected, set the *vfo* pot at the

*"The Voltage-Variable Silicon Capacitor," by Brands and Mitchell, *CQ* April 1959 page 30.

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For further information, check number 27, on page 126

operating position to midscale and the LOCAL TUNE dial on the *vfo* also to midscale. With the cathode RELAY circuit closed, adjust the band SET capacitor (100 *mmf*) until the *vfo* lands right on 3620. Now, check the variation of the *vfo* pot. It should be possible to move at least 10 *kc* either side of 3620 by adjusting the pot. The SHIFT pot is adjusted by operating the BREAK key on your machine until the 850 cycle shift is obtained. Once set, this control is left alone as the associated transmitter is operated on this band only.

That's all there is to it. Link coupling to a low power stage in your transmitter is recommended and is what is used at KØWMR. I drive a 6L6 which drives an 813. Local copy is obtained from my own receiver by using a *Dow-Key* coax relay which shorts the receiver line when transmitting. There is no interaction between the *vfo* and the final. The frequency spoted is exactly the same as the frequency transmitted, and the lack of noticeable drift is a wonder to behold. ■

HAM CLINIC [*from page 76*]

more than the little $2.50 asked for it.

The *Surplus Schematics Handbook* is now obtainable from the magazine book department. If you are interested in surplus, you'll be interested in the well-laid out schematics of some of the most popular surplus items. It is worth the $2.50 asked for it. I recommend it to the newcomer as well as the old-timer.

Thirty

Novice. There has evidently been some talk among *some* very *thoughtless* hams who have been advocating the abolishment of the Novice Class.

I feel that the Novice licensee is an important "cog" in the ham radio "machine" and I say "bosh" to those who have forgotten that they too were once *novices!*

No one can judge the majority by the actions of a minority; especially when the critics could stand some "polishing" themselves!

Advice to those who think we should have no Novices: instead of being critical, be *practical;* help out the beginners and strengthen our fine hobby. Don't tear it down by discouraging those who are trying to do their best to advance technically. Don't forget—you too were once a "green-horn."

Advice to the Novice: keep plugging and do not listen to some of these "squirts" who have adopted a selfish attitude—because they have a General or Extra Class license does not mean they are *real* hams—it takes more than a license. *Do* observe correct operating practices and emulate the *good* hams—those who have the welfare of hamdom at large in mind when they operate.

For further information, check number 29, on page 126

If you are a Novice, be proud that you are one—you're on the right path! With a little extra study and practice you'll make the higher grade—then you too can help a beginner.

So for this month then, HAM CLINIC will sign off and remind you that we exist in CQ to help you, the amateur (subscriber or not). No infallibility is claimed and we do try to do the best we can.

As one reader wrote: "boy, it is nice to know that you don't forget. Although you honestly told me that you did not have the information I sought, you did say that you'd keep trying. Well you did come up with the info after a year and I can still use it!"

See you on down the log. 72, 73 and 75.

Chuck F7FE/W6QLV

SIDEBAND [*from page 81*]

Double Sideband DX stations prior to June 1st, 1960, we will continue to accept confirmations for these contacts. After that date, only SSB contacts will be counted toward any award or sticker.

Band Hopping

When listening to Doc, W5RHW, don't think the band has suddenly changed if his signal drops! Doc has not one, but two beams up with instantaneous switching facilities and he can carry on a QSO with stations in widely separated areas and still get 40 over 9 reports from each . . . Gene, W6HYG, and XYL will be ocean bound for South Africa this month to visit ZS6ATA, ZS6AQQ, et al . . . Clarence, K7AFZ, lives on beautiful Mercer Island photographed in the April issue of National Geographic . . . Wonder if Sheriff Bernie, W5YVJ, will take his new KWM2/PM (Palomino Mobile)? Bernie confessed that, as soon as his new copy of *CQ* arrives, he whips out his magnifying glass to read the ham ads. The type really isn't that small, Bernie! . . . Bob, W3QHQ, in Cabin John, Md., informs us that residents of that city have a novel clause in their land deeds: any gold found on the property belongs to the State! Seems that pirates buried their treasures along the Potomac! . . . Lucky fellow Mort, W2KR; he was slated to accompany Butch, KØDWC, as technical consultant on Butch's jaunt to Japan . . . Ron, K4JXL, enjoyed his tour of duty on Ice Island as KG1DT so much he's thinking of applying for reassignment. How could a Miami, Fla. boy withstand that cold, cold weather? . . . Heard Doug, W6NJD, calling a JA3 in Japanese; now there was a real show stopper . . . Tom, K2CM, wondered aloud how many eavesdroppers there were on 3999.99 and received a long letter from Elmer who's recently become WA2EYR. Elmer stated that he's been listening to and enjoying the roundtables and proceeded to enumerate all the stations he's heard on the frequency . . . 77 stations in all since 1958, many of the entries accompanied by detailed information on the operator . . . Bob, W2DAH, intently operating his new KWM2 mobile, found himself thirty miles the wrong way before ending a QSO! Good thing he didn't care where he was going, this being his maiden voyage with the rig . . . Spent a pleasant hour chatting with Orlo, K6AVN, who is experimenting with chemical reactions at high speeds in rocket research, about the crew of the first space ship to leave Earth. Ham operator needed —any applicants?

Tried to swing a deal for Sam, W1KGW, who is in the top soil and gravel business, with Dom, W1URM, supermarket operator. If Dom's customers find sand in the spinach, it's through the courtesy of W1KGW!

How about dropping us a line about yourself and your station? We'd like a picture too, if you have one to spare.

Our cat accidently lapped up some gas the other day and began to race madly about the room, leaping wildly into the air and finally collapsing on the floor in a heap. Dead? Nope, just ran out of gas! Us too!

73, Irv and Dorothy

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For further information, check number 31, on page 126

PROPAGATION [*from page 82*]

little fading and noise.
C—Fair circuit, weak to moderately strong signals, some noise and fading.
D—Poor circuit, weak signals, considerable fading and high noise level.
E—Circuit out.

Table 2 relates these Circuit Quality Figures with the probability indices and the day-to-day overall propagation conditions forecast for June.

TABLE 2

Last Minute Forecast of Propagation Conditions

Probability Indices	Above Normal (June 16-19)	Normal (June 1-3, 8-15, 20-21, 27-30)	Slightly Disturbed (June 4-7)	Moderately Disturbed (June 22-26)
(0)	D	E	E	E
(1)*	C	D-E	E	E
(2)*	B	C-D	D	E
(3)*	A	B-C	C	D
(4)*	A	A	B	C
(5)	A	A	A	B

*Also applicable to the May-June DX Charts which appeared in May's column.

For example, Table 2 shows that a moderate ionospheric disturbance is forecast for June 22-26; during this period openings shown in the charts with a probability index of (4) are expected to have a Circuit Quality of C (fair circuit, weak to moderately strong signals, some noise and fading). Circuits shown with a (2) or less are not expected to open at all during this moderately disturbed period, etc.

The Short-Skip Chart can be used *anywhere* in the Continental USA; *local standard time* is used to indicate time of band openings. The Hawaii/Alaska Charts are for use between these new states, and the mainland areas of the country; *local standard time* in Hawaii and Alaska is used to indicate time of band openings.

The editor of this column would appreciate reader's comments concerning the presentation of the Short-Skip Chart, and the accuracy (or lack of it) that may be observed with the new method of attempting to relate band openings with specific days of the month.

Solar Cycle

The Swiss Federal Solar Observatory reports a monthly sunspot number of 104 for March, 1960. This results in a 12-month running smoothed sunspot number of 146 centered on September, 1959. The present solar cycle continues its slow decline from maximum. A smoothed sunspot number of 118 is forecast for June, 1960.

Major Ionospheric Disturbance

One of the most severe radio storms ever experienced began on March 31st and lasted until April 3rd. For some 36 hours during the height of the storm (April 1-2) the entire high frequency spectrum was virtually useless, with almost a complete black-out of all signals, *including noise*. During the early stage of the

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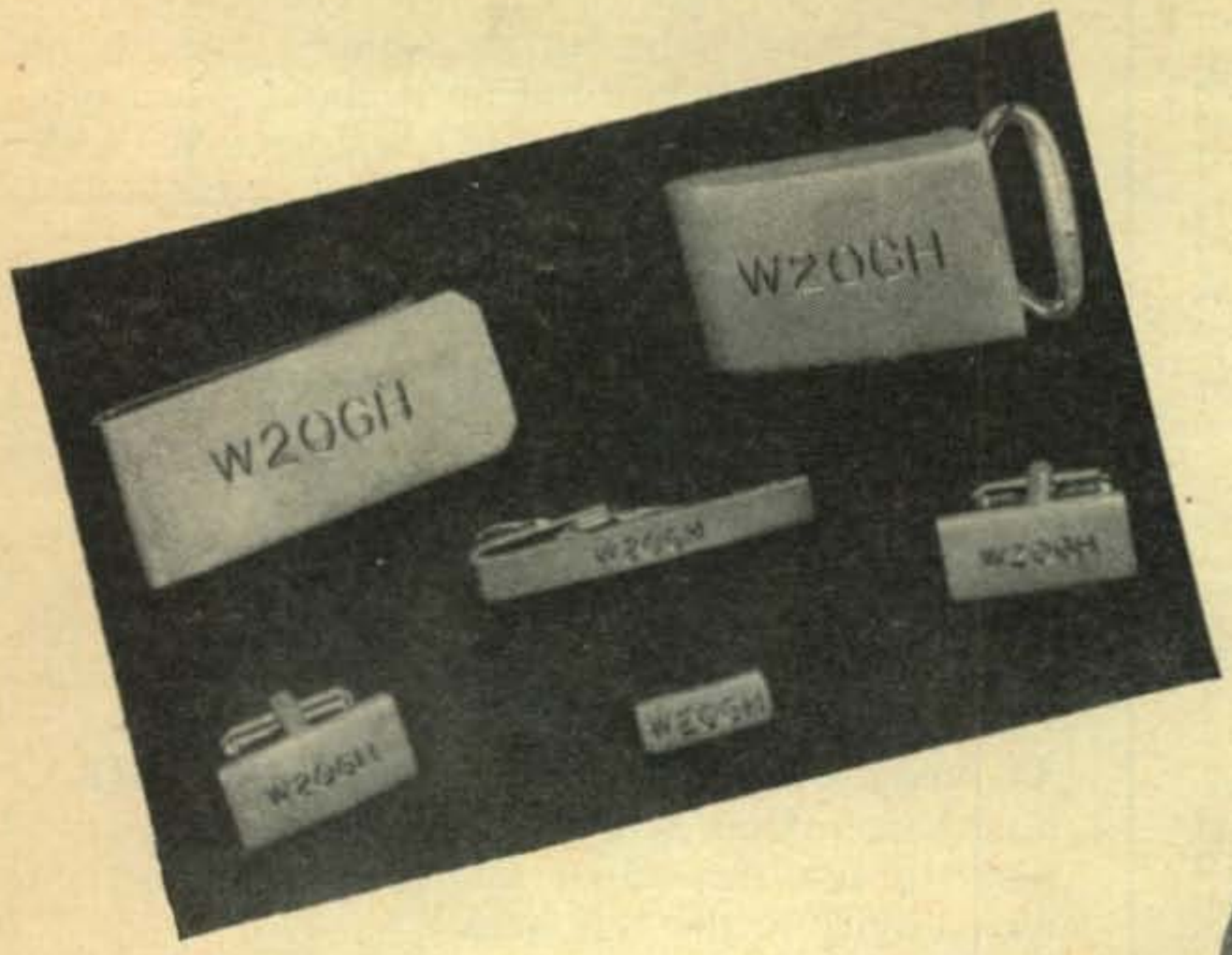

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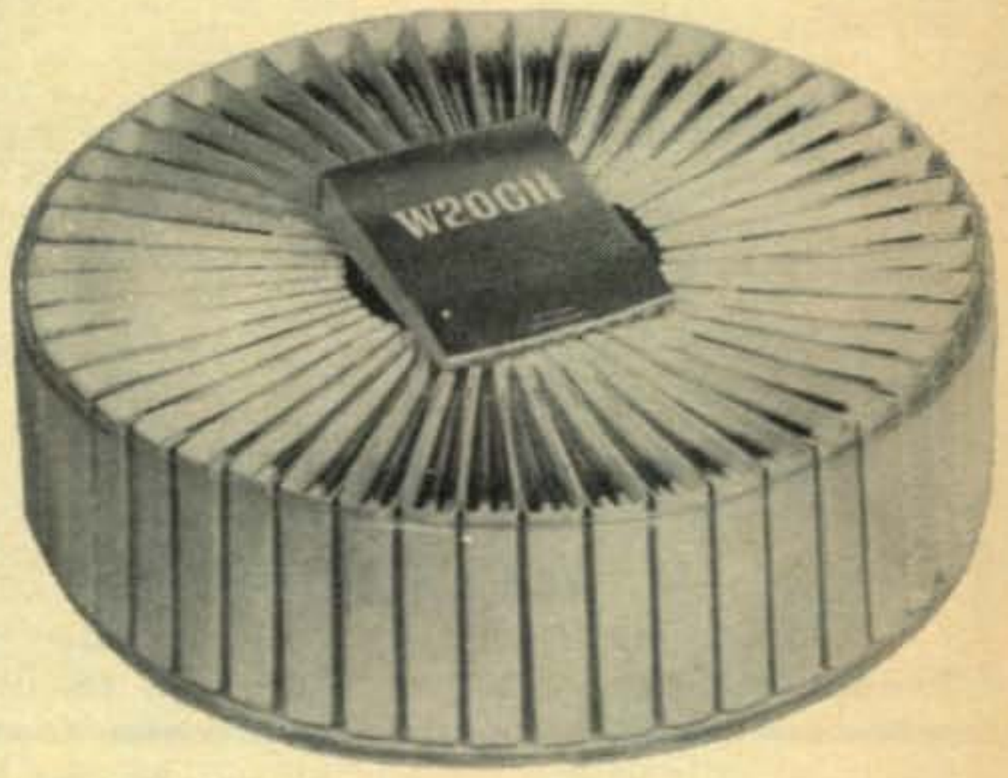

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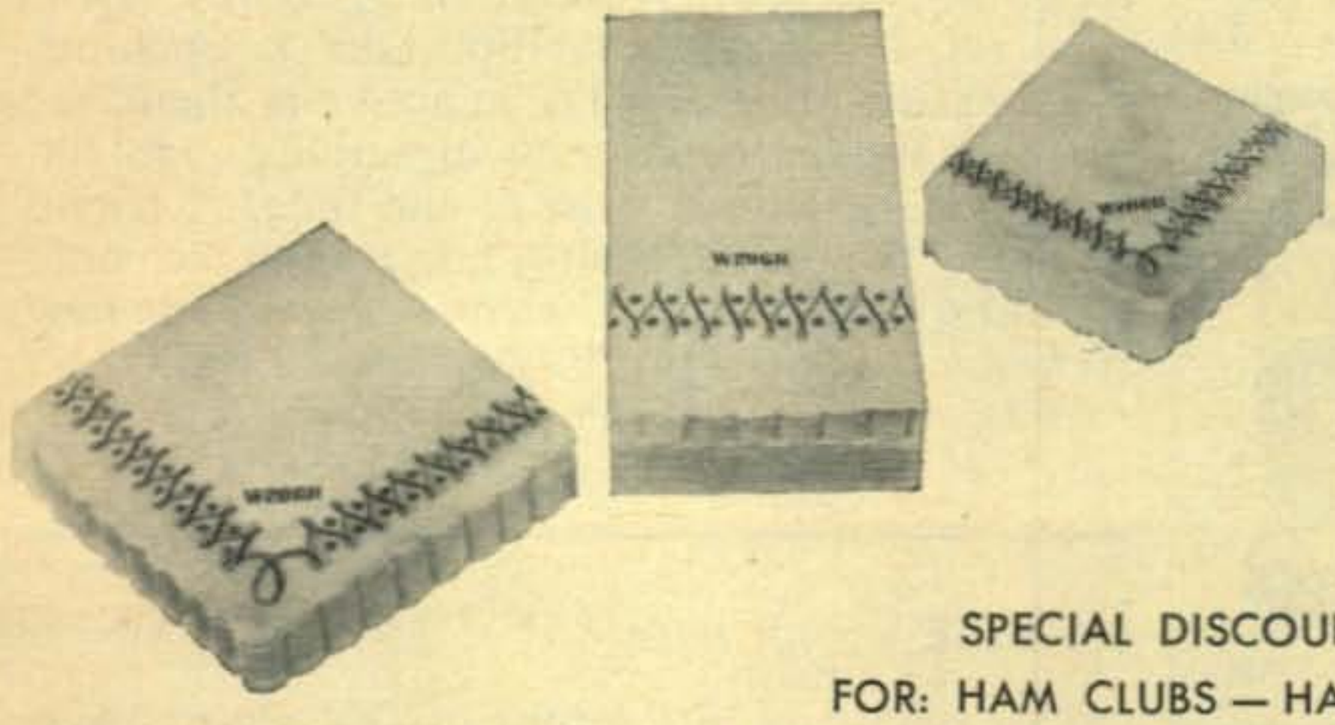

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disturbance, auroral displays were seen as far south as Florida. The storm was believed to be caused by a tremendously active sunspot group located on the face of the sun. The storm subsided by April 4th, but ionospheric conditions did not return to normal until about April 6th.

73, George, W3ASK

VHF *[from page 85]*

I will QSL anyone that needs Vermont and sends me a card."

"Would be interested in scatter CW skeds, if anyone wants to take a stab at it. Probably 150 watts would be a little marginal for this work, but it would be fun to try. Also, CW will be used on aurora." *You'll be a very popular fellow, Nandi, welcome to six meters.*

Alameda, California. Dale Clark (WA6IRK), a new technician writes: "Just received my tech ticket a few days ago, so here is a report on *vhf* activity in the Bay area."

"Six meters is quite active except in the mornings. In the evenings (especially week-ends) it sounds like 40 meter phone. On Wednesday and Saturday at 2000 PST on 51.15 the 'Bay City Net' holds forth."

"I have a homebrew receiver which is very sensitive. My rig is a homebrew one; 12AT7 driving a 2E26 in the final, running 10 watts phone, 25 watts CW, into a ground plane antenna on the roof. Haven't snagged any openings yet, but heard that Sporadic E openings are due this May, and I'll be active in them."

"Two meters is different in activity than six. Two meters is dead most of the time. A friend of mine, WV6GIQ, built a fine transceiver only to find a dead band." *Welcome to another new technician, and we all know you'll enjoy six meters, be it alive or dead, local, skip or DX.*

73, Sam, W1FZJ

NOVICE *[from page 87]*

Our next stop in the tour of DX reports is at the QTH of Tima Popovic, YU1-RS-357, Banat Novo Selo, Yugoslavia. Tima reports hearing the following stations on 15 meters.

Feb. 26, 1524-1853 GMT: KN1KFU, MBO, MFA, MIH, MOJ, MPM, MWU, NIY, WV2FOL, FVL, FYE, GWL, KN3HVT, JLI, KN4ORY, WV6HXL, KN8PCQ, PMY, PYV, RHK, KN9IWG, TZK, UER, UWT, KNØYQZ. Mar. 3, 1732-1930: KN1KPS, KZL, MOK, WV2FBF, FBV, FCJ, FHQ, GXT, HGQ, HRX, HUB, HUX, HVN, IDM, ITK, JBF, JMV, JNR, KIR, KIU, KN3JFX, JGI, KXM, WP4AUL, KN4LHH, PLV, PUH/4, KN8PTM, PXN. Mar. 5, 1853-1925: KN1LLU, MTU, NCV, QDT, WV2JDT, KRJ, KN3CPW, IAN, KN4FPZ, MPE, OVS, PPX, RJJ, KN5YZG. Mar. 6, 1604-1852: KN1KDP, KHW, LPC, LUX, LVY, LWZ, MCL, MGK, MKP, MMH, NFL, WV2FJW, GBG, KWT, IKB, JSU, JSV, KJA, KN3IXK, JJN, JLK, JVA, KHW, KIQ, KNH, KQS, KSK, WP4AUV, KN4FSA, GLU, IEF, ILG, KN8NWR, OLL, OUU, PDO, QKJ, QXB, RFR, KN9RNQ, ULB, VBN/9, VWG, KNØTVC, VBX, YTI.

Thanks again Tima for this excellent list of calls.

[Continued on page 112]

WALKIE-TALKIES

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MODEL MAB
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SINGLE CHANNEL.
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MODEL MAB WALKY-TALKY is a compact, portable, fixed-frequency 2-way crystal-controlled transmitter-receiver, ruggedly designed for military use. It is completely modern in design, with outstanding features such as Superheterodyne Receiver circuit, miniature standard type tubes, Heising (AM) Plate Modulation, 7-Section (extends to 85") Telescopic Antenna with built-in adjustable Loading Coil, Pierce-crystal-controlled Oscillator (minimizes tuning adjustments), plus many others.

Since the frequency range of this unit is 2.3 MC to 4.5 MC, it is ideally suited for use on the 80 Meter Amateur Phone Band, and for Emergency use (especially for small boats) on the Ship-to-Ship frequencies of 2638 or 2738 KC. By slight modifications, the frequency range can be changed to cover 2.0 MC-4.2 MC so that it can be pre-set to operate on 2182 KC, which is the "Safety and Calling" frequency constantly monitored by the Coast Guard and hundreds of pleasure and fishing boats. Many other applications are possible, such as Logging Camps, Barges, Searching Parties, CAP, etc., where emergency communications may become necessary.

The MAB is housed in a watertight plastic case, dim. of which are: 7½" H. x 10" W. x 3-9/16" D. Net weight of the Walky-Talky, with Battery Pack, is approx. 9 lbs. Tubes used are: Receiver total 4; 1R5 Crystal Oscillator-Mixer, 1T4 I.F. Amplifier, 1S5 2nd Detector and 1st Audio, 3S4 Audio Power Output Stage; Transmitter total 3, 1T4 Crystal Oscillator, 3S4 RF Power Amplifier, and 3S4 Audio Modulator. Space is provided within the plastic carrying case for housing either a Dry Battery Pack (supplying 135 volts "B", 1.5 volts "A", and 6.0 volts "C"), or, a miniature plug-on Vibrator Power Supply (delivering the same voltages) which operates from a miniature clip-on non-spillable and rechargeable 6.0 volt storage battery, or from an external storage battery such as 6.0 volt car battery (12 volt car batteries require series dropping resistor).

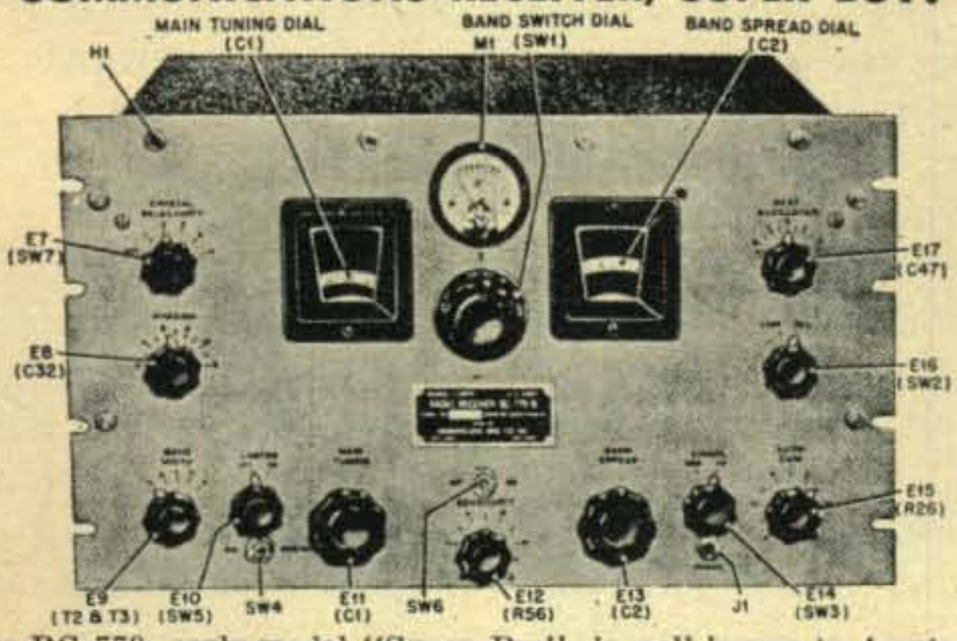
Each MAB unit is thoroughly tested before shipment, and is supplied complete (less crystals or batteries) with Telescopic Antenna, Earphones, Press-to-Talk Microphone, Canvas Carrying Case, Harness Straps, and Instruction Book. Shipping Weight **PER PAIR** is 28 lbs. **PER PAIR**.... **$49.95**

BATTERY PACK FOR MAB (or DAV), New—Not Surplus, Mfd. by Burgess. Shpg. Wt. 5 lbs. **EACH** $8.75

VIBRATOR POWER PACK, for MAB or DAV, operates from 6 Volts Miniature or Car Battery (12 V. Battery requires 2.25 ohm, 20 W. Resistor). **EACH**..... $8.95

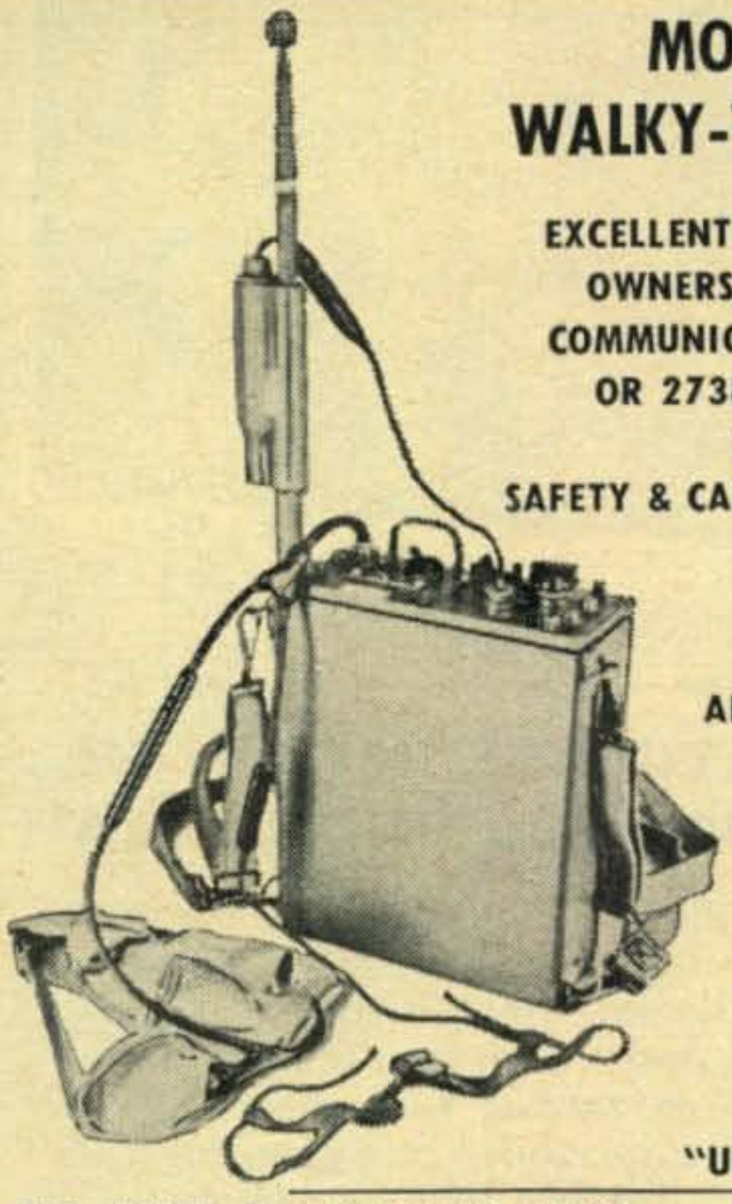
FT-243 CRYSTALS, 3885 KC (80 Meter Phone Band) Operation 1 for transmitter and 1 for Receiver, **PER SET**..... $5.00

HAMMARLUND "SUPER-PRO" BC-779 COMMUNICATIONS RECEIVER, SUPER BUY!



The BC-779, early model "Super-Pro", is well known to Amateurs and Signal Corps Communications Personnel. We made a good buy in a limited quantity of these units, in New and Almost New condition. This receiver covers both low and high frequencies in 5 bands as follows: 1—100-200 KC, 2—200-400 KC, 3—2.50-5.0 MC, 4—5.0-10MC, and 5—10.0-20.0 MC. Included are such desirable features as: Separate Band-Spread, Crystal Filter with Crystal Selectivity Control, Limiter On-Off Switch, S-Meter, BFO Control, Band-Width Control, Phasing Control, AVC-Manual Switch, Send-Receive Switch, etc. Circuit employs 2 stages of TRF before Mixer, and 3 stages of Int. Amp. to assure excellent selectivity and sensitivity. Receiver is cabinet enclosed, with front panel designed for rack mtg. Supplied with separate AC Fower Supply, also for rack mtg. Shpg. wt. 115 lbs. **LIKE-NEW** as described . . . **EACH** **$119.50**

SAME AS ABOVE, BUT "NEW-UNUSED" CONDITION $139.50



MODEL DAV-2, WALKY-TALKY PLUS

EXCELLENT FOR SMALL BOAT OWNERS, FOR EMERGENCY COMMUNICATIONS ON 2638 OR 2738 KC; OR 2182 KC (WHEN MODIFIED) SAFETY & CALLING FREQUENCY.
• • •
BUILT-IN RADIO LOOP PLUS SENSE ANTENNA PROVIDES ACCURATE DIRECTION FINDING ON OPERATING FREQUENCY.
• • •
EACH UNIT "UNUSED" & TESTED.

THE MODEL DAV-2 WALKY-TALKY uses similar circuitry and tubes as employed in the MAB. However, the case is plywood, watertight, and measures 10¾" H. x 10" W. x 3⅜" D. A built-in stationary Loop permits homing or direction finding, on pre-set crystal controlled frequency, by rotating the Walky-Talky until proper Null in signal is obtained By use of a "sense" button (using telescopic antenna as "sense" antenna) true direction of signals is indicated. A "Local-Distance" DF Switch is provided to assure accurate direction on strong or weak signals. This same switch has a third position, which changes the DAV from Direction Finder to a 2-Way Radiophone.

This versatile Portable Radio D.F. and Walky-Talky is ideal for small boat owners for use in emergencies, since it requires little space, operates independent of boat's power from self-contained power supply, requires no permanent installation and therefore can be removed after each trip and stored at home. In its present form, it can be set for either 2638 or 2738 KC which are ship-to-ship frequencies. The modified DAV (see below) covers 2000 KC to 4,200 KC (instead of 2300-4500 KC) and therefore permits communication on the Safety & Calling frequency of 2,182 KC, which is monitored by the Coast Guard and hundreds of pleasure and fishing boats.

Each DAV Unit is supplied complete (less crystals, batteries, or Power Pack) with all tubes, Telescopic Antenna with Adjustable Loading Coil, Phones, Differential type Carbon Microphone for clear-crisp speech, Canvas Carrying Case with straps, and Instruction Book. Each unit thoroughly tested before shipment. Shpg. wt. 18 lbs. **PRICE, EACH** (Single Unit) **$47.50**

SHIP-TO-SHIP CRYSTALS, 2638 or 2738 KC (Specify which), 1 for Transmitter and 1 for Receiver, **PER SET**..... $6.50

FOR ACCESSORIES, SUCH AS BATTERY PACK, VIBRATOR PACK, ETC., SEE "MAB" LISTING.

MODIFIED DAV-2 WALKY-TALKY, as above but modified so as to permit operation on 2,182 KC. **EACH**, with crystals... $64.50

LIMITED QUANTITY BARGAINS

BC-1306—TRANSMITTER-RECEIVER for MARS application. 3800 to 6500 KC, MO or Crystal Control. Includes Crystal Calibration and Net Controls. NEW UNITS, with all tubes except Final RF 2E22 tube. Shipping weight 50 lbs. **EACH** **$22.50**

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GG LINEARS [*from page 54*]

loading should be kept about 70 percent of the maximum plate current allowed for the tubes. Now gradually increase the exciter output and note whether the maximum plate current of the tubes is exceeded when the exciter is at full output. If so, reduce the antenna loading and recheck the plate "dip" until at full exciter output the tubes draw the maximum allowable plate current. It is wise to keep your hand on the exciter output control at all times and not permit maximum amplifier currents to flow for more than a few seconds. The above applies to grounded grid linear amplifiers capable of handling the full exciter output. For smaller amplifiers it will not be necessary to increase the exciter output fully as full output may cause damaging plate and grid currents or excessive plate dissipation. Likewise, if the amplifier is capable of exceeding "the legal limit" obviously the final loading must be held below this value except when connected to a dummy load. For a rough "rule of thumb" the loading (plate current) with a CW input (single tone) should be about double that which SSB voice peaks will reach on the plate meter. Also, the plate "dip" should not be too pronounced for this indicates light loading.

Having initially loaded as above or as specified by the equipment manufacturer, the amplifier should now go to the two tone test. This is a relatively simple test and is fully covered in the handbooks. It is the simplest way to determine your linearity, peak power, etc. Using this test, your amplifier should then be adjusted for the optimum idling current, drive and loading which will give the maximum input and the correct "scope" pattern without exceeding the plate and grid current ratings.

All the above may seem complicated but it really is not. Remember to always have your *plate voltage on and a load on the amplifier before applying drive.* Apply the drive gradually and be ready to cut it back promptly. The tubes during tune up are often loaded above the maximum dissipation ratings but *they should be kept at this point for only a few seconds at a time.* For newly constructed amplifiers the plate voltage may be reduced by about 50 percent during the initial testing and tune up. If an amplifier is loaded too heavily its efficiency is reduced but the linearity is improved. So when in doubt load heavily and later, *when you are sure*, reduce the loading. While it is possible to achieve reasonable results without a two tone test, its use is highly recommended so you'll know for sure! ■

ONE BLOCK DX [*from page 55*]

could manage the budget to get the "mostest the quickest."

A pair of headphones and a "spark coil" for each of us eventually arrived, and after getting

a couple of rolling-pins and enough annunciator wire to make the "tuners," and some tin-foil for condensers, we really got down to business.

The first "rig" was the "berries" though, and perked right off. We each had a 75 foot 4 wire antenna on 2 foot spreaders. Actually they were very good antennas, but as the distance was only one block (line of sight) and our antennas were 30 feet up, and parallel, there was little reason why the signals wouldn't carry. ONE BLOCK DX, but it worked, and the town had a wireless, much to the interest of the Doubting Toms.

Then began the usual "cut and try," build up and tear down and rebuild, by which process such things get better and better.

Boughten "two-slide" tuners arrived from E. I. Co., and gadgets from Wm. B. Duck Co., and bigger antennas went higher up. And thus arrived "set back" No. 1.

Friend Paul had an elaborate antenna rigged up with one end on a 40 ft. pole in the backyard, the other end on a 10 ft. pole tied to the chimney on the house. This worked swell until an ice storm one night brought it down with a clatter. Next morning, Paul's father, in no uncertain language and very decisive tones of voice, asserted that, "That dommed airless was down and would stay down. . . ."

But the "ham" spirit won't stay down, and eventually Paul rigged up another antenna on two poles further from the house, and "Pa" wasn't too reluctant—I think he bragged a little on the aside.

About this time, the sinking of the Titanic nearly made a "Jack Binns" out of both of us. Interest ran high for a time and many asked whether or not we heard the distress signals, but as yet, our DX was still one block away.

Then I moved away! Clear across town, about a mile distant.

This called for some work—quick. Soon a new antenna appeared at the new location, and the time neared for the big experiment—could we make contact across town? Work was rushed feverishly; every detail taken care of. The evening arrived on which the big attempt was to be made; the hour, set by previous agreement, had arrived. *Listen*, hey! jiggle that "cat-whisker" a bit—Hi, there he IS—

—·—· ——— —— ·· —·
——· ——— ···— · ·—·
——· ——— ···— · ·—·

Maybe you remember your first DX QSO, well, that was DX at that time. I don't know as he ever waited for me to finish the proper acknowledgement, or wether I did or not, for I lit out for his home as fast as two legs ever carried anybody. Down the block to the railroad tracks, and down the tracks I sped—no train could have overtaken me even had there been one in the vicinity.

About half way to his home I saw him coming—yelling like a Comanche Indian doin' a war dance, and we met head-on in a clinch that would have done credit to Joe Louis. ■

NOVICE [*from page 108*]

Net News

Paul Gregory, 99 Botsford Rd., Seymour, Conn. would like more members for the Connecticut Novice Net, which meets on 7174 *kc*. For more information, drop a SASE to Paul, WN1MVM, at the other address or call him at TU 8-6922.

Help Wanted

The following persons have written in to request help with their Novice examinations. Can you assist them??????

Letters

W3—George Porter, 236 Lurgan Ave., Shippensburg, Pa. (KE 2-6694)
Edward Kiely, 550 Pershing Avenue, Lancaster, Pa.
W8—Richard Meyer, 1723 Bukcland Ave., Fremont, Ohio
Evangeline Bird, 209 E. Melendy St., Ludington, Mich.
W9—Bill Remington, 731 James Ave., Rockford, Ill. (WO 3-9892)

Lloyd Westbrook, KN4HQI, 125 Cherry St., Commerce, Ga., commences things this month by telling about his DX-20, S-85, folded dipole and 2 element beam. The gear helped him snag FK8, KM6, UP8, 5A5, VP2, VP4, SP and PAØ among others! Lloyd would like a sked with Delaware to assist his WAS which stands at 50/49 (shame on you Delaware!).

Rick, KNØYCP, St. Louis, Mo., drags 'em in with a Knight R-100, which he claims is a FB receiver. He uses a doublet on 40 and 15 meters plus a Gotham V-80 which he would like some assistance with.

Paul and Tava Franklin, KN9RNR and RNQ

respectively, 436 S. Dale Ave., Arlington Heights, Ill., are a father and son ham team. Paul has a WAS of 37/33 but KN9RNQ leads with a 46/43. Both ops use a modified AT1, DX-100B and vertical trap antenna.

Jim Dionne, K1MEM, 35 High Rock St., Westwood, Mass., received his General ticket at 11 years old! Now that he is "big-time" he offers to help anyone with the Novice exam and will sked anyone needing Mass. Jim also passes along this hint: If a 10K pot is put in the+ line at the standby receive switch, the receiver can be used as a monitor when you're sending.

Ed Franklin, KN9UBK, 1600 George St., Logansport, Ind., has passed the General exam and his "OM" has made the Novice hurdle and received call letters KN9VWK. Ed uses a Viking Challenger and an S-107, and has dipoles for 80, 40, and 15. The WAS total stands at 45/44 and Ed would like skeds with Vermont, N. Dakota, Nev., Delaware, S. Carolina and KL7.

Mike B. Finney, 6937 Montgomery Rd., Cincinnati, Ohio is KN8RLQ and rolls along with a Globe Scout 65A, NC-173, and antennas include a 40 meter folded dipole, a 8 element beam for 15, and a 75 foot wire for receiving. WAS is currently at 47/39 and DX includes G2WQ and CN8JF. Mike would like a sked with N. Dakota, Alaska, and Utah.

Thomas Briers, KN8RJC, 210 Miller Ave., Hinton, W. Va., is "hot" for a sked with Delaware station to complete his WAS, on 80 meters. He will be pleased to sked anyone needing W. Va. Thomas believes he is the youngest Novice in W. Va., at age 12.

David Little, 1043 Clarksville, Paris, Texas, can really fool 'em with that QTH! Dave is 14, and runs a Globe Chief and NC-109 which has run up his WAS total to 35 with a VE3 thrown in for good measure. Dave would like to join a 15 or 40 meter net and will be glad to assist anyone needing Texas for WAS.

With David's letter I write 30 for another 30 days or so.

73, Don, W6TNS

SURPLUS [*from page 89*]

8850 Kendale Drive, St. Louis 21, Mo. can use a handbook on the **R-28/ARC-5** equipment. G. P. Griffis, 2415 S.W. Scholls Ferry Rd., Portland 1, Oregon needs a manual for the **T-14D/TRC-1** transmitter. The TRC-1 equipment handbook is also needed by The Albright College A.R.C., Reading, Pa. Phil Williams, 1077 Rosewood Dr., Atlanta 6, Ga. wants the manuals on the **ASB-7, BC-224, BC-669** and the **RAX-1.** R. A. Williams, 12439 Louise Ave., Mar Vista 66, Calif. has the HQ 100, 125 and 140 manuals for those who may want them. W. J. Havey, 359½ Valley Street, San Francisco 14, California wants the **DAS-3** and **BC-1346** Manuals. P. E. Moole, 342 Clifton St., Oakland 18, Calif. wants a conversion of the **BC-1306.** R. W. Randall, 43A University Heights, Burlington, Vermont is requesting manuals and conversion data on the **ARC-3** equipment. R. B. Mann, 248 South Central Avenue, Hartley, Iowa wants a schematic for the **GP-7** Navy Aircraft transmitter and its tuning units. T. P. Hall, 8928 Wakefield Avenue, Panorama City, Calif. would like to have a conversion of the **APN-4** for use as a good scope.

William Keiser, 44 Ovington Avenue, Highland Park, N. J. needs the maintenance manual and conversion data

For further information, check number 37, on page 126

on the **SCR-515** (Navy ABA). J. R. Noel, 8221 11th Ave. South, Minneapolis 20, Minn. has an **MS** and wants to convert it to Marine use if he can get a conversion manual. Ed Linksey, 1088 Carroll St., Brooklyn 25, N. Y. has manuals for the **GRC** power supplies and would like the **TS-133/UPM-1** manual. D. Ward. Box 462 Annex. Clarkson College, Potsdam, N. Y. wants a manual on the **BC-1268** radar oscilloscope which is part of the RC-184. B. Gard, 1201 Locust, Alva, Okla. would like to get any data on the **BC-653** transmitter. C. V. Thomas, 327 Mason Street, Hot Springs, Ark. would like to get a handbook on the Sylvania Model 108 surplus oscilloscope. Ed Shafer, 303 Virginia Ave., Albany, Ga. needs a manual or schematic to repair a linear power amplifier model **SDP-1000L** made by special Design Products. Joe Steen, 114 S. Mulberry, Kermit, Texas needs the **RAO-7, RBO** and **TCS-8** manuals and can loan the **TS-297, RT-70/GRC, AR-88, BC-312/342, I-177** and **RDR** manuals. G. S. Monroe, 1118 21st St., Portsmouth, Ohio needs information on the **RT-159A/URC-4.**

J. F. Brada, 4425 Streetsboro Rd., West Richfield, Ohio wants a manual on the **ID-60/APA-10.** J. G. Sanders, Box 11, Clifton Forge, Va. is looking for the Navy **TDH-3** transmitter manual. J. Cole, 240 Gillespie Drive, Abingdon, Va. needs a manual on the Navy **BL-6** equipment. Kenneth Lee; Police Dept., Box 731, Blooming Prarie, Minn. would like to get a manual on the Navy **MN** transmitter. W. Baumgartner, 1400 St. Albans Rd., San Marino, Calif. has an **OS-8A/U** oscilloscope and requires a handbook to get it into condition.

73, Ken, W2HDM

SEMI CONDUCTORS [*from page 91*]

volts, $1_c = 5$ *ma*, dissipation = 9 *mw*., $f_{max} =$ 25 *mc*, and is priced at 77 cents. The T-1768 seems to work fine on 10 meters. Although not much power for transmitter applications, these low cost transistors should be excellent for high frequency receivers. Run them at 2 *ma* with 4.5 volts on the collector for maximum performance.

Semiconductor News

General Electric, Semiconductor Products Department, 11840 West Olympic Blvd., Los Angeles, Calif., have announced several additions to their impressive line of rectifiers. Silicon stub mounted types 1N2847 through 2852 are rated at 500 *ma,* with PIV's to 600, and may be mounted directly on a chassis for the element is insulated from the stud. In the mighty-mite corner is their IN645 series of silicon double diffused junction subminiature glass rectifiers. These units measure 0.3 inches long, have *piv's* to 600 volts, and can handle 400 *ma.* New "Vac-U-Sel" units (two selenium encapsulated rectifiers with a common center terminal) include 6DG1, 6GC1, and 6GX1, for the TV servicemen.

International Rectifier Corporation, 1521 E. Grand Avenue, El Segundo, Calif., has prepared their spring edition of *Rectifier News* which contains an excellent article on "Properties of Rectifier Systems and Means to Improve Voltage Division". If you are not on their mailing list, request it on your company letterhead. International has also announced availability of their USN-1N430 8.4 volt reference diode. This device is the solid state

equivalent of the "standard cell" for it provides a stability of ± 16 millivolts over a temperature range of −55°C to + 100°C, with temperature coefficients of ± 0.002%/°C. These units are priced at $18.00 each in single quantities and are described in bulletin SR-255A.

Texas Instruments, P. O. Box 312, Dallas, Texas, has announced several new developments in the semiconductor field. A series of 48 standard types of encapsulated silicon diode stack, types 1N2878 through 1N2925 provide *piv's* between 700 and 6500 for high voltage supply use in radar and communications applications. Also new is a series of silicon controlled rectifiers, TI-010, 025, and 050 designations, for currents up to 3.3 amperes. Of particular interest to amateurs is TI's silicon mesa transistors, types 2N1564, 1565, and 1566, with 600 *mw* dissipation and an alpha of 50 *mc*. For regulation purposes, the TI-1N1816 series (42 types for regulation between 10 and 150 volts ± 5% 10 watts dissipation) and the 1N1746 (14 types from 3.3 volts to 12 volts ± 5%, with 400 *mw* dissipation) will be extremely useful. An interesting new transistor is the TI-2N1046 which is capable of switching 3 to 4 amperes in 10 microseconds. This new unit has a high frequency cutoff of 15 *mc*, features a maximum collector current of 10 amperes, and is available up to 130 volts V_c.

Radio Corporation of America, Semiconductor Division, Somerville, New Jersey, have introduced a new family of silicon rectifiers, types 1N2858 through 2864, which can handle up to 750 *ma* with *piv's* up to 600 volts. Also new is six intermediate power transistors, types 2N1183 A, B, and C, and the 2N1184, A, B, and C, intended for power switching, oscillators, regulators, and audio applications. The devices are rated to 100°C and can dissipate 7.5 watts at 25°C. A group of silicon military transistors, types 2N1479 through 2N1490, are useful in the same applications but are capable of operation up to 175°C.

And with that bit of news, I roll the top down on another issue. Don't forget to send details on any new and unusual amateur applications for semiconductors, to the address at the beginning of the column.

73, Don, W6TNS

YL [*from page 94*]

acted as control on two nets, one between ski patrolmen and their own as base station, and the other between sno-vehicles and base. The patrol net had about 15 walkie-talkies out along the cross-country track so situated that all the trail was within sight of one of them in case of accident. Fortunately, there were no emergencies during the entire two weeks.

At Squaw Valley proper the other YLs monitored the ski patrol net and the vehicle net. In spare time they operated K6USA, the Ham station set up for the Olympics, Pat, K6HOI, and

Fran, K6SBL, making most of their contacts on 75 meters.

2nd California YL Convention

According to all reports, the Camellia Capital Chirps did a wonderful job of planning and presenting the California YL gabfest at Sacramento the weekend of March 4. K6ENK, Wanda, and K6ENL, Aleta, set up a Ham station in the hotel hospitality room Fri. a.m. and in the evening a large group gathered there to get acquainted.

71 YLs attended the Sat. luncheon—22 from LAYLRC, 5 from San Diego, 8 BAYLARCs plus several others from the Bay Area, 21 Chirps, others from Sacramento and Central Calif., plus 7 from Oregon. The Camellia Festival Queen and three princesses were guests at the luncheon. At each place were fresh camellias, as well as ceramic camellias made by the Chirps, and 4-leaf clover leaves in plastic, courtesy W2QHH. The W7 YLs presented gifts from Oregon to the Camellia Queen. The Chirps wore colonial style dresses and W7DVH, Alice, won a prize for the best outfit. Cards filled out with "craziest phonetics" and "secret ambition" of each YL were used as basis for prize drawing—and each YL received a prize! The Camellia show took up part of the afternoon and in the evening 73 YLs and OMs gathered for dinner. K6UTO, Betty, invited all the YLs to San Diego for the 1961 get-together.

With the Clubs

Current Officers of the **Rhode Island YL Club**: Pres., W1GSD Dot; V.P., K1GEF, Mickey; sec'y, K1AAR, Helen; treas., K1DCW, Eleanor.

Due to illness, etc., several **TYLRUN** officers resigned. Here is the new slate: Pres., K5JXD, Margie; V.P., K5OPS, Ethel; publicity, K5OPT, Ruth; S-T remains the same, K5MJW, Betty. K5OPS, Ethel Chastain, is custodian of the TYLRUN certificate and applications should be mailed to her at 4338 Seabrook, San Antonio, Tex.

WHO members K5CRH, Marie; K5PIO, Margie, and K5MTS, Dorothy, have been awarded certificates for outstanding service to the Ft. Worth area by the Kilocycle Club.

The Los Angeles YLRC celebrated its 8th annual YL-OM Valentine Banquet on Feb. 13 with 116 attending, largest group in the history of this social event. A cocktail hour preceded a steak dinner for the occasion. White orchids were presented to K6BUS, Midge, president, and to K6ANG, Billie, V.P. and chairman of the event. W6SGE, accompanying himself on the guitar, provided a program of songs and music.

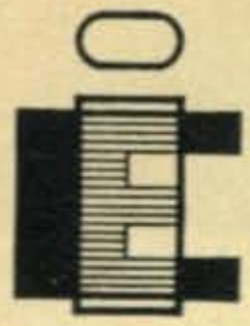
Just a reminder that the **Camellia Capital Chirps'** Cook Book is now available. Price is $1.75; order from K6HHD, Jan O'Brien, 6606—5th St., Rio Linda, Calif.

Members of **BAYLARC** are very sorry to report that their vice president, K6QCL, Joyce, lost her OM in a tragic accident in early February. Joyce has five jr. ops, ages 12, 10, 8, 6 and 4 years.

New officers for the **Loaded Clothes Line YL Net**: Pres. & NCS, KØEVG, Pat; V.P. & ANCS, W5YSJ, Jennie; S-T, K5KVJ, Gladys; P/C, KØEPE, Marte. Join the net at 7235, Monday 0900 MST, or the LCL CW net on Fri. 1100 MST on 14.1. For the LCL certificate, work 10 members off net time and send confirmations to K5GYZ, Lucille.

Book Review

ABC's of HAM RADIO—*How to get your novice license*—by Howard S. Pyle, W7OE, published by Howard W. Sams



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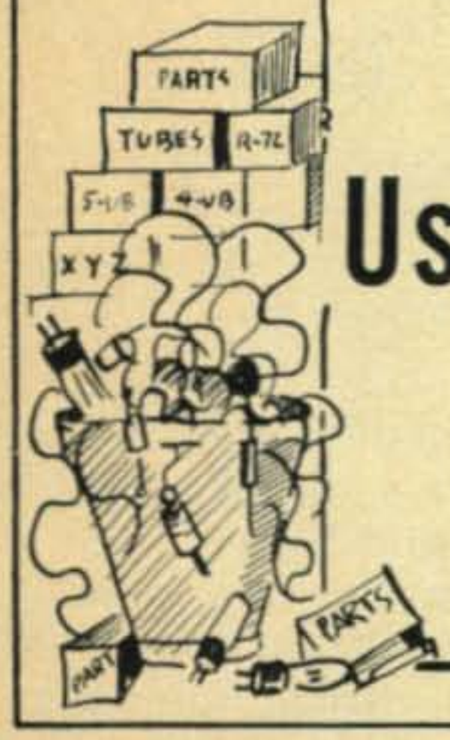

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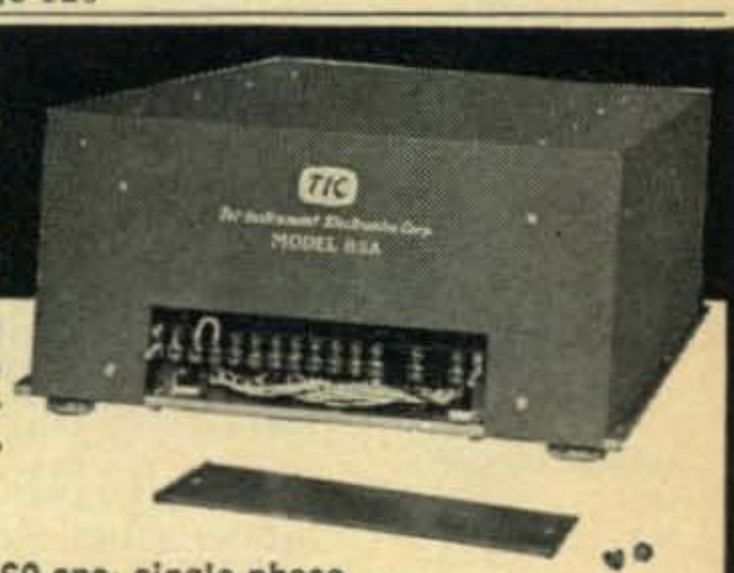

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Model 65B—130 lbs. net

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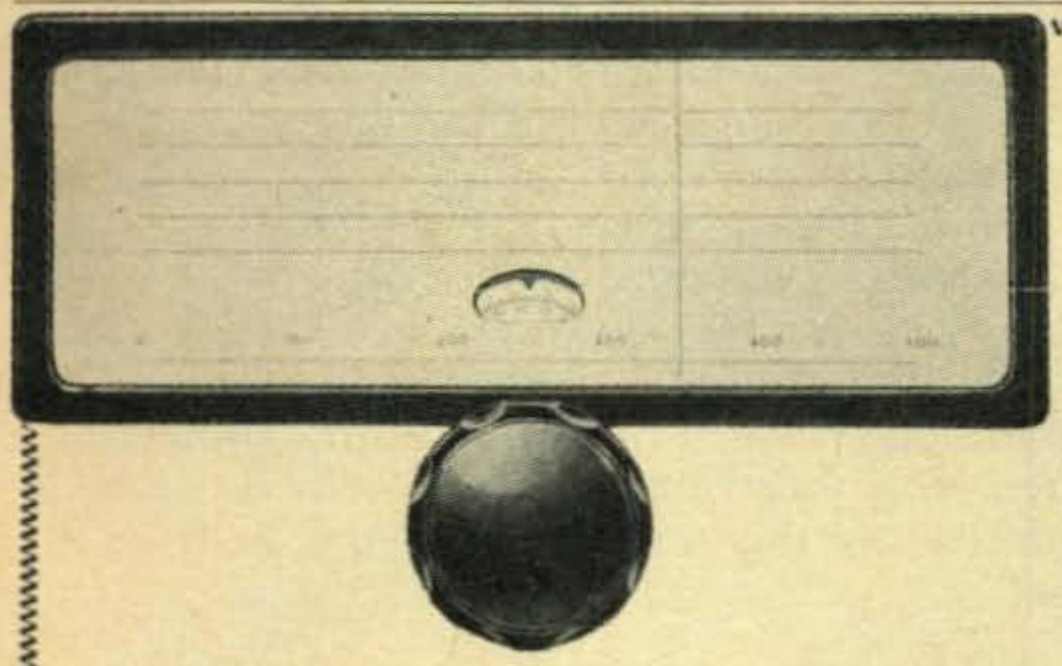

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YL [*from page 116*]

& Co., and The Bobbs-Merrill Co., 112 pages, price $1.50.

This book, just released in Feb., is devoted to introducing the reader to Ham radio in an entertaining and uncomplicated manner. It offers all the data needed to understand the basic principles of electricity and its application to radio, along with the applicable laws and regulations. It omits any confusing maze of wiring diagrams, equations, etc., none of which is needed to become a Novice. The radiotelegraph code and methods of learning it are presented in one chapter, and all-together this book should get any would-be Ham off to a good start. "YB", as we know him, is a good one to present this material—a Ham for some 50 years, he has been using successfully the system he describes in teaching adult education classes at a local high school at his QTH of Mercer Island, Wash.

"CQ YL"

In Spring an OM's fancy turns to—YLs! Read all about them and see their pictures in "CQ YL", one and only book devoted to telling their story. 169 pages, over 500 photographs; $3, postpaid. Order from this column editor, QTH at head of column.

33, Loursa, W5RZJ

MOBILE [*from page 50*]

the vibrator power unit, mounted on the bottom of the cabinet, switches and indicator lights mounted on the front panel and filter components and relays mounted on the rear panel. A cable connects to the transmitter power socket. The length of the leads is not critical, allowing for considerable leeway in the choice of location of parts. The leads were made somewhat longer than necessary to permit removal of front and rear panels without disconnecting wires. The transmitter is housed in the left hand cabinet with the chassis bolted to the front panel for easy removal; only removal of front panel screws and interconnecting cables is necessary.

Although the chassis shown in the drawing may be constructed from stock aluminum of the easily worked soft temper type, standard chassis are available to suit the needs of size. The parts layout is also flexible and may be altered to suit the installation and parts available. The only circuits in which lead length is critical lies in the oscillator and *rf* circuits, where the leads should be kept as short and direct as possible. The capacitor shafts of C_{10} and C_{11}, crystal socket, 3 circuit microphone jack and the closed circuit jack are mounted on the front panel. The antenna socket for coaxial cable to the converter and power supply connector socket are mounted on the rear of the chassis. Holes are punched (standard socket punches provide a good size for this purpose) in the rear cover for these connections, with additional holes to provide adequate ventilation. Both cabinets are bolted together and the combined unit is mounted on the underside of the instrument panel.

Adjustments

About the only adjustments which will require the unit to be removed from the cabinet

are the settings of L_1 and L_2. These are tuned for maximum grid drive to their respective circuits. If at first the circuits are considerably out of resonance, they may be tuned by peaking L_1 for maximum output on twenty meters and L_2 for maximum on ten meters while listening on a receiver. Once these adjustments have been made, only tuning of the final will be necessary when changing frequency due to the relative broad banded characteristics of the circuits. With an antenna or dummy load connected, C_{11} is tuned for maximum current, C_{10} is tuned for a "dip", and the process repeated until the desired loading is attained (about 50 milliamperes).

Conclusion

This installation has proven quite successful for the operations of "W5TBC Mobile", for local "rag chews", operation on the RACES net and regular contacts with more distant stations. Although no "rare DX" has been worked, very good reports have been received from contacts with stations on both the east and west coast areas while in operation on highways in the north and central sections of Texas. Rather than being the ultimate in a mobile "rig", it is a compromise between the minimum amount of equipment and the more costly installations which supply more flexible and higher power operation. Many miles of road have been traveled and the log books shows many hours on ten meter phone with numerous contacts. The small investment in time, effort and cost of parts has been repaid by satisfaction in "going mobile the easy way". ■

IFNL [*from page 44*]

Most impulse type of noise interference is due to automobile ignition systems and similar electrical devices wherein the pulses are steep sided ones of very short duration. Noise interference from sources such as power leaks, fluorescent lights, etc., may be due to pulses which are quite long in duration and which run together, drawn out into a continuously overlapping train, in which case the effectiveness of *any* impulse-noise limiter will be reduced. Thus any *one* type of noise silencer is not necessarily a cure-all against *all* types of noise interference.

It has been shown elsewhere[2] that impulse-noise suppression can be more effective when it is applied at a point ahead of high Q or highly selective circuits. Unfortunately, the available *rf* operating potential at a point ahead of the selective filter system in most SSB receivers is too low to satisfactorily operate the IFNL. Nevertheless, even though it must be installed at a point further on in the receiver, it does an exceptionally effective job of impulse-noise suppression with excellent SSB signal intelligibility. ■

[2] Collins Instruction Manual for 75A4.

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FOR SALE: Ham Dream — 1958 Thunderbird-KWM1. Thunderbird fully equipped, rig fully debugged, Mosely tri-bander, complete $4000.00. J. R. Popkin-Clurman, W2LNP, 28 Ranick Drive, Amityville, New York.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 PP. DePaul, 101 Starview, San Francisco.

CHICAGOLAND AMATEURS! Factory Authorized service for Hallicrafters, Hammarlund, Globe. Service all Amateur equipment to factory standards. Heights Electronics, Inc., 1145 Halsted St., Chicago Heights, Ill. Skyline 5-4056.

ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog. Fabulous bargains. Meshna, Malden 48, Mass.

AMATEUR call letters engraved on laminated phenolic. White letters on either black, red, green, walnut or mahogany. 2" x 8" for $1.00 each, postpaid. Specify color. Send order to Don A. Mathews, W6BRY, P.O. Box 761, Dept. C, Paso Robles, Calif.

MOBILE HAMS, Citizens, Stop Generator Whine, Ignition Noise, Regulator Clicks, $6.65. Postpaid. Ignition Kit, 19 Salem Street, Cos Cob, Conn.

RADIO & TV TUBES at Manufacturer's prices! 100% Guaranteed! Brand New! No re-brands or pulls! United Radio, Box 1000-a, Newark, N. J.

LOWEST Prices: Latest amateur equipment. Factory fresh sealed cartons. Self addressed stamped envelope for lowest quotation on your needs. HDH Sales Co., 919 High Ridge Road, Stamford, Conn. DA 2-0703.

CITIZENS BAND CRYSTALS. All frequencies ± .005% HC-6/U $2.95. HC-18/U (Miniature) $3.95. Specify frequency, equipment, holder, pin size or wire leads. All orders pre-paid. Other types of crystals also available. Anderson Electronics, Inc., Box 1710, Altoona, Pa.

CALL LETTERS may be applied to any surface. 2" set 60¢, 3" set 80¢. Send to C. Lee Co., P. O. Box 395, Grand Central Station, New York 36, N. Y.

LISTEN TO the Radiotrician Digest; Southern Calif. every Friday 7 PM, 860 kc.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash for each item that you want preserved. 24-hour service. Send to C. Lee Co. P.O. Box 395, Grand Central Stn., New York 36, N. Y.

ANTENNA TROUBLES? Watch Laurel & Hardy erect a roof antenna amid hilarious antics Kraus and Yagi never dreamed of. Low front to back ratio, but loads of laffs for all ages . . . especially the Jr. Ops. 200 ft, 8mm film. $5.50 postpaid; send check or M. O. (no cash or COD) to JAGFILMS, 1738- 201 St., Bayside 60, N. Y.

NEW repair parts for BC-348 models H, K, L and R. Stamped, addressed envelope for free list. Electroincraft, Box 399, Mt. Kisco, N. Y.

FOR SALE: Aluminum for every ham need. Write to Dick's, 62 Cherry Avenue, Tiffin, Ohio, for list of tubing, angle, channel, castings, plain and perforated sheet, and complete beam kits.

SELL command twins triple conversion receiver speaker output coils six-ten-fifteen-twenty-forty $65. E. N. Hayes, 218 11th St. SE, Masillon, Ohio.

FOR SALE: Drake 1-A, C. E. 20A, QT1, VFO, P&H LA400, and TR switch only $460. Push-pull 811As 500 watt linear with p.s. $65. Want KWM1. David Dennis, K8ATS, R#1, Adrian, Michigan.

FOR SALE: Filter King VHF-50 and HI-Q-50 both for $37.00. Condition like new. Techraft TR20-50 Excellent condition, $28.00. 5E1-6M Beam Gamma Match, Telrex, $11.00. 5" Scope Precise #315, New, $25.00. Sig. Gen. Eico #322, New, $11.00. K2EKP, 73-12 35th Ave., Jackson Heights, N. Y TW 8-5673.

SELLING OUT, moving to Florida. NC 125—$100. Plenty of other equipment cheap. No shipping. List on request. Harry E. Cudney, W2KNQ, Hewitt, N. J. Phone ULrick 3-3192.

FOR SALE: Navy Model 15 teletypewriters $75.00. FRH converters $50.00. Ultra-high frequency standard signal generators made by Ferris, Model 48A $150.00. Amboy Electronics, P.O. Box 664, Perth Amboy, N. J.

FOR SALE: KWM-1 and ACsupply. Only 21 months old. First time offered. For quick sale, will take $625. Gil Spencer, W1ZCH. 470 Stuart Street, Boston. KE 6-5810.

TELETYPE FOR SALE. Model 15 just overhauled $150.00 With sync motor. FOB Mill Valley. Mike Lando K6OFI, 118 La Goma, Mill Valley, Calif.

FOR SALE: S-86 receiver $89. Excellent condition. Brand new January 1960. Brad Brayton, 160 Palmer Ave., Falmouth, Mass.

COLLINS 51J2 $495., 51J-3 (R-388) $675. HT-32 $495. 32V-3 $299., Valiant $295. Ranger $219., 75A-2 $289. Write Tom, W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048).

FOR SALE: Kits wired and tested. Write for details. David Marshall, 2650 Oak Street, Terre Haute, Indiana, K9EJN.

FOR SALE: Four items: (1) Elmac PMR-7 receiver, very little used, brand-new cabinet, $100. (2) W1JEQ mobile transmitter in also-new matching PMR-7 cabinet (1957 Handbook, p. 459) 65W input. 80-10 meters, $50. (3) High fidelity Knight AM-FM tuner (83YX787), well designed circuit, professionally aligned, perfect working order, $45. (4) Heath A7-E, dependable 7W amplifier, $15. Bob Newhall, K6JHN, 1220 Dover Road, Santa Barbara, Calif.

---

200 WATT AMPLIFIER for 220 MC. Completely shielded 4X250M with blower. 110 watts output only $39. WA6LEN 3974 Riviera Dr., San Diego, Calif.

ACROSOUND "Ultra-linear" Amplifier, $50; Bell stereo tape Preamplifier, $25; Corona portable typewriter, $20; Philco LP-player, new cartridge, $10; 2-station Intercom, $10; 24-hour Clock, $6. "Ted" Hein, 418 Gregory, Rockford, Illinois.

FOR SALE: Miscellaneous Resistors, ½ to 2 watt. 25 for $1.00. Post Paid, P.O. Box 607, Simpson, Penna.

SELL: Complete station factory equipment excellent to near new 500 watt CW 200 AM Viking Ranger Courier Hallicrafter SX96. 10-40 Hy Gain trap antenna, Johnson TR switch SWR unit signal sentry lopass. Bud 100KC, D-104, Miscellaneous gear package deal $659. Dave Easton, Main 3-0600, P.O. Box 11096, Tucson, Arizona.

VHF—VHF—VHF! Our magazine has a one-tracked mind . . . to give you the best VHF Ham Radio has to offer! We cover all aspects of very high frequency work from DX'ing to technical construction. A few calls of those connected with our magazine: KH6UK, KL7AUV, HC1FS, VK4ZBE, LU3DCA, K4PEV, K5IQL, W7MKW, W2AZL. Lots of pictures of your on-the-air buddies! Send $1.00 for six big issues, or $2.00 for a full year of . . . "THE VHF AMATEUR," 67 Russell, Rahway, N. J.

For further information, check number 46, on page 126

FOR SALE (cont'd)

FOR SALE: Hammarlund SP-600-JX-14 receiver with full set USAF manuals. Very good condition. A real professional receiver. Prefer local sale, but will pack. $300. certified check or money order. Boyd D. Walker, K2YID/1, 82 Hemingway St., Winchester, Mass.

FOR SALE: Miniature GG Linear Using 811's as described in March issue. $100. Semi-Break in unit described in November issue. $35. 6AG7 Linear described in November issue. $15. W6BLZ, 528 Colima St., La Jolla, California.

FOR SALE: Two completely wired Heath Kit Citizen's Band transceivers. Brand new working. $30 each. Cy Broder, W4IXJ—1307 Delaware Ave., Ft. Pierce, Fla.

FOR SALE: Johnson Thunderbolt kilowatt amplifier. Top condition $485. W7YHS, Dr. M. F. Hash, 319 North 26th, Billings, Montana.

FOR SALE: Viking Ranger, F. W. & T. $199.00. Heath DX40, factory adjusted A1 $65.00. Heath VFO $15.00. Gerst, 2674 W. 25th St., Cleveland 13, Ohio.

FOR SALE: Twenty eight page booklet and 22"x 36" schematic for converting Collins ART/13 to 80 through 10 meter ham bands on AM and Side Band. Over three hundred copies already sold with perfect satisfaction. Materials prepaid slow mail $2.50; air mail 35¢ extra within USA. Sam Appleton, K5MKI, Box 717, Tulia, Texas.

FOR SALE: Heath M-1 handitester $16.00 P.P. Heath SG-8 signal generator $18.00 P.P. both A1 with manuals. W8-UGD, George W. Eastman, Ossineke, Michigan.

FOR SALE: Commanche, Cheyenne, A.C. power supply—complete fixed station—$225. P.O. Box 851, Wilmington, Delaware.

FOR SALE: Temco 500 GA Transmitter 750 watts 80 thru 10 meters $300 can not ship. Jack Cook, KØAQO, Freeman, Missouri.

FOR SALE: Johnson Viking 500 and AC power supply—New—Wired Unit—$600.00. W2ZDU, 348 E. 29th St., Paterson, N. J.

DICTOGRAPH INTER-COM. STATIONS and cable for sale. Six and ten key sets @ $10.00 Five key master sets @ $15.00. Cable @ .05 per foot. Terminal boxes @ .25 each. Contact Harold Garvie, (K8ICI), 2219 Woodruff, Lansing, Michigan. Shipment FOB Lansing, Mich.

SACRIFICE like new Globe King 500-C xmitter. Receiver HRO5 AT1. DB22A preselector. W2LFB Azzara, Nutley, N. J. NO 7-7552.

SELL: RME speech clipper Model-100. Excellent condition —$25.00 post paid. WØKZZ, 1422 No. 12th St., Fargo, No. Dakota.

FOR SALE: Hallicrafters SX-99; Heathkit DX-40 excellent condition. Write John D. Velie, Route 1, Box 326, Long Lake, Minnesota.

FOR SALE: World's finest reconditioned equipment at lower prices. On trial. Trades. World's best terms financed by us. S-38, $29.00; S-53A, $59.00; SX-99, $119.00; SX-100, $199.00; SX-101, $279.00; HT-32, $479.00; HQ-100, $129.00; NC-57, $59.00; NC-300, $249.00; Viking II, $179.00; 75A-4, $549.00; KWM-1, $595.00. Hundreds of other items. Write for list. Henry Radio, Butler, Missouri.

SELL: Collins 32S1 with AC power supply—$560., Eldico KW Linear—$325., Telrex 15 Meter 3 Element full size, still crated, $65., HQ 100 good condition—$100. W3VDE, 1219 Yardley Road, Morrisville, Pa.

FOR SALE: Johnson Challenger, HQ-100C, mike, crystals, key. Excellent condition. $210.00 cash. Richard Warren, 2151 McBurney Drive, Florence, Alabama.

COLLINS 75A4 nearly new, serial 5025 with 3.1 kc and 500 cps. Mechanical filter. Asking $675. What will you bid. Need cash. Bill Sandusky, K4UWJ, 223-B West Point Ave., College Park, Ga. PO 6-7090.

HRO Senior—four coils covering 1.7-30 mcs. Heath Q Multiplier. An oldie still going strong. To the highest bidder. V. L. Spoley, 13 Sunnybrook Rd., Bronxville, N. Y.

COLLINS and GLOBE Spectaculars!!! RECONDITIONED! TERMS! TRIALS! FULL GUARANTEE: GLOBE Transmitters; Scouts 40A $54.50; 65A $65.00; 66 $75.00; 680A $79.50; Chief 90A $49.95; Hi Bander 6-2 $119.95; Sidebander 100 79.50; Champ 300A $369.00; King 400C $275.00; King 500 $399.50; 500B $599.50; Linear LA-1 $89.95; 755 VFO $40.00; 6M Converter $19.95; VOX-10 $14.50; FCL-1 speech booster $14.95; COLLINS Receivers; 75A1 $265.00; 75A2 $325.00; 75A3 $399.00; 75A4 $549.00 to $595.00; 75S1 $429.00; Transmitters; 310B-1 $149.00; 32V1 $275.00; 32V2 $399.00; 32V3 $475.00; KWS-1 $1,199.00 to $1,495.00; KWM-1 transceivers $649.00 up. Leo, WØGFQ, Box 919, Council Bluffs, Iowa— World Radio Laboratories.

WANTED

WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft, Box 399, Mount Kisco, N. Y.

WANTED: TELETYPE TG-7 and Model 15 and parts, printers and reperforators, etc.; COMM'NS REC'V'RS AND XMTRS, e.g. BC-610-E, –I, BC-399A, Collins 51J, 17L3, –4; R-388 and R-390/URR; 18S-2, –3; ARN-14 and –30; APR-9, –10, ARC-21, 27, etc.; APS-31, –33; and TEST EQP'T. with TS– or 1–prefix. We pay freight. AMBER INDUSTRIAL CORP., 75 Varick St., N. Y. 13, N. Y.

WANTED: Tubes, Diodes, Transistors. Top prices for Klystrons, Thyratrons, Power, TV, and Receiving Tubes. Must be unused. WANTED: Laboratory-Grade Test Equipment, Oscilloscopes, Bridges, Signal Generators (microvolters) RF & Audio, Recorders, etc. Commercial (Hewlett Packard, etc.) and military (TS & UPM prefixes). Write us detailed description. Bob Sanett, W6REX, V&H Radio & Electronics, 2053 Venice Blvd., Los Angeles 6, California.

WANTED: Teletype printers, perforators, reperforators, transmitter-distributors, test equipment: Model #14, #15, #19, #26, #28, GRC, TT, TGC, GGC, etc. All types Collins receivers, 51J, R-388, R-390, 75A, etc. Cash, or trade for NEW amateur equipment. Write Tom, W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048).

WANT RECEIVER: Misc. ham gear, have 21" TV, cash or both. Manning, 312 Bryant, Dalton, Ga.

WANTED: SSB slicer, in good condition, reasonably priced. Richard Lentini, 123 N. Huron, Sheboygan, Mich.

WANTED: High Serial Numbered Collins KWS-1 and 75A4. KW Matchbox, Micro-Match. Hallicrafters S-72B. W4SHZ Box 1638, Brookley AFB, Alabama.

TECHNICIAN holding first or second class radiotelephone operator's license wanted to install and service General Electric two-way mobile communication equipment in the Palm Beach, Florida area. Only persons with previous mobile experience and a valid license will be considered. If you would like a permanent job in Florida doing this kind of work, write giving full particulars as to age, marital status, previous experience, and salary expected to Spencer Communications, Inc., 440 25th Street, West Palm Beach, Florida.

QSL

QSL's-SWL's: That are different colored, embossed card stock, and "Kromekote." Samples 10¢. K8AIA, Box 953, Hamilton, Ohio.

Picture QSL cards of your shack, rig, home; made from your photograph. 1000 $12.00. Raum's, 4154 Fifth Street, Philadelphia 40, Pa.

QSLS-SWLS: 100 two color glossy $3.00; QSO file cards $1.00 per 100; Samples 10¢ Rusprint, Box 7507, Kansas City 16, Missouri .

QSL's, SWL's, XYL-OM's. (Sample assortment approximately 9¾¢.) Covering designing, planning, printing, arranging, mailing, eye-catching, comic sedate, fantabulous, DX-attracting, prototypal, snazzy, unparagoned cards. (Wow!) Rogers KØAAB, 737 Lincoln Avenue, St. Paul 5, Minnesota.

GLOSSY 3-color QSL cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, New Brunswick, N. J.

QSLS four colors glossy stock forty design send $5 for 200 and get surprise of your life 48 hour service satisfaction guaranteed. Constantine Press, Bladensburg, Md.

For further information, check number 48, on page 126

QSL

QSL: 100 4-color $3.50. Others less. Glossy cards. Nice selection. Samples 10¢. Dick, W8VXK, 1018 Arthur, Mt. Pleasant, Michigan.

QSLs. Samples Free. Phillips, W7HRG, 1708 Bridge Street, The Dalles, Oregon.

QSL'S—$1.75 per 100 postpaid U.S. only. Glossy, red and green. All orders mailed within 10 days. Free sample. Hobby Print Shop, Umatilla, Fla.

QSL Cards Printed. 24 hour service, send dime for samples. QSL Printing Co., Box 12351, Houston 17, Texas.

QSL's. Samples 15¢. Sims, 3227 Missouri Ave., St. Louis 18, Mo.

QSL's—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QSL's-SWL's, samples 10¢. Malgo Press, 1937 Glendale Avenue, Toledo 14, Ohio.

QSL's: Samples, dime. Print Shop, Corwith, Iowa.

QSL's?? SWL's?? Largest variety samples 25¢ (refundable). CALLBOOKS Summer (American) $5.00, Foreign calls $3.00. Sackers, W8DED, Holland, Michigan.

QSL's—10 useable samples 10¢. Back issues CQ. QST, 75¢ Co-op, Box 5938 Kansas City 11, Missouri.

SWAP OR SELL

SWAP OR SELL—Collins 75S-1, 32S-1, with Power Supply. Used 50 hours/want KWM-1 and cash. W4KGR.

TRADE: Mosley 10 Meter Beam Model A-310. Two months old. A1 condition. Want Model A-142 2-meter Mosley Beam or Gonset Big Bertha. Sheldon Kurtzman, K6RMM, 5363 Geyser Ave., Tarzana, Calif.

SWAP Exacta VX outfit including 135 mm automatic telephoto, 58mm automatic Biotar, 35mm automatic Flektagon, supplementary Exa body, filters, master case all in excellent condition for comparable quality ham receiver, etc. Marty Gooen, 173 Henry Street, New York, N. Y.

HAM-SWAP—Need a new piece of gear? Need to trade or sell the old? Then you need the new Ham-Swap! Published twice monthly—national circulation. $1 ad free with $1 year's subscription. Send your $1 now to Ham-Swap, Inc., 35-Beach Wacker, Chicago 1, Illinois.

MISCELLANEOUS

SIXTH ANNUAL Syracuse VHF Roundup, October 8, 1960.

CALL LETTER personalized gifts. Brochure. K9TVA, 6429D Glenwood, Chicago 26.

BREAKFAST CLUB HAMFEST July 31, Terry Park, Palmyra, Illinois. Dale Elliott, K9SKJ, Secy. Box 134, Loami, Illinois.

MAGNETIC MODUL [*from page 35*]

this configuration, much lower carrier frequencies could be used. Many possibilities for such thin film devices can be visualized. This is an area that needs further investigation.

The authors wish to express their thanks to the St. Paul Remington Rand Univac for graciously providing the films which made this investigation possible. They also wish to express their appreciation to their many colleagues both at Iowa State University and elsewhere for their interest and helpful suggestions. In particular they wish to thank Dr. A. V. Pohm and Mr. R. D. Anderson. ■

WW DX CONTEST [*from page 41*]

USA & Canadian Club Scores

North Jersey DX Association	2,365,178
Potomac Valley Radio Club	2,290,983
Southern California DX Club	1,112,305
Ohio Valley Amateur Radio Assn.	642,407
Northeast DX Club	527,945
Northern California DX Club	413,394
Faetulant ARC (Virginia)	215,430
Newport County Radio Club	211,770
DX Club Greater St. Louis	208,844
West Gulf DX Club	168,199
Maui Amateur Radio Club (Hawaii)	135,720
Niles Michigan Amateur Radio Club	129,691
Boiled Owls Radio Club	123,166
Hart House ARC (Canada)	102,289
Rochester DX Association	94,735
Northern Ohio Teenage DX Club	91,185
Cowicham Valley RC (Canada)	63,300
Friendly AR Transmitting Society (Pa.)	63,147
Ridgewood ARC (New Jersey)	55,985
Westside Amateur Radio Club (La.)	50,544
Frankford Radio Club	47,920
Willamette Valley Radio Club	27,234
Florida DX Club	17,938
William Penn Radio Club	17,834
QCWA DX Club (New York)	16,631
Columbus Amateur Radio Assn.	11,262
Central High School Radio Club (Iowa)	8,260
Westpark Radiops	7,093
Hamfesters Radio Club (Ill.)	2,560
John Hopkins Radio Club	728

Foreign Club Scores

German DX Team (DARC)	**2,433,536**
Kharkov Radio Club (USSR)	938,245
Central Radio Club of Praha (CAV)	470,074
Pohjois-Kymen-Viiboset-Riy (SRAL)	169,506
Japan DX Radio Club (JARL)	148,673
Academic Radio Club (NARL)	135,771
Radio Club of Kuibyshev (USSR)	87,042
Radio Club of Moribor (SRJ)	81,389
Radio Club of Bruo (CAV)	71,003
Wroctawski Radio Club (PZK)	61,007
Gdansk Radio Club (PZK)	51,295
Radio Club of Tartu (USSR)	47,203
Central Radio Club of Budapest	30,857
Radio Club of Kunstat (CAV)	26,026
Poznanski Radio Club (PZK)	21,978
Radio Amateurs of Stockholm (SSA)	15,336
Kemin Yhdeksikot Radio Club (SRAL)	14,015
Sverdlovsk Radio Club (USSR)	13,965
Trondheim Radio Club (NRRL)	8,624
Sobu Amateur Radio Club (JARL)	4,625
Kristiansund Radio Club (NRRL)	4,472

ADVERTISING INDEX

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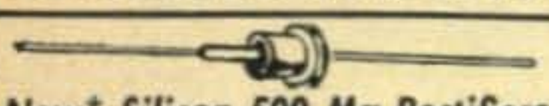
Kit 75 Resistors ½/1/2W	Kit 35 Power Resistors
Kit 150 Carbon Resistors	Kit 75 Mica Condensers
Kit 25 Panel Lamps	Kit 5 Crystal Diodes
Kit 12 Electrolytic Cond's	Kit 200ft Hook Up Wire, Color
Kit 15 Volume Controls	4 Rolls, 50ft/ea. Asstd. Color types
Kit 56 Tube Sockets	Kit 100 Fuses, assorted types
Kit 65 Tubular Condensers	Kit 100 Ceramic Condensers
Kit 500 Lugs & Eyelets	Kit 5 FT243 Xtal Holders
Kit 10 Bathtub Oil Cond's	Kit 5 Microswitches
Kit 5 lbs. Surprise Package	Kit 10 Wheat Lamps
Kit 10 Transmit Mica Cond's	Kit 3 Transistor Xtmrs
Kit Glyptal & Cement	Kit 8 Xtal Osc-Blanks
Kit 3 Phone/Patch Xfmrs	Kit 4 Asstd Rectifiers
Kit 3 Searchlights	Kit 12 Alligator Clips Astd
Kit 4 AN/Reflector Lites	Kit 5 UG/Connectors
Kit 6 Insltd Tuning Tools	Kit 100 Self/Tap Screws

Order Ten Kits We Ship Eleven!!! **ONE EACH ABOVE KIT ONLY..... 99c**



New* Silicon 500 Ma Rectifiers, Working Volts RMS-ACV Input!

rms/piv	rms/piv	rms/piv	rms/piv
35/50 25¢	70/100 35¢	140/200 45¢	210/300 55¢
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280/400 65¢	350/500 85¢	420/600 $1.10	490/700 $1.35
rms/piv	rms/piv	rms/piv	rms/piv
560/800 $1.50	630/900 $1.70	700/1000 $2.00	770/1100 $2.50

Use in Bridge or C.T. up to 750ma dc

**Derate 20% for Capacitive input*

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One Year Gtd! DC AMP	18VAC 14VDC	36VAC 28VDC	72VAC 54VDC	130VAC 100VDC
½	$1.00	$1.90	$3.85	$5.00
1	1.30	2.00	4.90	8.15
2	2.15	3.00	6.25	11.10
3	2.90	4.00	8.60	13.45
6	4.15	8.00	18.75	31.90
10	6.10	12.15	26.30	41.60
12	7.75	14.90	30.95	43.45
20	12.85	24.60		
24	15.00	29.45		

New "TABTRAN" Rectifier Xfmrs

Sec'd Volts (DUAL†) 0-9-15-18-&-0-9-15-18. Series Sec'ds 0-3-6-9-12-15-18-21-24-27-30-33-36 Volts.

Write for Rectifier Catalog

TR4001 @ 1 Amp† ea/sec/winding $5.15
TR4002 @ 2 Amp† ea/sec/winding.....$7.15
TR4003 @ 5 Amp† ea/sec/winding..9.90
†Wndgs in Series at Ratings shown: Parallel 2X Current. Voltage output. 0-9-15-18

RECTIFIERS 130V/RMS HALF-WAVE

75Ma 49c, 5 for $2; 100Ma 59c, 6 for $3 150Ma 70c, 8 for $5; 250Ma 79c, 6 for $4 300Ma 88c, 5 for $4; 350Ma $1.00, 8 for $7 400Ma $1.10, 5 for $5; 500Ma $1.35, 5 for $5

This Item P.Pd. 48 states orders $10.

WE BUY! SELL & TRADE
Send 25¢ for Bonus Catalog!

"TAB" Tubes Tested, Inspected, Boxed
Six Months Guaranteed! No Rejects!
GOVT & MFGRS Surplus! New & Used

0A2	.70	6BZ7	1.25	*We Buy & Sell*	
0A3	.80	6C4	.45	43	.75
0B2	.65	6C5	.69	45	.49
0C3	.70	6C6	1.08	50L6	.69
0D3	.50	6C8	1.08	RK59	1.39
0Z4	.60	*We Trade!*		RK60	1.17
1A7	.90	6CB6	.89	HY69	2.20
1B3	.78	6CD6	1.49	75	.81
1L4	.82	6CF6	.85	HY75	5.00
1R4	5/$1	6CL6	1.40	83V	.95

We Swap Tubes! What Do/U Have?

1R5	.78	6CB6	.89	4PR60A	37.50
1S4	.78	6CG8	1.12	4-125A	27.50
1S5	.68	6CM6	.79	4X150G	15.00
1T4	.85	6CS6	.70	4X250B	41.00
1T5	.95	6CU6	1.29	4-400A	41.75
1U4	6/$1	6D6	.99	4E27A	39.00
1U5	.75	6E5	.79	250TL	19.45
1X2	.99	6F4	2.49	307A	2/$1
2C39A	9.00	6F5	.63	316A	5/$1
2C40	5.50	6F6	.99	VR92	5/$1

Send 25¢ for Catalog!

2C43	6.50	6F7	.99	388A	3/$1
2C51	2.00	6F8	1.39	350A	2.45
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2E22	1.75	6J4	1.72	371B	.95
2E24	1.90	6J5	.59	5146	3.90
2E25	2.50	6J6	.59	416B	16.00
2E26	2.75	6J7	.99	450TH	43.00
2E30	1.70	6J8	1.39	450TL	43.00
2E35	1.60	6K6	.59	460	11.50
2K25	9.75	6K7	.79		

All Tubes Stocked at Low Prices!

2K26	34.00	6K8	.99	703A	2.00
2K28	30.00	6L6	1.19	707B	3.50
2V3	2/$1	6SN7	.72	715C	10.90
2X2	.48	6T8	.98	717A	5/$1
3A4	.70	6V6GT	.90	723AB	5.00
3A5	1.00	6X5	.49	725A	2.75
3API	5.95	12AT6	.59	803	3.50
3BPI	3.99	12AT7	.89	804	8.85
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69	*We Trade!*	
We Buy!		*We Sell!*		807 1.10	
3E29	6.00	12AX7	.79	5/$5, 10/$12	
3Q4	.68	12AY7	1.29		
3Q5	.86	12B4	.95		
4-65A	13.50	12BA6	.65	811	3.45
4-125A	27.50	12BA7	.99	811A	4.41
4-250A	34.00	12BD6	.59	812	3.30
4X150A	7.00	12BE6	.59	813	8.00
4X250	36.00	12BH6	.79	815	1.75
4X500	37.00	12BH7	.99	826	.59
5API	2.95	12BY7	1.00		

Wanted Test Sets and Equipment

5BPI	5.02	12BZ7	.99	828	9.00
5BP4	5.00	12H6	.75	829B	8.00
5CPI	4.99	12J5	.69	832A	6.00
5CP7	9.00	12J7	.69	833A	36.00
5R4	1.00	12J8	1.35	837	2/$2
5T4	.90	12K8	.89	866A	2.45
5U4	.99	12SA7	.69	954	10/$1
5V4	.89	12SC7	.89	955	3/$1
5Y3	.60	12SF5	.69	957	3/$1
5Z3	.89	12SG7	.89	958A	2/$1

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15GP22	89.00	12SH7	.89	991	5/$1
6A7	1.00	12SJ7	.75	1614	2.75
6A8	.99	12SK7	.75	1619	5/$1
6AB4	.59	12SL7	.79	1620	2.00
6AC7	.72	12SN7	.69	1625	5/$1
6AG5	.65	12SQ7	.69	1626	5/$1
6AG7	.75	12SR7	.69	1629	4/$1
6AK5	.69	15E	1.19	2050	1.25
6AL5	.59	15R	4/$1	5517	1.25
6AQ5	.66	FG17	3.49	5608	3.95

Top $$$ Paid for 304TL tubes

6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.69	5725	1.95

Top $$$ Paid for XMTR Tubes!

6BK7	.99	FG27	8.28	5732	2.00
6BL7	1.35	HV27	19.39	5736	85.00
6BN4	.69	28D7	.89	5749	1.95
6BN6	1.08	FG33	15.00	5750	2.75
6BN7	1.99	EL34	3.49	5751	1.25
6BQ6	1.19	35A5	.69	5814	1.20
6BQ7	.99	35L6	.59	5879	1.20
6BX7	1.11	35T	4.49	5894	$12.00
6BY5	1.19	35Z5	.89		
6BZ6	.91	RK39	2.99	No See—Write!	

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Include 1st, 2nd, 3rd & 4th choice! On XTALS!
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New low-cost filtered 0.5% Ripple Power Supply. Same as specified in Transistor Manual G.E. Ideal for Powering transistor circuits, small in size!

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25VDC at 150Ma-T25V150M	$10
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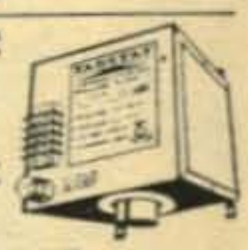
NEW POWER CONVERTER
12VDC to 500VDC up to 200MA
100 Watts; Tap at 250VDC
Type C1250E $35



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IRISH TAPE 1200' HiQlty.	3 for $5
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1N34A 45¢@, 15/$5; 1N35 $1; IN38 70¢@;	
XTAL OVEN—115V&Thermostat	$2
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Blower AC/Miniature 6&12VAC	$1.00
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New Variacs/or equiv 0-135V/7.5A	$15.30
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RF-MTR GE/475 Ma & 5 Amp	$4@, 2/$7
DC-METER Dejur 800 Ma/3½"	$3@, 2/$5
DC-METER One Ma/4" Rd.	$5@, 2/$8
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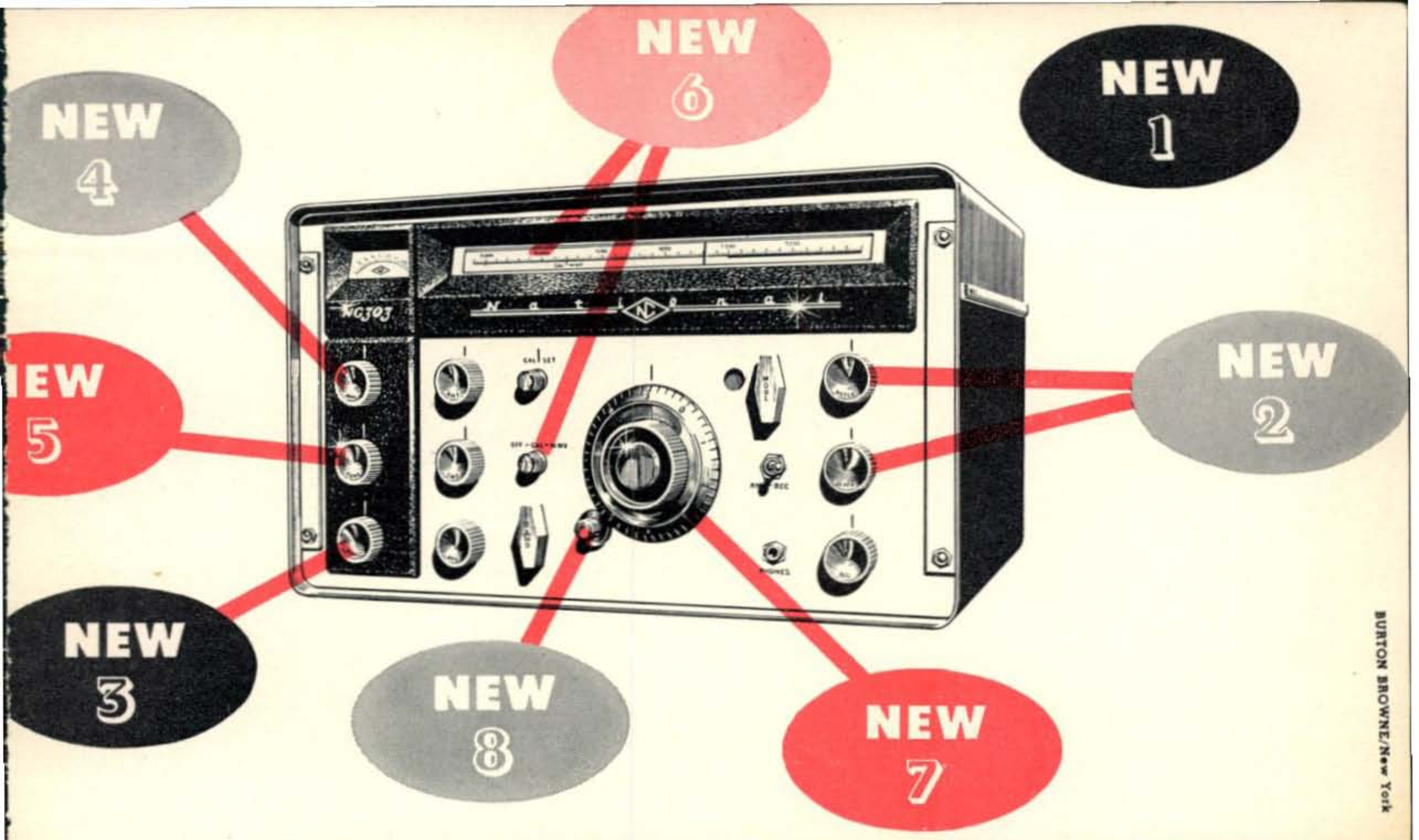
For further information, check number 51, on page 126



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NEW "Q" Multiplier provides razor-sharp rejection notch (more than 60 db deep). May be tuned continuously across entire receiver passband. Separate notch frequency and notch depth controls.

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For further information, check number 2 on page 126.

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