CQ

ICD

October 1965

75¢

Featuring:

he APR-4

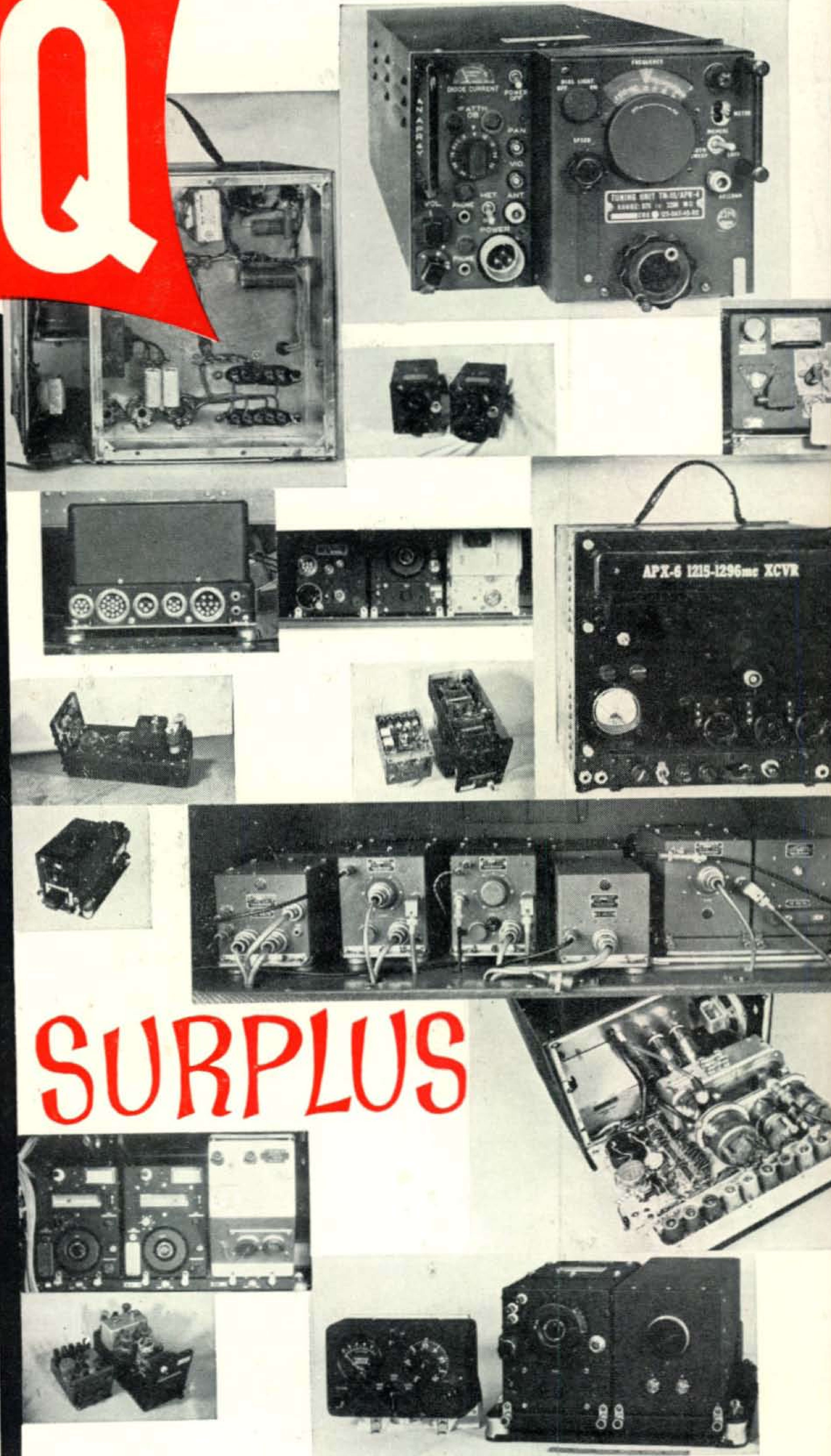
40 Meter
ARC-Port

eluxe ARC-5
onversion

C-652A: the
$10 Wonder

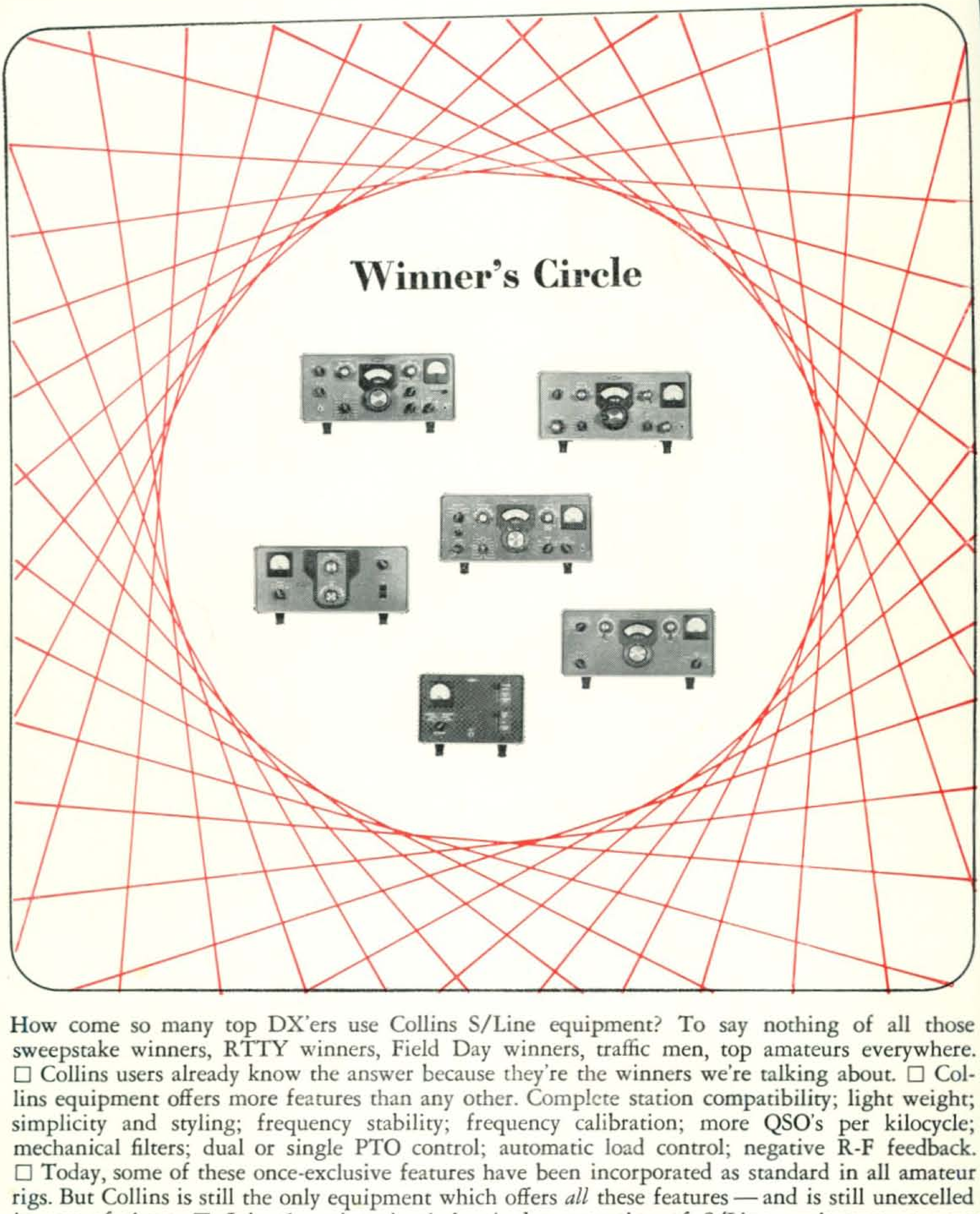
PX-6 on
1215 mc

FSKing
the
ARC-3



SURPLUS

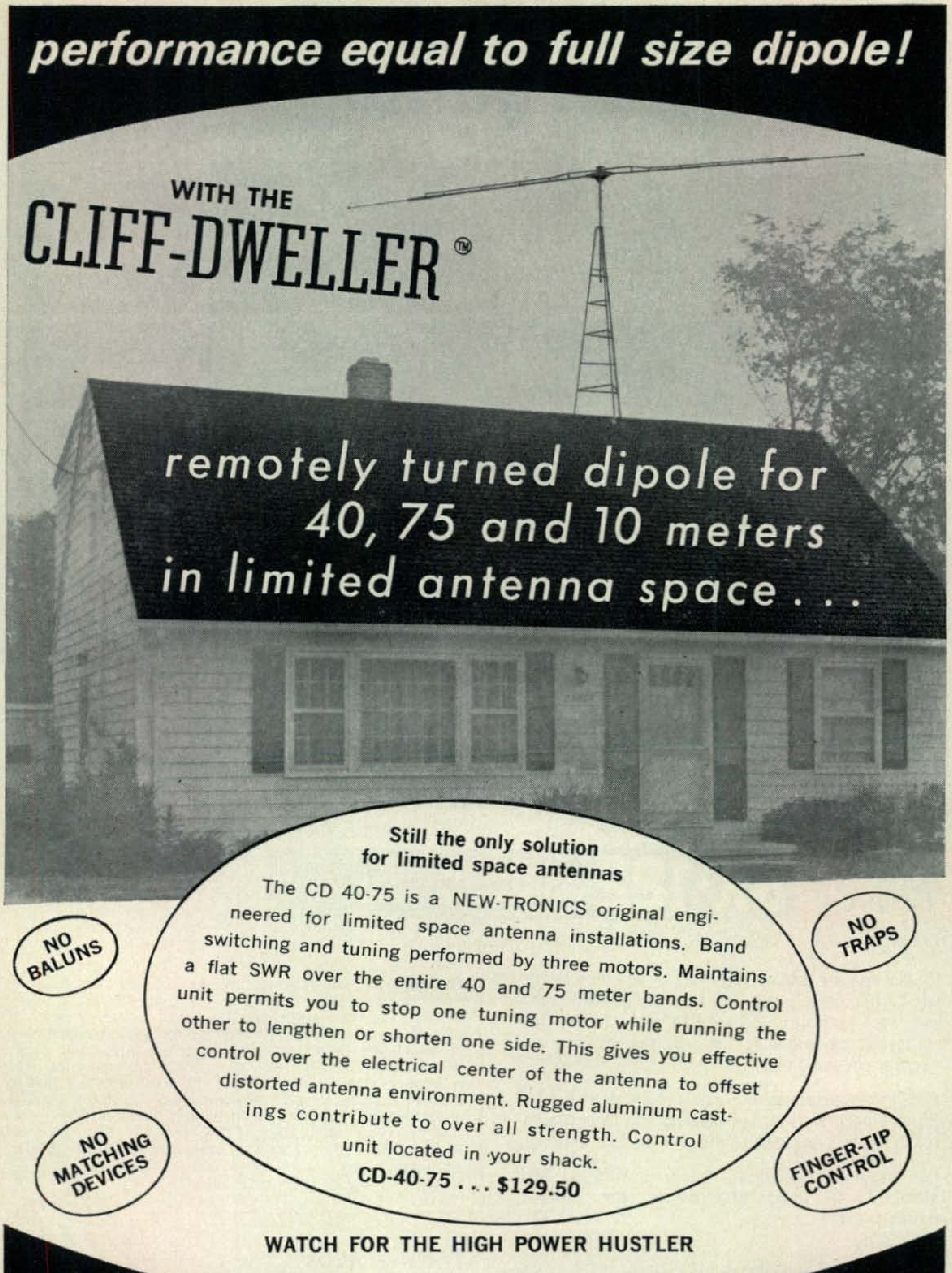
The Radio Amateur's Journal



How come so many top DX'ers use Collins S/Line equipment? To say nothing of all those sweepstake winners, RTTY winners, Field Day winners, traffic men, top amateurs everywhere. ☐ Collins users already know the answer because they're the winners we're talking about. ☐ Collins equipment offers more features than any other. Complete station compatibility; light weight; simplicity and styling; frequency stability; frequency calibration; more QSO's per kilocycle; mechanical filters; dual or single PTO control; automatic load control; negative R-F feedback. ☐ Today, some of these once-exclusive features have been incorporated as standard in all amateur rigs. But Collins is still the only equipment which offers *all* these features — and is still unexcelled in any of them. ☐ Join the winner's circle. A demonstration of S/Line equipment at your Collins distributor's can be very convincing. And don't forget to check those resale values. You'll be surprised to find out how little it costs to own the finest.

For further information, check number 3, on page 110

COLLINS



For further information, check number 1, on page 110

Compromise...
but not with quality!

The SX-122 is subjected to exactly the same exhaustive Quality Control Procedures applied to the most costly of Hallicrafters amateur-band equipment.

NEW SX-122 dual conversion general coverage receiver $295⁰⁰

If you operate **exclusively** on the amateur bands, we hardly need point out that an amateur-band-only receiver will give you more sophisticated features and performance for your money than **any** general coverage unit.

But if your personal interests require the versatility of a general coverage receiver, the wisest compromise you can make is the new SX-122 receiver.

For maximum flexibility consistent with the **high standards of basic performance you demand,** nothing even close to its price can touch the SX-122.

In addition to the solid value specifications listed alongside, the SX-122 brings you a major advance in stability through additional temperature compensation of the h.f. oscillator circuits and use of crystal-controlled 2nd conversion oscillator.

The SX-122 is in stock, at your distributor's today.

FEATURES: Deluxe general coverage receiver. Broadcast (538-1580 kc.) plus three S/W bands (1720 kc.—34 Mc.). Dual conversion, superheterodyne over the entire frequency range. SSB/CW/AM reception. Product detector for SSB/CW. Envelope detector for AM. Series noise limiter. Heavy-duty tuning capacitor with copper plates in oscillator section for maximum electromechanical stability. Audio output: 1.0 watts with less than 10% distortion. Three steps of selectivity: 0.5, 2.5, 5.0 kc. at 6.0 db down. Antenna trimmer, amplified AVC. 2nd conversion oscillator crystal-controlled. Size: 18¾" wide, 8" high, 9¾" deep. Provision for 100 kc. crystal calibrator accessory (HA-7). UL approved.

The new ideas
in communications
are born at...

hallicrafters

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

Export: Hallicrafters International Div.
Canada: Gould Sales Co., Montreal, P.Q.

For further information, check number 2, on page 110

OCTOBER 1965 VOL. 21, NO. 10

CQ The Radio Amateur's Journal

TABLE OF CONTENTS

DEPARTMENTS

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

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

Mobile service is the most demanding form of voice communications you use. Power and size limitations are extreme, putting an unusual premium on efficiency. The environment is tough, putting an accent on reliability. In the final analysis you will benefit fully from your mobile equipment only by paying strict attention to every detail of installation and operation.

Mobile service performance starts with the microphone—the first active element in the system—and there's no better way to start than with the new E-V Model 600E dynamic microphone. It is a little more costly than many microphones you can buy that "just work", and rightly so. For the E-V 600E is a lifetime investment in top-notch performance.

Look closely. The dynamic element of the 600E is the direct descendant of a long line of military microphones built to perform faithfully under battle conditions. This element was chosen for high intelligibility and its ability to withstand any environmental conditions. The proved ruggedness of the E-V Acoustalloy® diaphragm easily withstands ear-shattering sound pressures with no change in characteristics. But there is more to the 600E than ruggedness. Its sound quality has no equal. Here's why.

The frequency response of the 600E is ideally suited to SSB and critical AM transmission. You get highest intelligibility with any ALC circuit or frequency-shaping network in common use. That's been proved with on-the-air tests with every commercial SSB mobile transmitter and transceiver on the market today. Further, the high output level of the 600E will fully modulate even the "Scotch" input circuits sometimes found in mobile rigs. The 600E is available in 150-ohm or Hi-Z models.

Now pick up the 600E. It is shaped for comfort, with an easy-acting switch that gives you positive control, even when you are wearing heavy gloves. The case is molded of Cycolac®, a space-age plastic that absorbs a fantastic amount of abuse. The 600E never feels hot or cold to the touch, regardless of the climate. The shielded coiled cord has passed flexing tests that far exceed normal life, while the switch has test-cycled on and off over a half-million times without a sign of failure. Even so, both cord and switch are designed for easy field service, if necessary.

There Is Nothing Tougher Than Mobile Service...Except Our New Model 600E!

Model 600E
$23.40
Amateur Net

The E-V 600E is built to outlast every other piece of mobile equipment you may use, while outperforming every other microphone on the market. It will probably be transferred from rig to rig as the one most useful communications tool you own. Actually, the 600E, like all E-V microphones, is guaranteed forever against defects in workmanship or materials. It must perform as stated, or your money back.

The one best way to find out what the E-V 600E can contribute to your mobile installation is to try it. We guarantee you have nothing to lose. Ask your Electro-Voice distributor to help you put the new E-V 600E dynamic mircophone to work in your rig, today!

ELECTRO-VOICE, INC.

Dept. 1052G, Buchanan, Michigan

For further information, check number 9, on page 110

Electro-Voice®

SETTING NEW STANDARDS IN SOUND

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

It is the RF Communications Model RF-301

Now nomenclatured AN/URC-58

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

RF-301, SSB TRANSCEIVER

Brief Specifications

Frequency Range: 2 to 15 Mc

Synthesizer: Can be tuned to 1 Kc increments. Provisions for unlocking synthesizer and tuning continuously.

Power Output: 100 watts p.e.p. and average

Stability: 1 part 10^6 standard, 5 parts 10^8 optional

Modes: USB, LSB, AM, CW. Also FSK with adapter.

Power Input: 115/230 volts, 50/60 cycles standard. 12 or 24 volt DC with additional built-in module.

Size: 7¾ x 17 x 14¾ inches • **Weight:** 59 pounds

Please contact us for further details.

rf

R F COMMUNICATIONS, INC.

1680 UNIVERSITY AVENUE • ROCHESTER, NEW YORK 14610

For further information, check number 5, on page 110

CONVENIENCE ENGINEERED HAM GEAR

by *Waters*

PROTAX™

COAXIAL ANTENNA SWITCH

with

AUTOMATIC GROUNDING

Another first from Waters! Now, as easily as you switch from beam to dipole . . . from 40 meters to 75, you can switch your entire antenna system to ground with the newest addition to our line of coaxial switches, PROTAX, automatic-grounding coaxial antenna switch! Designed with the same advanced engineering skill that outmoded all other coaxial switches two years ago, PROTAX is another giant step forward in "Convenience Engineered" ham gear by Waters. In effect, PROTAX is two switches in one . . . a regular antenna-selector switch with power-carrying capacity of 1,000 watts that becomes a grounding switch for all antennas (leaving the receiver input open) when the rig is not in use. In two distinctive models: #375 — six position and ground with back connectors; #376 — five position and ground with connectors in radial arrangement. (#376 has its own wall-mounting bracket.)

Model 375 .... **$13.95** **Model 376** **$12.50**

Waters AUTO-MATCH

You'll boost your signals up to 4 db with AUTO-MATCH, the built-to-last mobile antenna. Operates all bands with only a change of Top-Center loading coils . . . has rugged new fold-over hinge . . . fits any standard base or bumper mount.

PRICES

MAST 370-1	$12.95
RADIATOR TIP 370-2	9.95
COIL 370-75	15.95
COIL 370-40	14.95
COIL 370-20	13.45
COIL 370-15	12.75
COIL 370-11	11.95
COIL 370-10	11.95

Model 347

Waters ILLUMINATED KNOBS

Ideal for use with coaxial switches, Waters Illuminated Knob serves as pilot light and switch position indicator. Installs easily on ¼" shaft with a single wire from 6-volt source.

PRICE: $5.00

Model 3002

Waters UNIVERSAL HYBRID COUPLER II PHONE PATCH

The ultimate in phone patches providing effortless, positive VOX operation . . . and it also connects tape recorder for both IN and OUT. Built-in Waters "Compreamp" increases low telephone line signals while simultaneously preventing overmodulation. "Compreamp" also operates alone (without patch) with station mike.

Model 3002 .... **$69.95**
(less battery)
Model 3001 .... **$49.50**
(without "Compreamp")

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

WATERS PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

For further information, check number 6, on page 110

ZERO BIAS

Back in 1961, when *CQ* first got the notion to sponsor a new awards program, it was agreed among the staff and award experts that to be worthy of its following, the award would have to be a *real* challenge. Several possibilities were considered, but the idea of a US counties award held particular appeal for several reasons. First, there were so many counties that it was unlikely that any one amateur would have a great numerical advantage over all others. This was a good point because it didn't necessarily give the old-timer the upper hand before the hunt began.

Second, it was possible to work several hundred counties from continental US on any band from 160 right on through 6 meters, and maybe even 2. From outside the USA, several hundred counties were still possible to work. Again no particular advantage to any individual.

Third, with the great numbers of counties, it was possible for a fellow to spend a few years working for the award, while the stability of the number of counties avoided the hassles of DXCC and WPX about what is or isn't a new county or prefix. All in all, the program ultimately called the "United States of America Counties Award" seemed like an ideal challenge for amateur radio. It was, and it still is.

Also back in 1961, the likelihood of anyone ever working all three thousand odd counties seemed so remote as to be almost unthinkable. So we offered an extra special plaque to anyone achieving all counties, not reckoning with the likes of one Cliff Corne, K9EAB. It wasn't easy, (it wasn't planned to be) and it took over four years of intensive work, but we're pleased to have to dig deep and come up with that special "USA-CA 3079" plaque for one of the most inspiring hams in the world. K9EAB.

For those who are unfamiliar with Cliff, he is 26 years old, and practically a full-time ham as a result of paralytic polio that has confined him to an iron lung for much of his life. Not one to accept second-best, he has dedicated himself to attaining the highest levels of proficiency in every phase of amateur activity he tackles. He has succeeded in winning friends by the thousands and awards by the hundreds, always with the spirit of good sportsmanship.

Others will follow K9EAB to the top of the USA-CA ladder, but we're proud that the first of those "unattainable" plaques will go to one of the nicest guys in the business. Good show, Cliff!

Why Don't They . . .

Somewhere in this world is a mysterious, but all-powerful group called "They." We've all heard of them, and surely more abuse and acclaim has befallen this vaguely defined group than has befallen any other group in the world. Not to be outdone by the rest of the human race, the *CQ* staff has gathered a small list of admonishments for "They."

1–Why don't "they" standardize mike connectors on ham gear? Of all the dozens of pieces of gear *CQ*'s lab has checked out in the past few years, only a rare few had similar connectors, and we're quite sure that soon after this grievous error was discovered, "they" devised some sinister little replacement, totally unavailable.

2–Why don't "they" start a campaign to do away with that misfit word that has become stuck on the lips of 9 out of 10 s.s.b.'ers: "Go." Go where? If the average s.s.b.'er lacks the lung power necessary to add a simple "ahead" to the nonsensical "go," perhaps we'd better ask "they" recommend Prof. Emil Heisseluft's voice development exercises.

3—Why doesn't the Detroit division of "they" try just once to manufacture a car that doesn't require fifty feet of shielded cable, one gross of .001's and 10 feet of bonding strap to permit you to hear your own transmitter.

4–When are "they" going to learn that when putting together a rotary beam in the $100-plus class, that iron nuts and bolts just don't quite make the grade. Have "they" ever tried to disassemble a beam after 2 years above a smoke spewing chimney?

5–When are "they" going to learn that I'm not amused when, after slyly mentioning I drive a Porsche, they snicker, "Taking after Wayne Greene, eh?" Nope! One's enough!

Ah, yes, we could go on and on, but will "they" ever take heed? Probably not, but you can at least gain a little satisfaction by sending your pet gripes to "They," c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050. Best gripe each month wins a year's sub to *CQ*.

Thanks, Doc

New York State hams owe a tremendous debt of gratitude to a relative newcomer to our ranks, "Doc" Sam Rosen, WA2RAU. As was reported (rather hurriedly) last month, Doc ran into legal trouble concerning his crank up tower at his home in New Rochelle, N.Y. Certain ordinances were invoked by the city in an effort to have the tower removed on the grounds that it was not a normal adjunct to his home, and therefore, violated zoning rules.

Thankfully, Doc had the sheer guts to stick to his guns for three long and harrowing years of legal battles, and won his case–and in the process, set a powerful precedent for similar tower cases in New York.

But it was not only a legal fight. For most of those three years, Doc endured the chagrin of being ignored by many New Rochelle hams who "didn't want to stir things up." Frequently, he was *harassed* by these same fellows in an attempt to discourage his efforts to win this landmark case. He stuck with it at great personal expense, and only when it became clear that the case was well on its way to being won, did the antagonist hams begin to move. Now was the time to pick up a little of the glory.

I wonder, sometimes, if we have enough fellows like Doc Rosen, willing to stand and fight, to offset the growing legions of apathetic milk-toasts. I wonder.

73, Dick, K2MGA

LETTERS TO THE EDITOR

Top Honors Plaques

Editor, *CQ:*

Although this note of thanks has been delayed because of vacation and the press of business, I wish to express my sincere appreciation to you, and the staff of *CQ* magazine, for the Arne Trossman "Top Honors" plaque, dated 1963, which now enhances the most prominent position of my shack wall.

Thank you also, Dick, for your kindness and recognition of all awards hunters, hereby expressed in a beautiful and outstanding plaque.

While some are certain to disagree, it would appear that the mechanics of awards hunting results in a plus item for the amateur radio ledger . . . it creates better operators (within the limits of human frailty), and your unsolicited efforts to further this *incentive* by issuance of the Top Honors plaques must be most heartily commended.

Pete Billon, WA6MWG
4040 Via Opata
Palos Verdes Est., California

Editor, *CQ:*

I would like to thank you for the Arne Trossman plaque. I am very proud to receive it.

It is so beautiful and impressive looking that my XYL suggested keeping it "upstairs" rather than in the "dungeon" where my shack is located.

If you knew my better half, you would realize that this is possibly the most unexpected honor ever bestowed on anything connected with the Ham Radio.

Kazimiera J. Deskur, K2ZRO
Box 11
Endicott, New York

Editor, *CQ:*

Many thanks to *CQ* Magazine and those who made it possible for me to receive the Arne Trossman Plaque. It is displayed prominently in the shack for all to see. Many thanks for continuing this to all who have qualified for it.

At present my favorite column is USA-CA and with 3033 Counties worked and 3020 confirmed it looks like I will, in the near future have all the counties worked. I do operate mobile and will still give out many contacts from a lot of counties I travel in. Your Ed Hopper is doing a very fine job with the USA-CA column.

Arthur A. Jablonsky, WØMCX
1022 N. Rockhill Road
St. Louis, Missouri 63119

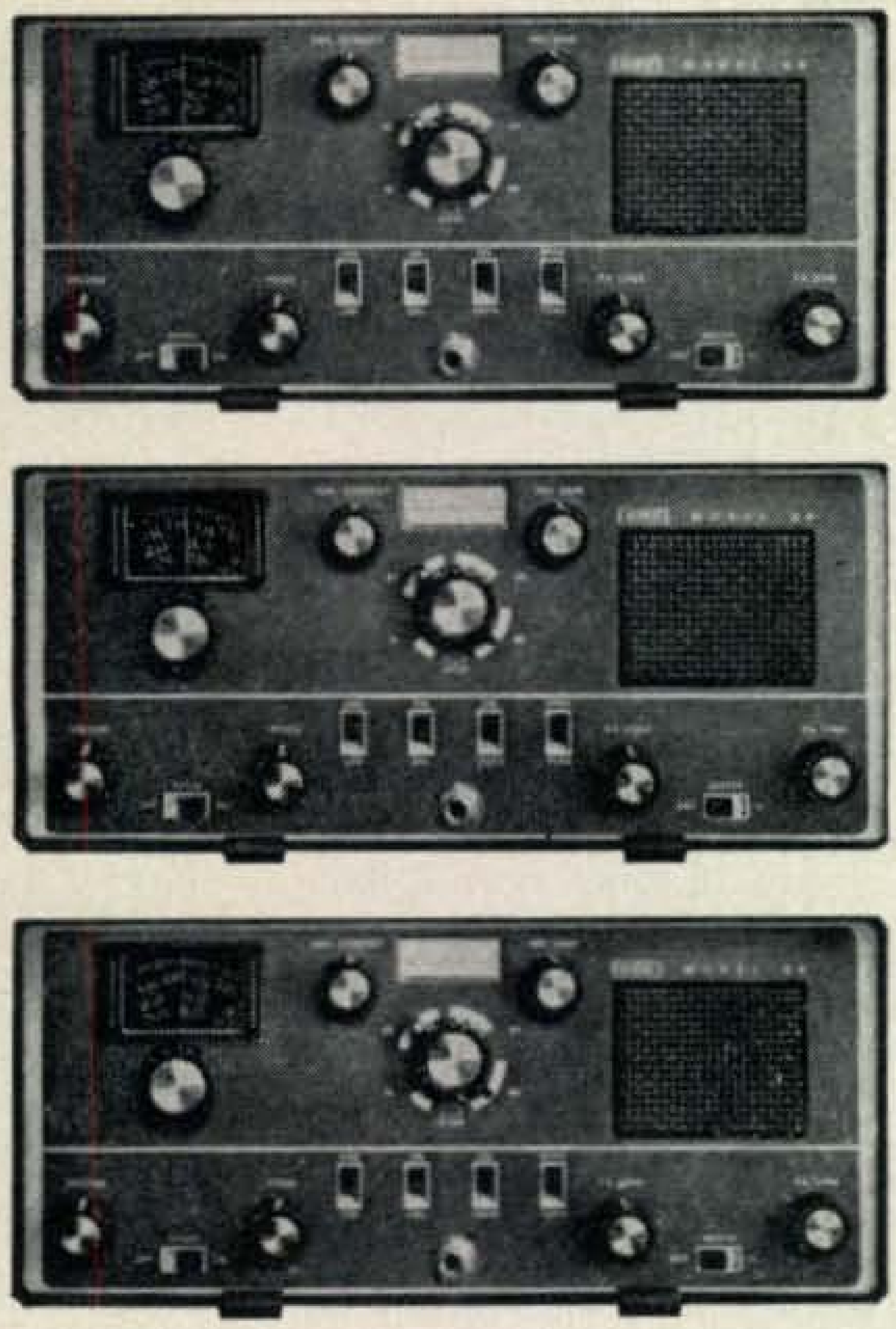
The Radiation Controversy

Editor, *CQ:*

I have just received my July issue of *CQ* and read the replies of Dr.'s Morgan and Dooley to the K8IKA article

◀ For further information check number 8 on page 110

SBE



SB-34 ...your biggest dollar value!

The price of **395.00** includes built-in, solid-state, transformer type power supply that lets you operate on **12V DC** for mobile...on **117V AC** for fixed station service. The power change is simple too—just use AC or DC cable. (Both furnished). **SB-34**, the complete SSB station, is so small, lightweight and easily carried (has a handle for this purpose) that you can readily enjoy double use of this fine SSB four-band transceiver.

More power? Just add the big-value **SB2-LA KW Linear Amplifier.**

Mobile KW? Add the compact SB2-LA Linear and SB3-DCP Inverter.

CW? Merely plug in the new **CODAPTER** and key away.

HIGHLIGHTS:

• Expanded frequency coverage • Delta receiver tuning •
• Solid-state dial corrector • Panel switch selects USB or LSB •
• Solid-state switching—no relays • Collins mechanical filter •

Power input: 135 watts P.E.P. input (slightly lower on 15). **Freq. range:** 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc. 21.2-21.45 mc 23 transistors, 18 diodes, 1-zener, 1-varactor, 2-6GB5's PA, 1-12DQ7 driver. **Speaker built in.** Pre-wired receptacles on rear accept VOX and Calibrator—both units optionally available. **Size:** 5"H, 11¼"W, 10"D. 20 lbs. (approx.)

SB-34 Transceiver	395.00
SB2-LA Linear ...	249.50
SB3-DCP Inverter	249.50
Codapter	39.95

SBE

SIDEBAND ENGINEERS
213 East Grand Ave.
So. San Francisco, Calif. 94080

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

For further information, check number 4, on page 110

on the hazards of v.h.f. While I have the greatest respect for their opinions and agree the symptoms described by K8IKA are very unlikely to have been caused by radiation (either X-ray or r.f.) or dielectric heating I feel they have overlooked one important possibility.

This possibility is conduction heating. Commonly, in industry, r.f. fields are used to heat a dielectric medium by the effects of the field on the electrons in the outer orbits of the atoms of the medium. This form of heating is called dielectric heating and the heat is generated relatively evenly throughout the object in the field. A second and less common type of heating used industrially is r.f. conduction heating. In this method r.f. currents are induced in a conducter by capacitive coupling or direct contact. By using the skin effect of r.f. conduction and proper choice of radio frequency, a thin layer of the surface may be heated. This is especially useful for case-hardening metal parts. The heating is primarily produced by resistive loss in the metal.

The conduction of electrical energy by the human body is a rather complex problem. The resistance of the skin is relatively high with the resistance of the tissue under the skin being lower, and that of the tissue in the center of the bones being lower still. Electrical energy, of course, follows the path of least resistance. The path of least resistance, however, is not a simple thing. As frequency goes up, the skin effect makes the effective resistance toward the center of a conductor higher. Thus we see that d.c. will tend to go to the bone marrow and r.f. will seek a level of best conduction between the bone and skin and when we get to microwave frequencies, the conduction is almost all on the skin. This explains why a 110v, d.c. shock is much more severe than a 110v, 60 cycle shock. The level a given r.f. frequency will penetrate, of course, differs greatly from person to person depending on his individual metabolism. This conductivity is also, modified by the presence of nerve fiber which is very conductive.

If r.f. power is applied through a small area to the human body and the level is high enough, the conduction through this small area will cause a large power loss at the point of contact and will result in a burn. This burn is identical to a burn produced by a match and is produced for the same reason. The match burns because it raises the temperature of the skin it effects enough to kill the cells in that area. The r.f. burn is caused by heating resulting from power loss as the current goes through the high resistance skin. If the level is high enough, immediate blisters will form. This will also result from lower power and a smaller contact area.

But what has this to do with the case of K8IKA? Well, since he "wetted his index finger tip and grasped one lead of the argon bulb with it" (I assume he used his thumb as well) let us suppose that the area of skin available to conduct the r.f. flowing through the argon bulb was great enough so that the power loss could not heat the skin to damaging temperatures—perhaps warm the finger a bit. Then the r.f. entered the hand and arm. The frequency was high enough so that skin-effect limited the conduction of the bone marrow and nerve fiber (which is rather small in the extremities) and the current flowed through the arm to shoulder and then to head. Well, the r.f. probably pretty well covered the head but in the mouth we have again another peculiar circumstance. For many years dentists have been removing parts of teeth and replacing them with silver which is a notoriously good conductor. In some cases the fillings even extend to the nerve which is relatively large. From the fillings to nerve to the brain (which is very conductive) and from there out on the nerves to dissipate in the rest of the body. Some thought will show that the smallest link in this current flow is the one from the gums to the fillings. Since the r.f. seems to focus at this point and the gums have a rather large resistance compared to the silver, a lot of energy is lost in the gums. Perhaps even enough to kill rather sensitive calls to produce a burn similar to a sunburn. Admittedly, a rather severe one in the second case. Incidentally, sunburn is the same kind of burn as is X-ray, but the penetrating quality of X-ray causes the damage to be internal rather than surface. I'll hazard that K8IKA has a number of rather deep fillings.

This information may be valuable to your v.h.f. following as this seems to be the critical frequency range.

SP4 Gerald V. Griffith
RA 17644659 Box 13
Co. A 319th USASA B
APO New York 09171

NOW! A TRI-BAND SSB TRANSCEIVER KIT FOR 179.95

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

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

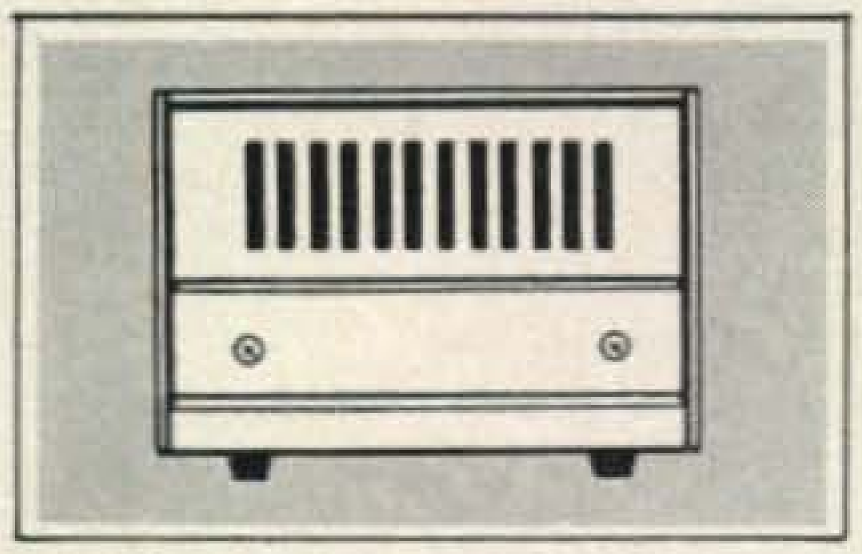
■ Full band coverage on 80, 40 and 20 meters. ■ Receiver offset tuning (up to ±10kc) without altering transmitter frequency. ■ Built-in VOX. ■ Panel selected VOX, PTT & STANDBY. ■ High level dynamic ALC to prevent flat-topping or splatter and permit the use of a linear amplifier. ■ Automatic carrier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

ADDITIONAL SPECIFICATIONS

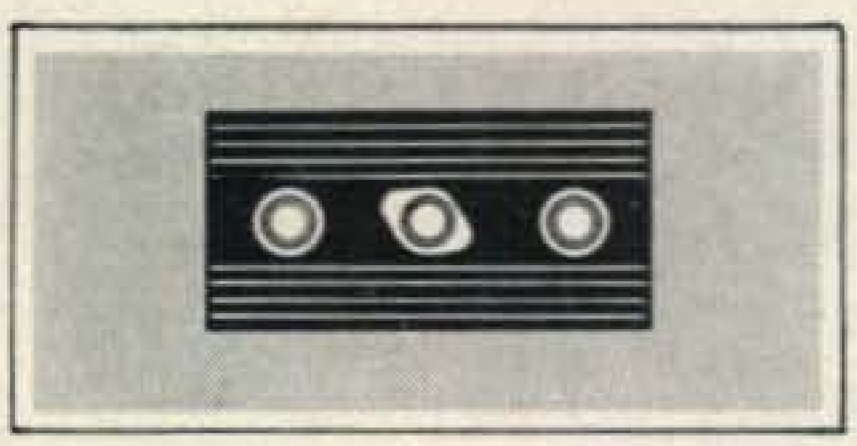
FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal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

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

Power Supplies Tailored for Optimum Performance of the 753.



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



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

For further information, check number 11, on page 110

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-10
131-01 39th Ave., Flushing, N. Y. 11352

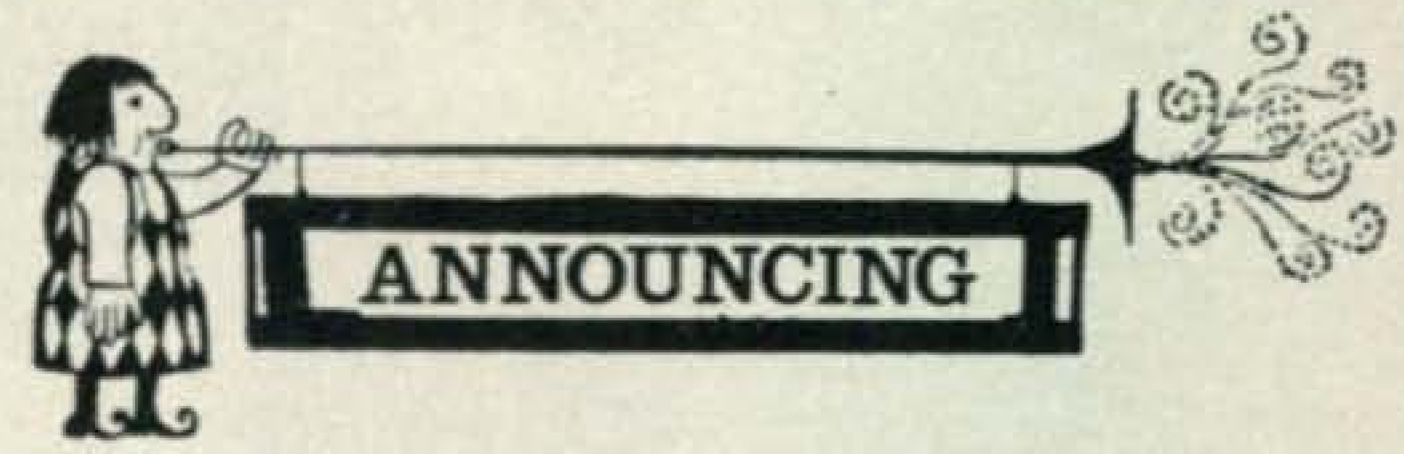
The Collins Story

Editor, *CQ:*

I was very much interested in the article on Collins Radio in the August issue. [A Story of Collins Radio, E. H. Marriner, W6BLZ p. 48.]

I, too, was an early purchaser from Art Collins and his basement "factory." I purchased a Collins 4A code transmitter from him in 1932, which was one of the origi-

[*Continued on page 91*]



FCC Announcement

This is to advise you that effective immediately, all operation by United States amateurs of amateur stations in Greenland will be identified by call signs in the block OX4AA—OX5ZZ and by the call signs XP1AA and XP1AB. Third party communications will be permissible only with XP1AA and XP1AB. The use of "KG1" calls in Greenland has been discontinued.

Ben F. Waple, Sec'y.
Federal Communications Commission
Washington, D.C. 20554

Tampa, Florida

The HARS Hamfest will take place in the beautiful Rowlett Park on the Hilisborough River on Sunday, October 17, 1965. Activities start at 9:00 a.m. There will be lots of prizes, swap tables, free lunch, and plenty of free parking. For more information write to H. Roy Scott, W4UHF, P.O. Box 8373, Tampa, Florida 33604.

Albuquerque, New Mexico

A new Directory of the Albuquerque amateurs including Alameda, Sandia Park, Cedar Crest, and Tijeras will be available in January. It will be cross-indexed by names in alphabetical order, and a separate section will give the existing Clubs and their members. Any club which gives out certificates will be named with the requirements to obtain these certificates. For more details write or phone Irene Henderson, K5WZA, 120½ 10th N.W., Albuquerque, New Mexico. Phone 242-4403.

Missouri Teenage Traffic Net

Teenagers around the Missouri area have formed plans for a traffic net which will be called the "Missouri Teenage Traffic Net." The net will begin operation on 3940 kc at 2330 GMT, Monday through Friday. This net was planned and will be operated by teenagers, but everyone is invited to check in with or without traffic, regardless of age.

Louisville, Kentucky

The Amateur Radio Transmitting Society of Louisville, Kentucky is proud to announce the sponsorship of a Ham Ken-Vention to be held the last weekend in October. The probable site for this venture is at the Kentucky State Fairgrounds and Exposition Center. This will be a two-day affair beginning on Saturday, October 30th and ending Sunday, October 31st, 1965. There will be Seminars, Speakers, Examination of Amateurs, Professional Exhibitor, Movies, Contests, Luncheons, Dinners, Swap and Shop and Horse Trading. For more information contact Willard W. Thompson, K4RRF, 5910 Tralee Lane, Louisville, Kentucky 40219.

PLEASE include your ZIP code number on all correspondence.

San Rafael, California

The "Greater Bay Area Hamfest" will be held this year at the Peacock Gap Country Club, San Rafael, Marin County, California on October 16 and 17, 1965. This will be the 4th annual holding of this Hamfest sponsored by 8 of the Amateur Radio Club in this area. There will be lectures, exhibits and conferences. For more information concerning this write "Greater Bay Area Hamfest", P.O. Box 113, Hayward, California.

Pittsburgh, Pennsylvania

The Western Pennsylvania Mobileers, an amateur mobile radio club, is planning its ninth annual "Fall Round-up" Hamfest on October 22, 1965. There will be a swap and shop, professional entertainment, refreshments, and prizes. For more information contact Richard B. Wilson, K3IXN, President, 714 Jane Street, Pittsburgh, Pennsylvania 15239.

Chicago, Illinois

The Annual CATS Meeting and Banquet will be held on Sunday, October 24, 1965 just prior to the opening of the National Electronics Conference. The meeting will begin at 10 a.m. with a good old eyeball QSO and demonstration period. At 1:00 p.m. the technical talks will begin and the awarding of door prizes. The meeting will be held at McCormick Place in Chicago in meeting room No. 7. At 6:30 p.m. the banquet will be held. Reservations are $5.50. A Model 28 KSR will be given away at the dinner. For more information and reservations write to Robert E. Paculat, 1327 N. Hamlin, Chicago, Ill.

Sacramento, California

The Radio Amateur Mobile Society (RAMS) are having their annual Dinner Dance on October 9th. This is in celebration of the tenth anniversary of the organization.

New London, Conn.

The Tri-City Amateur Radio Club, Inc., of New London is holding its 18th Annual "Hamfest" at the Crocker House on State Street in the city of New London, Connecticut on October 9, 1965. There will be a mobile installation evaluation contest, a QSL contest and a code receiving and sending contest plus many other activities.

Downers Grove, Illinois

The 6 & 2 Ham Club, Inc., of Downers Grove, Illinois will hold their Fourth Annual Banquet on October 9, 1965 at Moran & Galvin Restaurant in Hillside, Illinois. For further information write David G. Arnold, W9DTJ.

Kimchi Award

The Eighth United States Army Amateur Radio Club wishes to announce that the requirements for the "KIMCHI" award will be changed effective November 1, 1965. Ten two-way HL9 contacts will be required; HL9 QSL cards must accompany the application; and return postage for the cards, plus mailing charges for the Kimchi award, must be borne by the applicant. One IRC will pay for mailing the KIMCHI Award.

Syracuse, New York

The Syracuse VHF Club Inc. will sponsor the 11th annual VHF Roundup to be held at the Three Rivers Inn on October 2, 1965. This year's program will feature Henry H. Cross, W100P, who will talk on "Moon Bounce." Fred Collins, W1FRR, wall talk on "Solid State in VHF" and Nicholas K. Marshall, W6OLO, will present highlights on the "Oscar Program."

Houston, Texas

The 8th Annual Houston Area Hamfest will be on Oct. 30 and 31st with actives at the club building on Sat. Sunday's actives at Spring Creek Park. Prizes will be given. Registration will be $2.50 for adults and 75¢ for children. Preregistration prize will be a portable TV, a Drake TR4 and AC Power supply. Door prize will be an A.C. Alternator. For further information contact Jim Shotwell, WA5BUV, 315 1st Street, Humble, Texas.

For further information, check number 15, on page 110

CLUB FORUM

AL SMITH,* WA2TAQ

Up to this point the CLUB FORUM has not touched very much on the subject of amateur radio networks. AREC, RACES, and MARS seem to function nicely and the CLUB FORUM can do little more than throw in a plug for them once in a while.

Of course, all nets need members to keep operating. If you want to get in your required public service licks by being active on a net, you'll very likely find a very informative and interesting activity ahead of you, plus the fact that you'll be associating with some of the finest hams in our advocation.

Many fine public service nets have emerged from ordinary rag chew type club nets. The club and community net are all important. These nets can prove to be a very vital part of club activities. Most clubs only meet monthly and the weekly on the air get-togethers can help to keep the gang together and, in addition, will keep the membership informed as to the latest goings on.

Some areas are without benefit of AREC and/or RACES networks. Other areas have excellent nets but on frequencies that most hams cannot operate. Clubs can help this situation by starting nets on popular frequencies such as 75 or 40 meters. This will afford an opportunity to those who do not have the gear or antennas for 2, 6, or 10 meters. Just consider the number of amateur radio mobile rigs on the 20 meter band. In an emergency they could (if properly trained) render a terrific job even with crowded conditions. Even the avid DXers and rag chewers would bow to extreme emergency conditions.

One type of net that hasn't seemed to appear as yet (if I'm wrong I'll surely get letters on this one) is one encompassing all High School Amateur Radio Clubs on a county, section, or statewide basis. One High School club has just that goal in mind.

The Hillsborough High School Amateur Radio Club (WA4VQW in Tampa Florida area) is on a recruiting drive to set up a Florida wide network of High School amateur radio clubs. Lynn "Tank" Miller, WA4UBQ, President of the Hillsborough group, outlines the reasons his club thinks such a net will be worthwhile:

"1. Provide a net for high school clubs that would meet at an hour that is convenient for the high schooler. One does not exist as of yet; either they are too early or they are at night, a

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

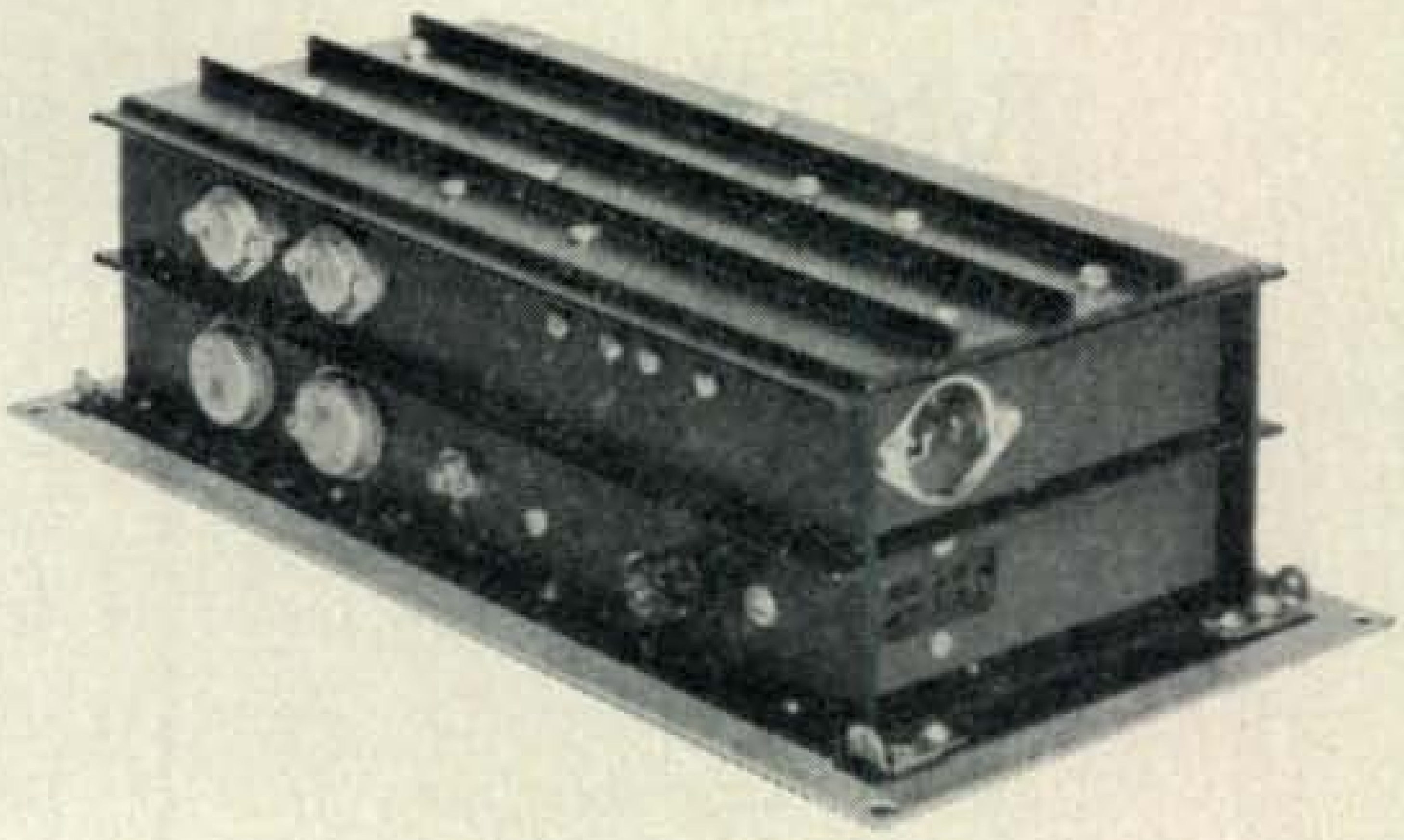
ANOTHER *LINEAR* LS *SYSTEMS 1st!*

«THE COMMANDER»

DUAL INPUT POWER SUPPLY AND CHARGER*

OUTPUTS
850/750/650 volts d.c.
325/285/250 volts d.c.
12.6 volts (filaments)
12.6 volts d.c. (charger)
0-125 volts d.c. (adj. bias)

INPUTS
110 volts a.c., 50-400 cps
12 to 15 volts d.c.
(In emergency service, both a.c. line and 12-volt battery are connected. Unit will automatically select line input.)



- 110 VOLT A.C. OR 12 VOLT D.C. OPERATION with automatic input voltage selection. Instantaneous voltage changeover prevents loss of power to transceiver, even when transmitting!
- CHARGES 12-VOLT BATTERY AUTOMATICALLY when operating from 110 volt a.c. input. Ideal for that emergency power system you have always wanted at the fixed station!
- SUPPLIES ALL VOLTAGES FOR ANY TRANSCEIVER UP TO 500 WATTS PEP. Multiple high- and low-voltage output taps, charger output, plus bias output adjustable from 0 to 125 volts d.c. gives true flexibility.
- QUICK, DETACHABLE MOBILE MOUNT INCLUDED. Makes moving the COMMANDER between car and house easy. You can even leave everything in the car and tune up the mobile rig using a.c. power. No haywire. No dead batteries!
- IMMEDIATELY AVAILABLE from your local dealer. The price: only $189.50. Seventeen-foot d.c. input and output cables, and six-foot a.c. input cable supplied. (Compare this one low price with the combined cost of separate mobile and fixed station supplies:)

LINEAR SYSTEMS, Inc.

605 UNIVERSITY AVENUE, LOS GATOS, CALIFORNIA
New Telephone: 354-6661 (Area Code 408)
New TWX: (408) 571-7249

 *Patent Applied For

For further information, check number 17, on page 110

time when the teenager is under other obligations—dances, games, other clubs, community affairs, etc."

"2. Tend to improve the reputation and standing of the high school amateur radio club; and therefore, that of amateur radio as a whole."

"3. Provide the high school amateur with his (probably) first contact with the real side of amateur radio—service."

"4. Act as a training ground for exact communications—a way of life that is vital to those who live in Florida, a land of hurricanes."

The stated reasons sound good to this writer and who knows perhaps "Tank" Miller's group has started the ball rolling on a major new activity in amateur radio. Incidentally, the activity at Hillsborough High doesn't end with just a network. This group has plans ready for a statewide association of high school amateur radio clubs. The Constitution and By-Laws has been outlined and interest of the members is all that is needed to launch the operation.

Tank Miller will welcome inquiries from members of all Florida high school amateur radio clubs. His address is 309 West Lambright, Tampa, Florida 33604.

Of course, a step up to a network of college ham clubs also deserves due consideration. Such things as cross-country debates or sporting events via amateur radio would make an interesting sidelight. With the great number of college club stations this is well within the bounds of reality.

One unconsidered side benefit of net operation is the example set for the inexperienced radio amateur. Here is an excellent training ground to smooth the usually rough edges of our new young hams.

The response received from those wishing information on the amateur radio clubs to join in their home areas has been very good. We might mention that the ARRL SCM and Director would also have club information available.

If there is any topic you would like covered or any service that you think the CLUB FORUM can render please drop us a line. By the way, letters sent to *CQ* headquarters in Port Washington are only delayed as they must be remailed to me. For best results use the Far Rockaway address listed.

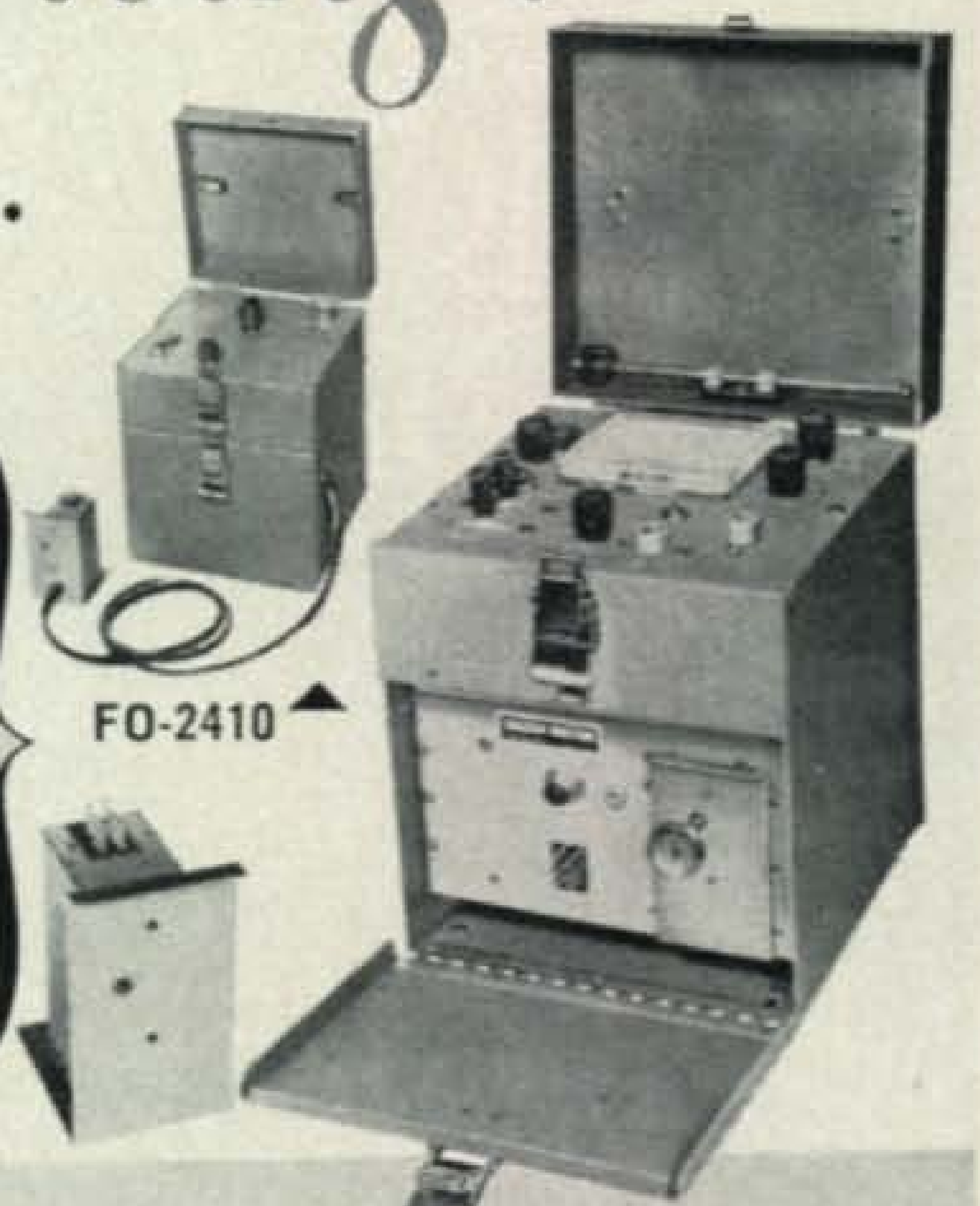
73 Al, WA2TAQ.

INTERNATIONAL FREQUENCY METERS

designed for servicing!

Equip your lab or service bench with the finest . . .

Discover new operating convenience.



FM-5000 FREQUENCY METER 25 MC to 470 MC

The FM-5000 is a beat frequency measuring device incorporating a transistor counter circuit, low RF output for receiver checking, transmitter keying circuit, audio oscillator, self contained batteries, plug-in oscillators with heating circuits covering frequencies from 100 kc to 60 mc. Stability: ± .00025% +85° to +95°F, ± .0005% +50° to +100°F, ± .001% +32° to +120°F. A separate oscillator (FO-2410) housing 24 crystals and a heater circuit is available. Dimensions: FM-5000, 10" x 8" x 7½".

FM-5000 with batteries, accessories and complete instruction manual, less oscillators, and crystals. Shipping weight: 18 lbs. Cat. No. 620-103 . . . . . . $375.00

Plug-in oscillators with crystal $16.00 to $50.00

C-12B FREQUENCY METER For Citizens Band Servicing

This extremely portable secondary frequency standard is a self contained unit for servicing radio transmitters and receivers used in the 27 mc Citizens Band. The meter is capable of holding 24 crystals and comes with 23 crystals installed. The 23 crystals cover Channel 1 through 23. The frequency stability of the C-12B is ± .0025% 32° to 125°F, .0015% 50° to 100°F. Other features include a transistorized frequency counter circuit, AM percentage modulation checker and power output meter.

C-12B complete with PK (pick-off) box, dummy load and connecting cable, crystals and batteries. Shipping weight: 9 lbs. Cat. No. 620-101 . . . . $300.00

C-12 CRYSTAL CONTROLLED ALIGNMENT OSCILLATOR

The International C-12 alignment oscillator provides a standard for alignment of IF and RF circuits 200 kc to 60 mc. It makes the 12 most used frequencies instantly available through 12 crystal positions 200 kc to 15,000 kc. Special oscillators are available for use at the higher frequencies to 60 mc. Maximum output .6 volt. Power requirements: 115 vac.

C-12 complete, but less crystals. Shipping weight: 9 lbs. Cat. No. 620-100 . . $69.50

C-12M FREQUENCY METER For Marine Band Servicing

The International C-12M is a portable secondary standard for servicing radio transmitters and receivers used in the 2 mc to 15 mc range. The meter has sockets for 24 crystals. The frequency stability is ± .0025% 32° to 125°F, ± .0015% 50° to 100°F. The C-12M has a built-in transistorized frequency counter circuit, AM percentage modulation checker and modulation carrier and relative percentage field strength.

C-12M complete with PK (pick-off) box and connecting cable, batteries, but less crystals. Shipping weight: 9 lbs. Cat. No. 620-104 . . . . $235.00

Crystals for C-12M (specify frequency) $5.00 ea.

KEEPING YOU ON FREQUENCY IS OUR BUSINESS...

Write today for our FREE 1965 CATALOG

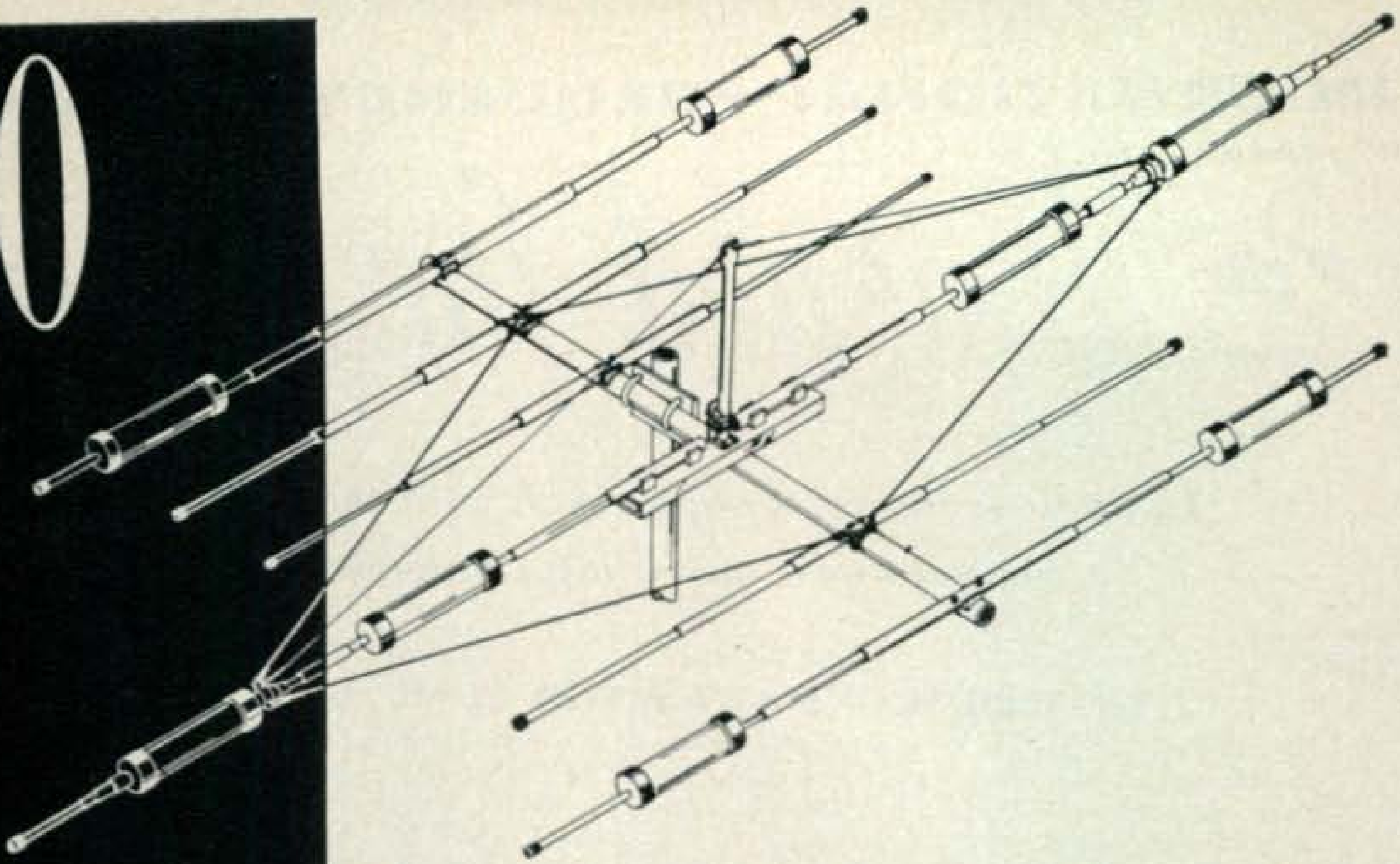
INTERNATIONAL CRYSTAL MFG. CO., INC.

18 NORTH LEE OKLAHOMA CITY, OKLAHOMA

For further information, check number 19, on page 110

TA-3640

for 10 15 20 and 40 meters



Put your signal where it counts. Use the ultimate in Ham beams - - - the Mosley TA-36 with Kit TA-40KR added to radiating element. Employs 4 operating elements on 10 meters, 3 operating elements on 15 meters, 3 operating elements on 20 meters. SWR is 1.5/1 or better at resonant frequencies over all 4 bands. Constructed of heavy-wall aluminum for maximum strength. Rated for full power.

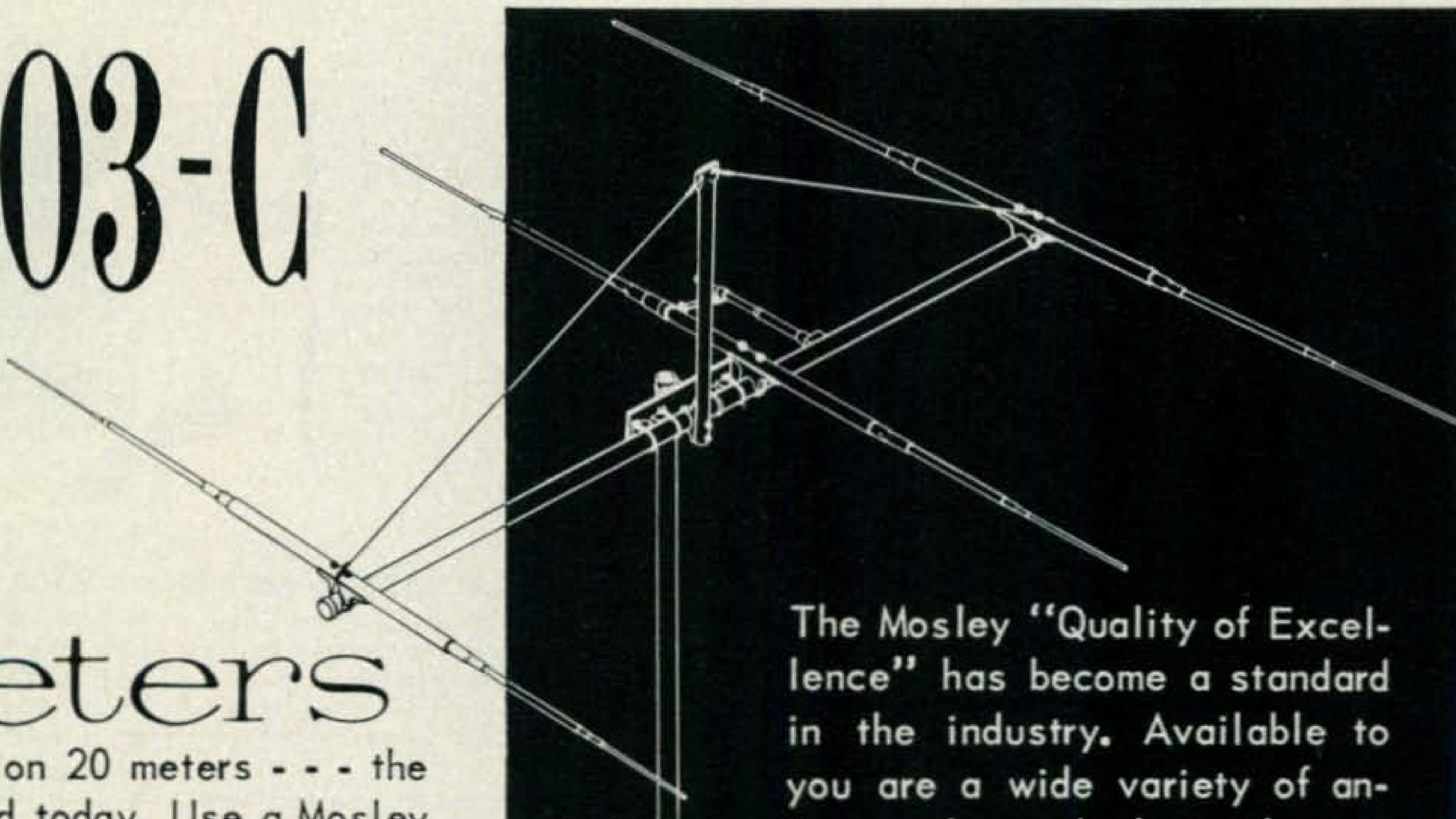
Write for detailed specifications and performance data on the Mosley TA-3640.

Mosley Electronics, Inc.
4610 NORTH LINDBERGH BLVD.
BRIDGETON, MISSOURI 63044

For further information, check number 20, on page 110

A-203-C

for 20 meters



Concentrate on 20 meters - - - the best DX band today. Use a Mosley full-size A-203-C wide spaced, gamma matched, 20 meter beam. Features: VSWR 1.5/1 or better. Rated for full power. Assembled weight 40 lbs. Turning radius 22 feet.

Exclusive Mosley element design virtually eliminates element flutter and boom vibration.

The Mosley "Quality of Excellence" has become a standard in the industry. Available to you are a wide variety of antennas from which to choose, plus antennas custom made to order. Let Mosley know your antenna needs.

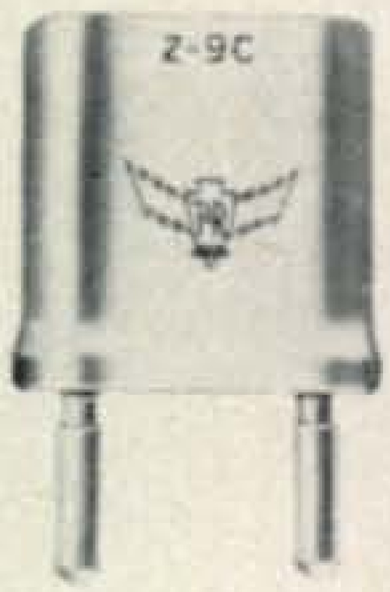
Mosley Electronics, Inc.
4610 N. LINDBERGH BLVD., BRIDGETON, MO. 63044

For further information, check number 21, on page 110

Preferred for VHF since 1934

For more than 30 years, VHF experts have been enthusiastic about the performance of PR Crystals . . . their activity, dependability, low drift, and hair-line accuracy. These qualities are built-in by precision workmanship at every stage of manufacture. And EVERY PR CRYSTAL IS UNCONDITIONALLY GUARANTEED.

FUNDAMENTAL, PR TYPE Z-9C



Frequency Ranges in Kcs.: 1,750 to 2,000 (160M); 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (2M); 8,334 to 9,000 (6M) ± 500 Cycles. $2.95 Net.

(All Z-9C Crystals calibrated with a load capacity of 32 mmfd.)

THIRD OVERTONE, PR TYPE Z-9A

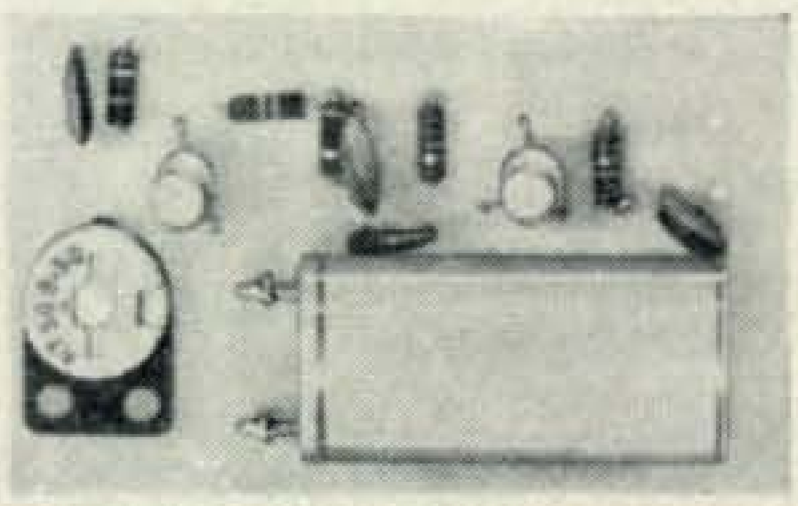
Third Overtone, PR Type Z-9A, 24,000 to 24,666, 25,000 to 27,000 Kc. ± 3 Kc., 28,000 to 29,700 Kc. ± 5 Kc. . . . . . $3.95 Net

6 Meters, Fifth Overtone, PR Type Z-9A, 50 to 54 Mc., ± 15 Kc. $4.95 Net.

Radio Control, PR Type Z-9R
Calibrated .005% . . . . $2.95 Net
Calibrated .002% . . . . $3.95 Net

PR-100 TRANSISTORIZED OSCILLATOR

With PR-100 you can check harmonics at 100 Kc. intervals through 54 Mc. A precision oscillator, fully wired, ready to install. Includes a Z-6A Crystal. Power requirements: 12V DC @ 14 Ma. Oscillator output connects to receiver antenna, high side. Base is 1-7/8 x 2-13/16 inches. Weighs 2 ounces. . . . **$12.95** Net



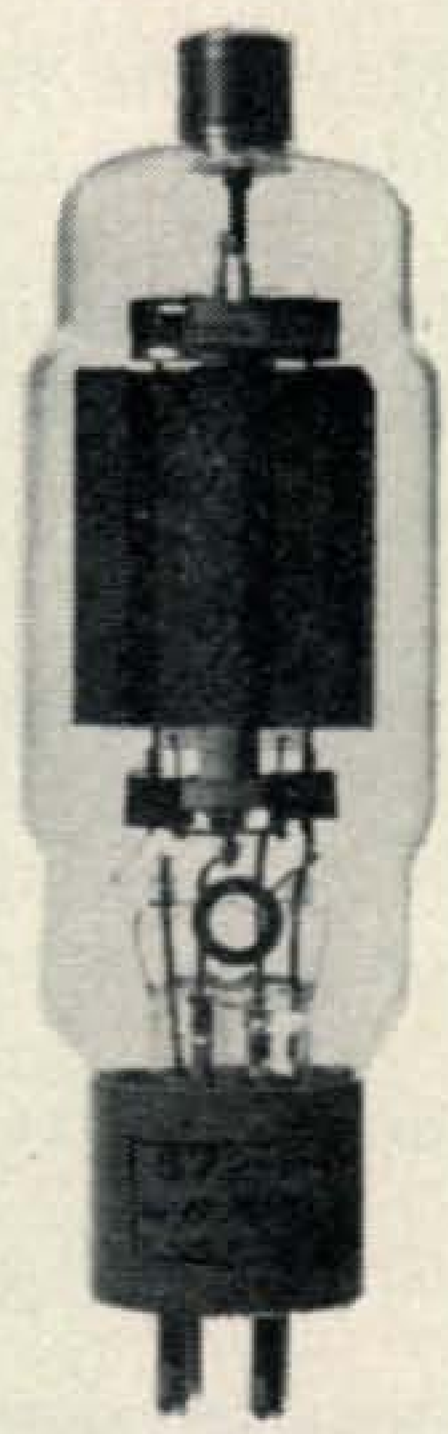
A PR CRYSTAL IS THE FINEST RADIO FREQUENCY CONTROL THAT MONEY CAN BUY . . . ORDER FROM YOUR JOBBER

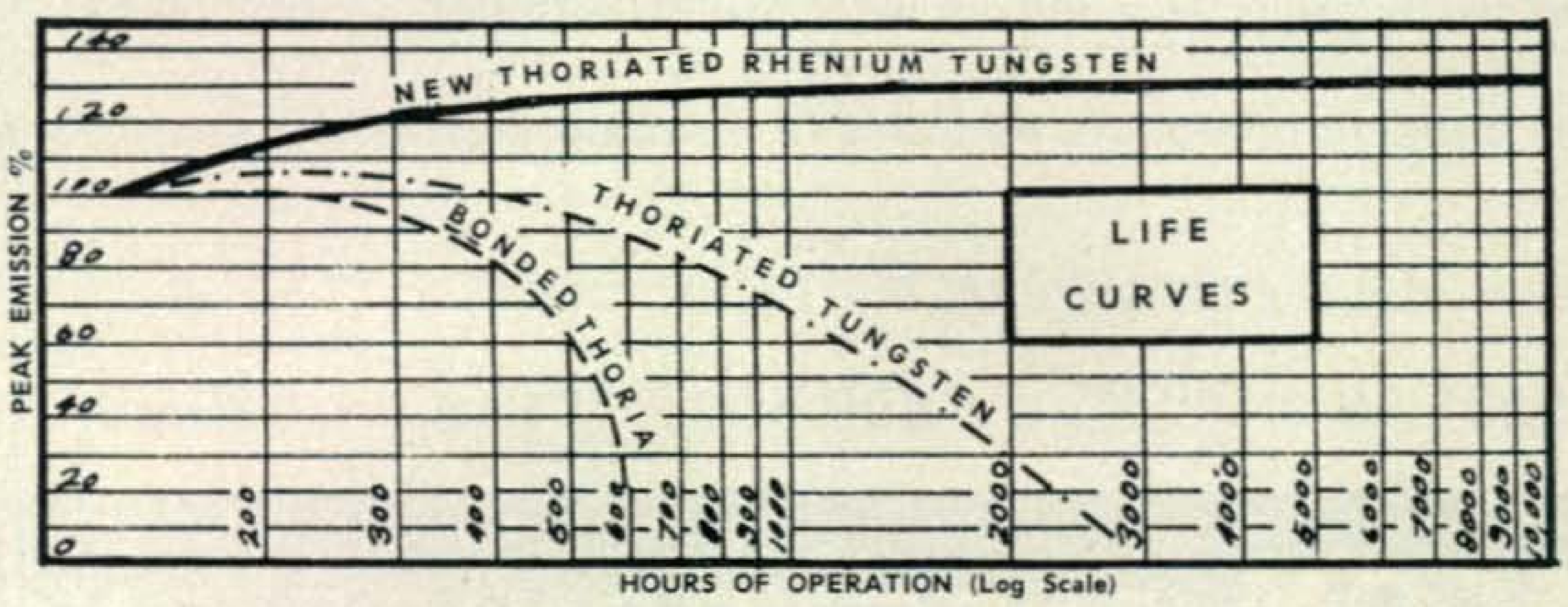
PETERSEN RADIO CO., INC.
2800 W. BROADWAY
COUNCIL BLUFFS, IOWA

For further information, check number 24, on page 110

A MAJOR ADVANCE IN POWER TRIODES
SINECO TUBE TYPE 572B

Using a revolutionary filament made from **thoriated tungsten-rhenium wire** developed by the **Rhenium Division** of **Chase Brass & Copper Company,** SINECO tube type 572B is guaranteed to withstand 300g shock loads and operate for more than 2000 hours. Old style thoriated tungsten filament type power triodes exhibit erratic operating lifes from several thousand hours down to only several hundred and have been so fragile they could not be given a shock rating. As the curve below shows, in actual life tests the 572B has shown no deterioration in peak emission after 10,000 hours of operation, an amazing fact when related to the performance of old style power triodes that have no rhenium content.





Scientific Instrument Research & Development Company

525 LEHIGH AVE., UNION, NEW JERSEY — Phone MUrdock 7-5550

For further information, check number 25, on page 110

For further information, check number 22, on page 110

For further information, check number 23, on page 110

Behind This Honest Face

Heath Deluxe SB-Series Tuning Dial — with features proven by thousands of satisfied SB-Series owners . . . features you can prove for yourself!

HEATHKIT®

- Calibration accurate to 400 cps on all bands
- Readable to 200 cps
- Bandspread equal to 10 feet per megacycle
- Uniform ⅛ inch spacing between all 1 kc dial divisions
- Backlash less than 50 cps

HEATH COMPANY, Dept. 12-10, Benton Harbor, Michigan 49023
In Canada: Daystrom, Ltd., Cooksville, Ontario

☐ Enclosed is $________, plus shipping.
Please send model (s)________
☐ Please send me free 1966 Heathkit Catalog.

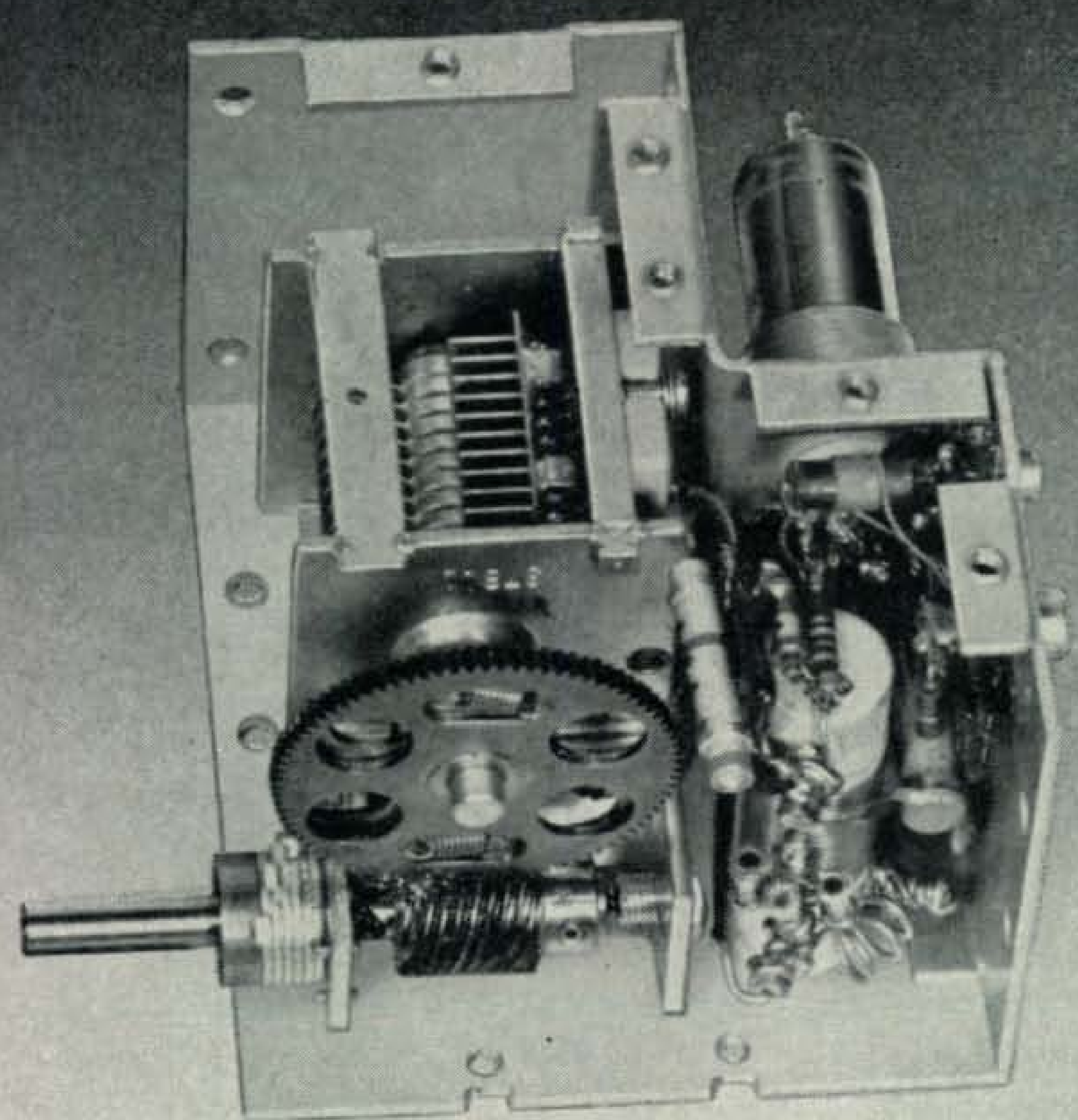
Name________
(Please Print)
Address________
City________ State________ Zip________

Prices & specifications subject to change without notice. AM-156

FREE 1966 HEATHKIT CATALOG

See the wide array of Heathkit Amateur Radio Equipment available at tremendous do-it-yourself savings! Everything you need in "mobile" or "fixed" station gear with full descriptions and specifications. Send for Free copy!

...Beats A Stout Heart

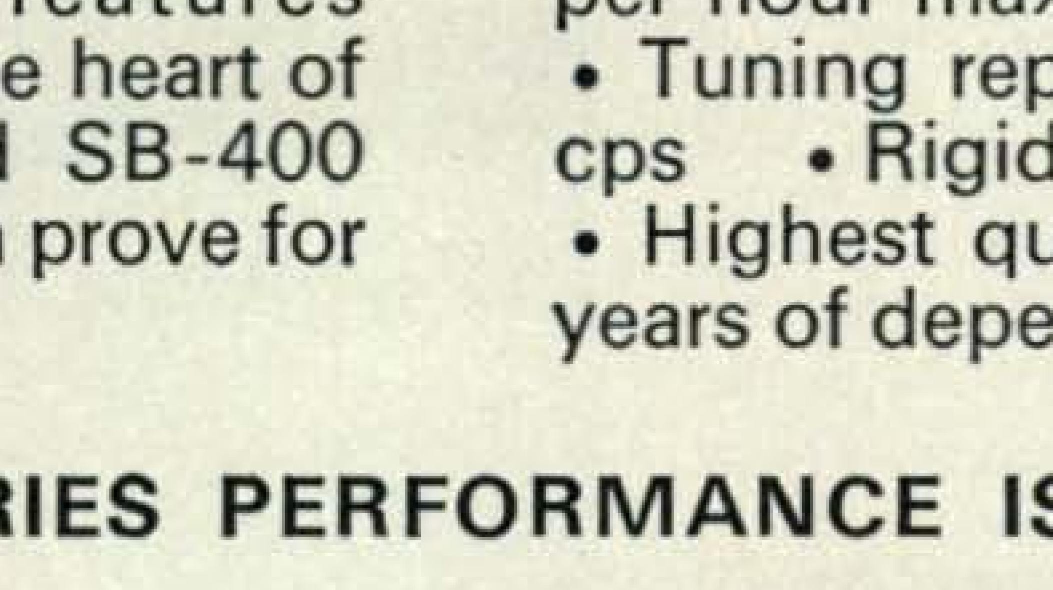


Heath Deluxe SB-Series LMO (Linear Master Oscillator) — with features factory built into the heart of every SB-300 and SB-400 ... features you can prove for yourself!

• True linear tuning . . . (within 400 cps) • Stable—less than 100 cps per hour maximum drift after warmup • Tuning repeatability better than 50 cps • Rigid mechanical construction • Highest quality components assure years of dependable performance

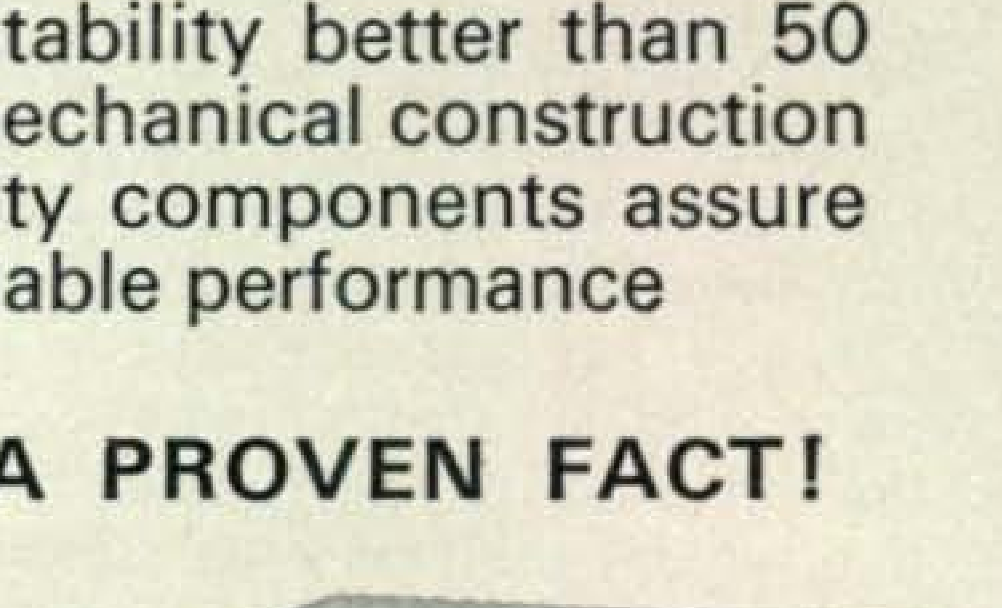
HEATH SB-SERIES PERFORMANCE IS A PROVEN FACT!

Operate 80 through 10 meters on either the SB-300 Receiver or the SB-400 Transmitter —operate 6 meters on the SB-110 transceiver — experience the same precision tuning and near-perfect stability on each. All of these features will be included in the SB-100, 80 through 10 meter transceiver, available soon.



Kit SB-300, less speaker, 23 lbs. ... $27 dn., $22 mo. **$265.00**

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



Kit SB-110, (less spkr. & pwr. supply), 23 lbs. . . . $32 dn., $28 mo. **$320.00**

For further information, check number 26, on page 110

Putting The URC-4 On 50-144-220

BY STANLEY F. BRIGHAM,* W3TFA

THE availability of radio equipment has been gradually diminishing on the surplus market. However, there are a few units which show up occasionally and are worthy of consideration. One of these is the RT-159-AN/URC-4 walkie-talkie. Conversion articles have appeared previously but these have been tailored for operation in the two meter band.[1] The results were so gratifying that similar procedures were developed for 50 and 220 mc with equally satisfying results.

220 Mc Conversion

Once it has been established that the URC-4 is working, remove the chassis from the base by loosening the three chassis mounting screws. These screws are easily identified by the heads which are painted red. Remove the v.h.f. detector tube (6050, V_5). Save the tube for a spare. Next remove the neoprene waterproof cover over the microphone/earphone grill. This will improve the modulation.

Transmitter Modification For 220 Mc

A transmitter crystal between 27.500 and 28.125 mc must be used for 1¼ meters. A third overtone series mode crystal installed in an HC/18-U holder equipped with wire leads is recommended as a replacement type for the CR/24-U crystal orginally supplied with the units. The new crystal may be secured by lifting the old pressure spring and sliding it into position. Solder the two wires to the original crystal holder terminals. Be sure to clamp the wire leads of the crystal with the flat jaws of pliers between the crystal and terminal to be soldered to act as a heat sink and prevent possible fracture of the crystal.

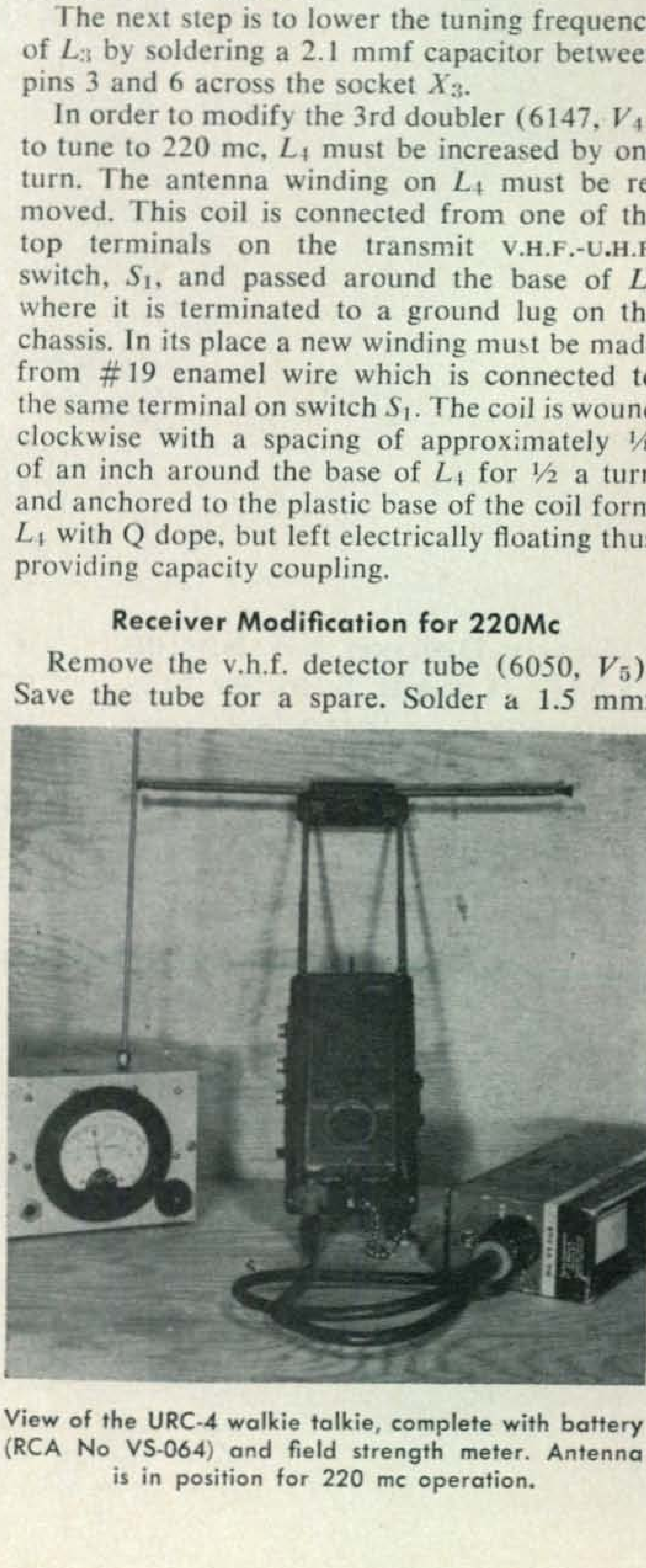
The first step in modifying the tuned circuits is to lower the resonant frequency of the 1st doubler (6050, V_2) by soldering a 2.7 mmf capacitor across L_2. This is easily accomplished by soldering the capacitor between pin 1 of V_2 and the feedthrough insulator mounted on the chassis between V_1 and V_2 to which the other end of L_2 is attached.

The next step is to lower the tuning frequency of L_3 by soldering a 2.1 mmf capacitor between pins 3 and 6 across the socket X_3.

In order to modify the 3rd doubler (6147, V_4) to tune to 220 mc, L_4 must be increased by one turn. The antenna winding on L_4 must be removed. This coil is connected from one of the top terminals on the transmit V.H.F.-U.H.F. switch, S_1, and passed around the base of L_4 where it is terminated to a ground lug on the chassis. In its place a new winding must be made from #19 enamel wire which is connected to the same terminal on switch S_1. The coil is wound clockwise with a spacing of approximately ⅛ of an inch around the base of L_4 for ½ a turn and anchored to the plastic base of the coil form L_4 with Q dope, but left electrically floating thus providing capacity coupling.

Receiver Modification for 220Mc

Remove the v.h.f. detector tube (6050, V_5). Save the tube for a spare. Solder a 1.5 mmf



View of the URC-4 walkie talkie, complete with battery (RCA No VS-064) and field strength meter. Antenna is in position for 220 mc operation.

*7211 16th Ave., Takoma Park 12, Maryland.

[1]Orr, W. I., *Surplus Radio Conversion Manual, Vol. III* Editors and Engineers Ltd., Summerland, California.

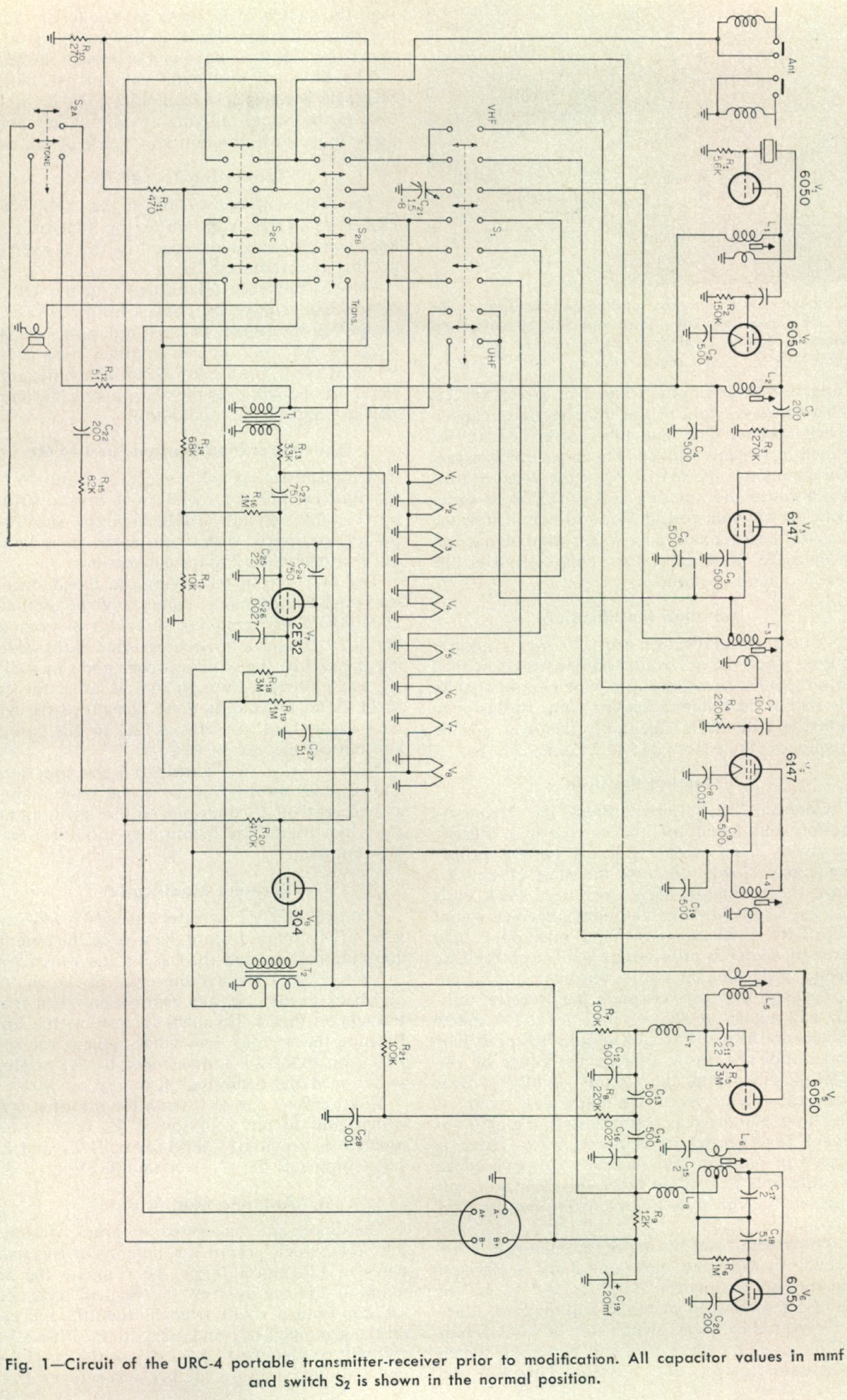
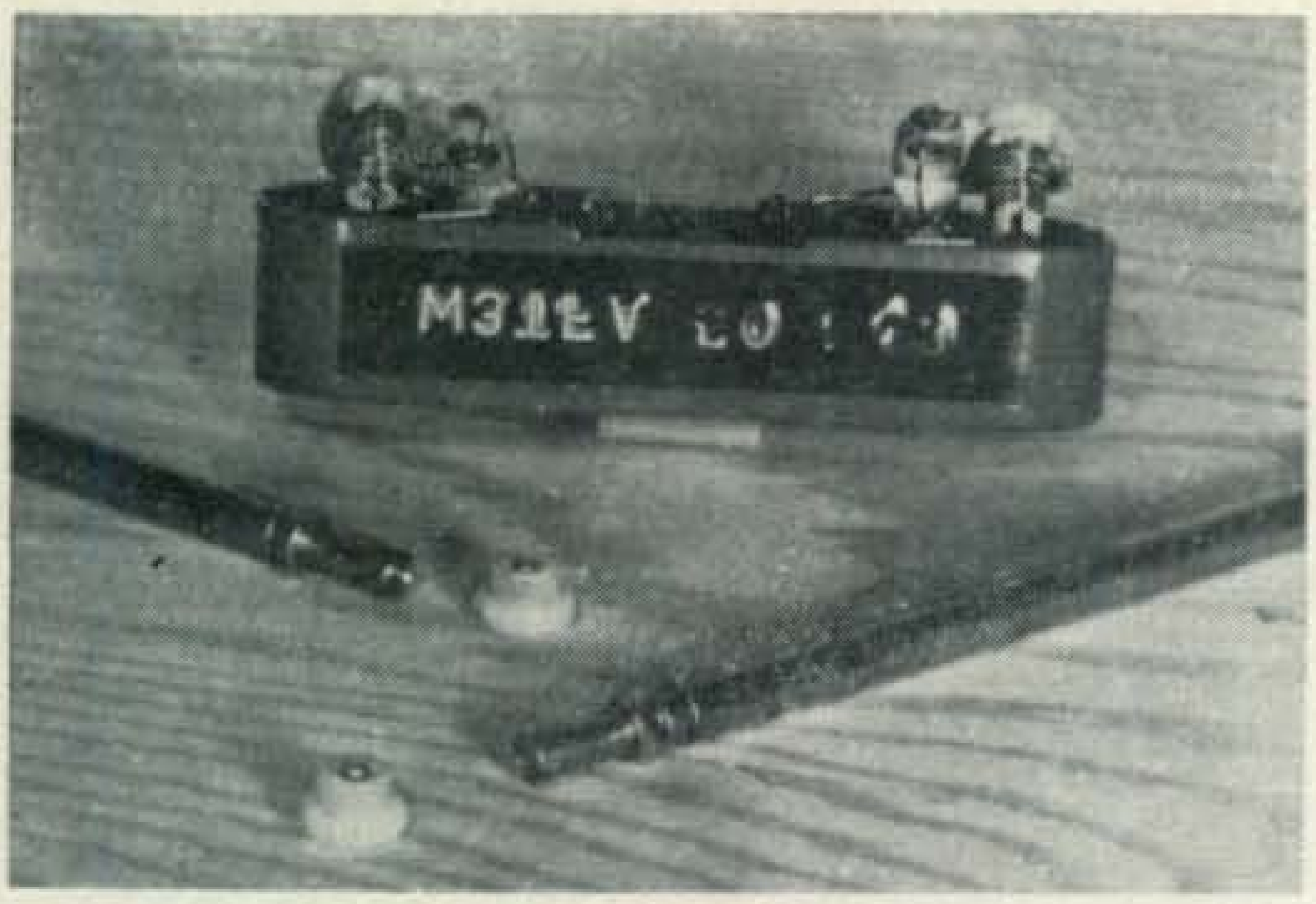


Fig. 1—Circuit of the URC-4 portable transmitter-receiver prior to modification. All capacitor values in mmf and switch S_2 is shown in the normal position.



Close-up view of antenna loading coils wound for the 50 mc conversion. The plastic tips can be unscrewed from the dipoles making it easy to remove them from the plastic housing.

capacitor between pins 1 and 3 of the socket X_5. This value is equal to the interelectrode capacitance between grid and plate of the 6050, V_5, which has been removed. The capacitor is essential and affects the sensitivity of the detector tube V_6 because the antenna coil of V_5 is in series with the antenna coil of V_6. Add one turn to the coil L_6 and replace C_{17}, a 2.0 mmf capacitor, with a 0.5 mmf capacitor. This completes the receiver modification.

Antenna Modification

Antenna modification for 220 mc is not required when the horizontal antenna is telescoped into the fully closed position which automatically shorts out the antenna loading coils. In this position the antenna is essentially flat over a wide frequency range from 215 to 245 mc.

Testing the Unit

Connect the batteries. Press the TRANSMIT button and listen for the carrier in a nearby receiver. If no signal is heard on the proper frequency slowly unscrew the slug of coil L_1 until the oscillator starts operation. Peak coils L_1, L_2, L_3 and L_4 for maximum received signal with URC-4 antenna in the u.h.f. position. A field strength meter is an accurate and more realistic means of peaking the output for maximum signal.

To align the receiver, press the "receive" button and adjust the slug L_6 until local 1¼ meter signals are heard. The slug should be about half way inside the form. Placing the cover on the URC-4 will detune the circuits slightly so final slug adjustments should be made with cover off and then readjusted as required so that maximum signal performance is acquired when cover is placed in position and secured. This procedure is preferable to drilling holes through the cover opposite the coil slugs and adjusting the resonant circuits externally.

To prevent transmitting on an unassigned frequency in the V.H.F. position, shape a piece of bakelite approximately 7/32" × ⅛" × ¾" to be inserted between switch S_1 and the case. Place it between the die cast switch stop molded as part of the case and the spring clip when the switch is actuated in the U.H.F. position. This will prevent the switch from being moved to the V.H.F. position and transmitting an unwanted signal on approximately 110 mc which is outside the band.

The threaded protection cap for the battery recptacle is easily lost so modify it by drilling a hole in the center, affixing a chain at this point, and connect it to the bottom outside of the case.

Converting To 144 Mc

The following conversion of the AN/URC-4 (RT-159) is for operation in the 144 mc band and is an abbreviated version of the conversion previously referenced[1].

Once it has been established that the URC-4 is working, remove the chassis from the case by loosening the three chassis mounting screws. Remove the U.H.F. power amplifier tube (6147, V_4) and save it for a spare. Remove the neoprene water proof cover over the microphone/earphone grill to improve the modulation.

Transmitter Modification For 144 Mc

A transmitter crystal between 36.0 and 36.775 mc must be used for 2 meters. A third overtone series mode crystal installed in an HC/18-U holder equipped with wire leads is mounted as described in the 220 mc conversion.

The first step in modifying the tuned circuits is to raise the resonant frequency of the oscillator (6050, V_1) by removing three turns from the top of L_1. This can be accomplished by unsoldering the end of the winding from pin 1 of socket X_1 and pulling it through the eyelet of the coil form. After unwinding three turns feed the wire back through the eyelet, resolder to pin 1 of X_1 and cut off the excess wire.

Next remove two turns from the top of L_2 and resolder to pin 1 of X_2 in the same manner as before. Coil L_3 does not require pruning and L_4 is not used. The transmitter modification is now complete.

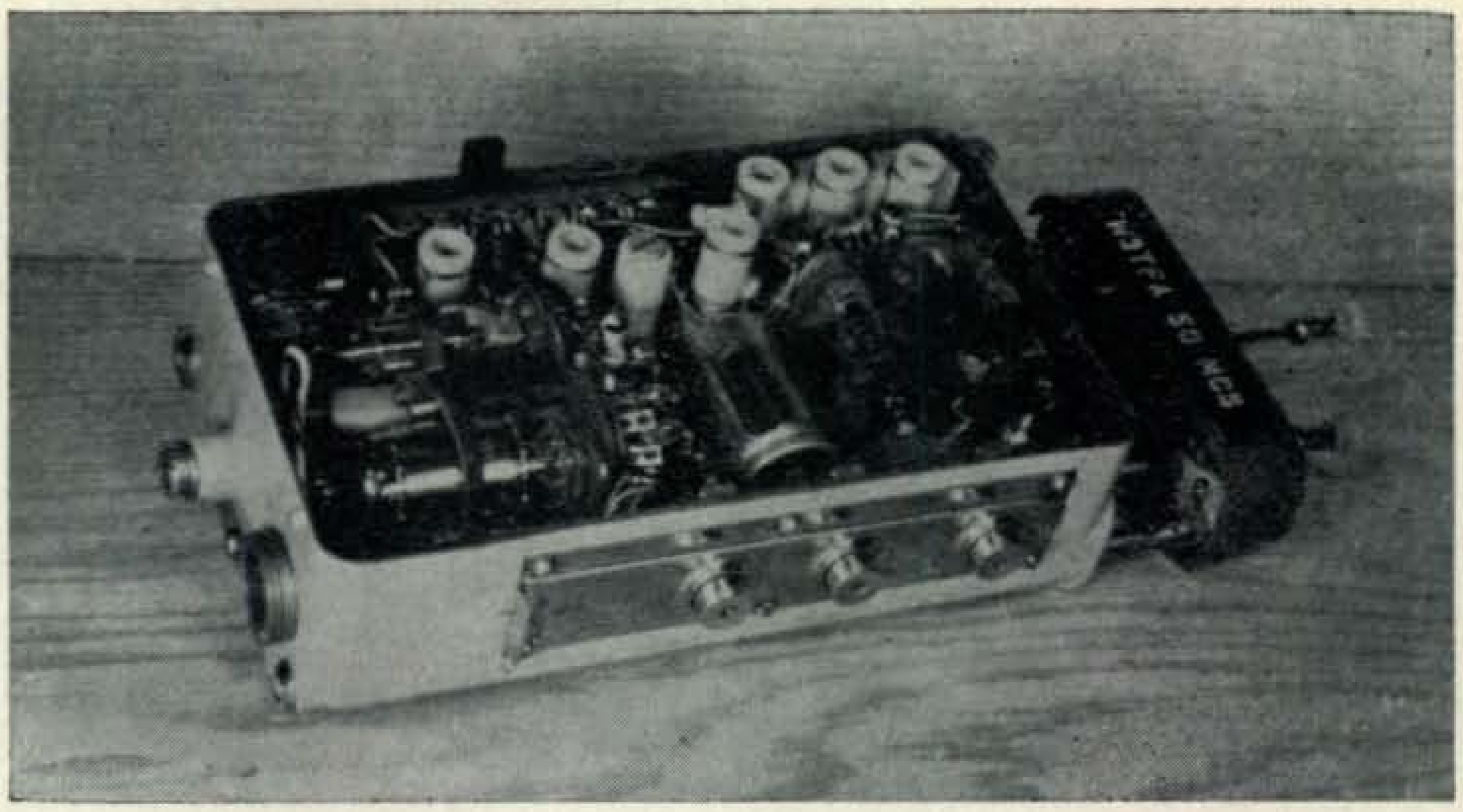
Receiver Modification

Remove the UHF detector tube (6050, V_6) and save it for a spare. Locate the wire of the antenna coupling coil around the base of L_5 which runs to switch, S_2. Unsolder this wire at the switch, pull back to the coil, and remove one turn from the coil so that 1 1/6 turns remain on the link. Reroute the wire to the switch, replace the spaghetti on this lead and resolder to the original switch terminal trimming off the excess wire.

Next remove one turn from the top of coil L_5 which runs to pin 1 of socket X_5 in the same manner as previously done for coils L_1 and L_2. This completes the receiver modification.

Antenna Modification

The dipole antenna system employs two loading coils which permit the antenna to resonate between 120 and 130 mc. To resonate the antenna at 144 mc unscrew the vertical rods near the cap with a small wrench. Identify the coil on the grounded side and mark it "B." The other coil will be identified "A." Lift out the two loading coils and remove all but three turns from



Interior view of a URC-4 modified for 50 mc operation. Switch S_1—V.H.F.-U.H.F. selector, is on the far side and the bakelite stop can be seen projecting upward. For the 144 mc modification the stop is also placed as shown. For 220 mc service the bakelite block is inserted on the right side of the switch.

the coil marked "A", and all but two from the coil marked "B." Replace the coils.

A check of the resonant frequency of the antenna may be made by soldering a one inch loop of wire across the two contacts near the center of the antenna cap. Check the resonant frequency with a grid dip meter which should be between 144 and 145 mc. Remove the one inch loop and replace the antenna assembly on the vertical rods. The telescoping horizontal rods are to be fully extended for 144 mc operation.

Testing

Connect the batteries. Press the "transmit" button and listen for the carrier in a nearby receiver. First slowly unscrew the slug of L_1 until the oscillator starts operation. Rotate ½ turn counter clockwise beyond the point where oscillation is first encountered. Peak coils L_1, L_2 and L_3 for maximum output with antenna in the fully extended position by using a field strength meter as the output indicator.

To align the receiver, press the "receive" button and adjust the slug L_5 until local 2 meter signals are heard. The slug should be about one third of the way inside the form. Placing the cover on the URC-4 may again detune the circuits slightly as previously explained.

As recommended for the other units converted, and to preclude accidental modulation without a load in the UHF position, fabricate a bakelite piece to be inserted between switch S_1 and the case, and between the die cast switch stop and the spring clip when the switch is placed in the V.H.F. position. This will prevent the switch from being moved to the U.H.F. position.

Converting To 50 Mc

Converting the URC-4 (RT-159) to 144 mc and 220 mc has proven so successful that a similar conversion of this unit to 50 mc was undertaken.

Once it has been established that the URC-4 is working, remove the chassis from the case by loosening the three chassis mounting screws. Remove the u.h.f. detector tube (6050, V_6). Remove the 1st doubler tube (6050, V_2) and the 3rd doubler tube (6147, V_4) and save them for spare tubes. Next remove the neoprene waterproof cover over the microphone/earphone grill to improve modulation.

Transmitter Modification For 50 Mc

A transmitter crystal between 25.050 and 27.000 mc must be used for 6 meter service. Again a third overtone series mode crystal installed in an HC/18-U holder equipped with wire leads is recommended as a replacement.

The first step in modifying the tuned circuits is to lower the resonant frequency of the oscillator (6050, V_1) by soldering a 2.4 mmf capacitor across L_1. This is done by soldering the capacitor between pin 1 of V_1 and the feedthrough insulator mounted on the chassis between V_1 and V_2 to which the other end of L_1 is attached.

Next, eliminate L_2 electrically from the circuit by cutting the coil leads right at the coil form. Remove the residual coil lead from pin 1 of V_2. Remove C_1 from the circuit and wire pin 1 of V_1 to pin 1 of V_2 which is now merely a tie point.

The next step is to lower the tuning frequency of L_3 by removing the existing coil and rewinding the form with 10 turns of closely wound #26 enamel wire. This coil will just fill the available length of the winding portion of the form. Coil L_3 must be padded by additional capacitance to resonate at 50 mc. This is accomplished by soldering a 10 mmf capacitor between pin 3 of V_3 and the top terminal of S_1, position 3. Effectively this capacitor is in parallel with L_3.

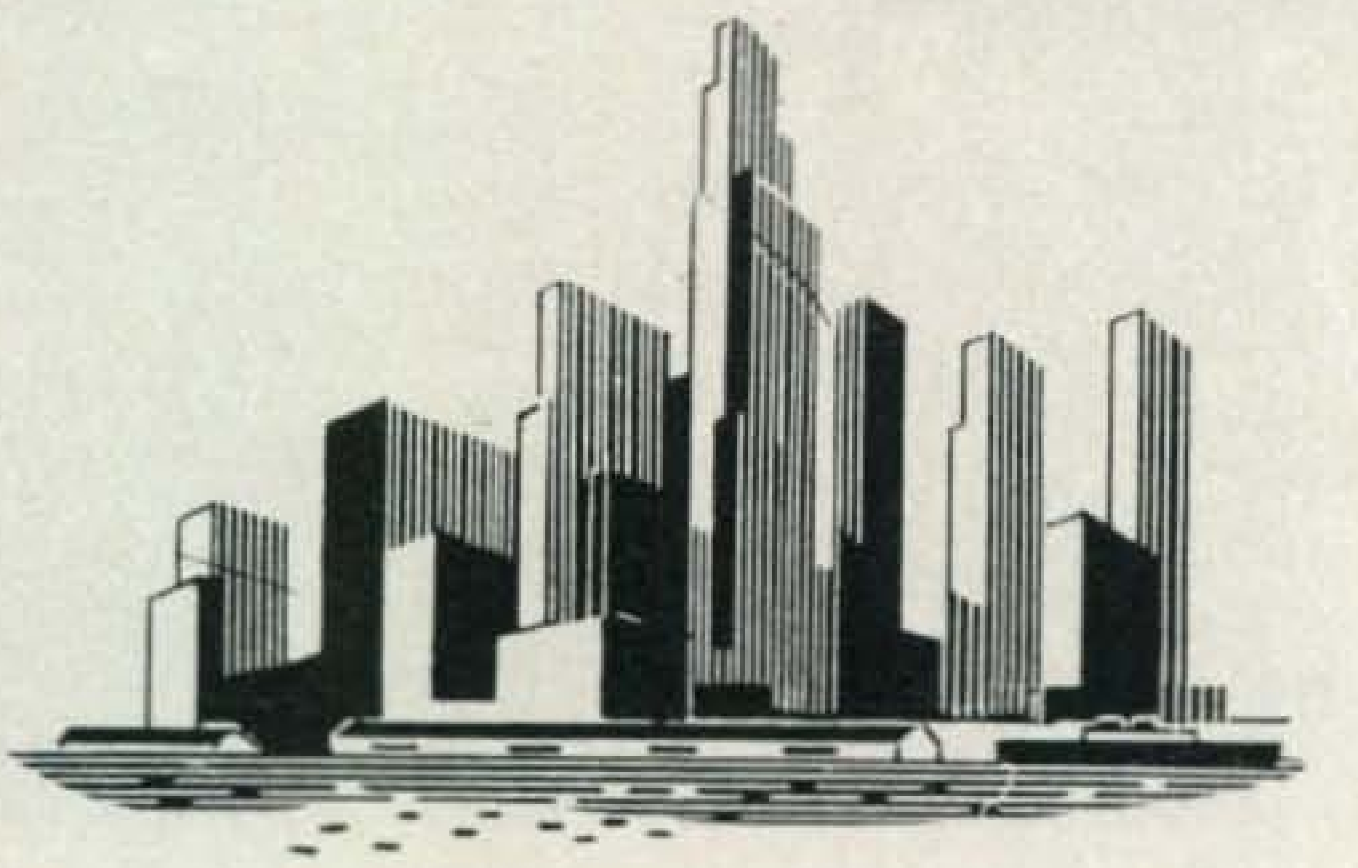
The antenna coil for L_3 must be increased by one turn. This coil is connected from one of the top terminals on the transmit V.H.F.-U.H.F. switch, S_1 and passed around the base of L_3 where it is terminated to a ground lug on the chassis.

Receiver Modification For 50 Mc

Remove the u.h.f. detector tube (6050, V_6). Remove coil L_5 and rewind on the same form 14 turns of #29 enamel. Pad this coil with a 3.3 mmf capacitor so the circuit will resonate at 50 mc. This capacitor should be soldered between pin 1 of V_5 and the junction between C_{22} and L_7. Wind a one and three quarter turn coil of

[*Continued on page 96*]

The Cortlandt Street Story



"N.Y. Radio Row"

THE last really great land transaction in New York took place when, in that historic moment, Manhattan Island was sold for a memorable twenty four dollars. Today in Manhattan, that figure might possibly buy a potted plant at a local florist, but at least it would be New York soil.

Land in New York—or more precisely, land in the borough of Manhattan—is perhaps the most valuable property in the world. One single acre may easily be worth a million dollars or more, depending upon where on the island its located. It is little wonder then, that the city has grown upward when it can't grow outward. That single acre must produce thousands upon thousands of square feet of office space.

The land situation in lower Manhattan has been critical for a long time. For over one hundred years, vacant land has been non-existent, and any new structure built was at the expense of some older, less economical building. That fate now faces the area popularly known as Radio Row.

For the historical buff, Radio Row or Cortlandt Street, was opened and named in 1736. The street was named after an early Dutch settler, Olaf Stevenson Cortlandt. It is not true that Murray Baum of G&G Radio was there to sell him the property.

A few years ago it was decided (by people who decide things) that a single center for world commerce would be built in New York City. It would be called the World Trade Center. Architects proposals were submitted and the plans finally adopted (by the same people) which called for two identical skyscrapers—one mile high—to be built on the fifteen square block area bounded by Liberty Street on the South, Church Street on the East, Vesey Street on the North and the Hudson River on the West. This is Radio Row. At this writing, test borings have been made, court litigations evolved and all that remains is a definite date of eviction to pull the shrouds over the forty year history of an industry.

Just what is this legendary little area that has attracted ham and experimenter for forty years or more? Basically, Radio Row is a small area of several square blocks, centered on Cortlandt Street, that contains store after store catering to every phase of radio and electronics. The lofts and offices above these stores contain wholesalers and storage space for other dealers in electronics. There are surplus outlets, tube specialists, diodes specialists, transformer dealers, Hi fi stores, tinkerer's bargain stores and several legitimate wholesale and retail parts distributors. Nowhere else on earth does such a diversification of radio stores exist.

Cortlandt Street is generally considered the heart of Radio Row, with the great majority of old surplus, parts, and equipment stores either located there or having been located there at one time or another. The street is not particularly big, extending only for four city blocks, East from New York's Hudson River to Broadway. Of these four blocks only two are taken up by radio parts stores. From this nucleus, stores branch out South to Liberty Street, North to Vesey Street and still further North as far as Canal Street.

In the past ten years, there has been a gradual change in the quality and flavor of the Cortlandt Street area. Some of the past landmarks have disappeared and some stores have moved out; others have moved uptown. The great throngs that congregated there on Saturday afternoons are almost gone. The little childish hand that reached over the counter with a labourously handwritten parts list containing 187 individual items each indispensable, and the squeeky voice saying "Stop when you reach $6.15, that's all I have," is a thing of the past.

Replacing the long trek to the city, the standing in line, the shifting through trays and boxes of indescribable merchandise, of breathing in that certain scent all radio stores seem to have (especially stored surplus and waxed wrappings), is the mail order catalog, the ad in the magazine, direct mailings to the home, and

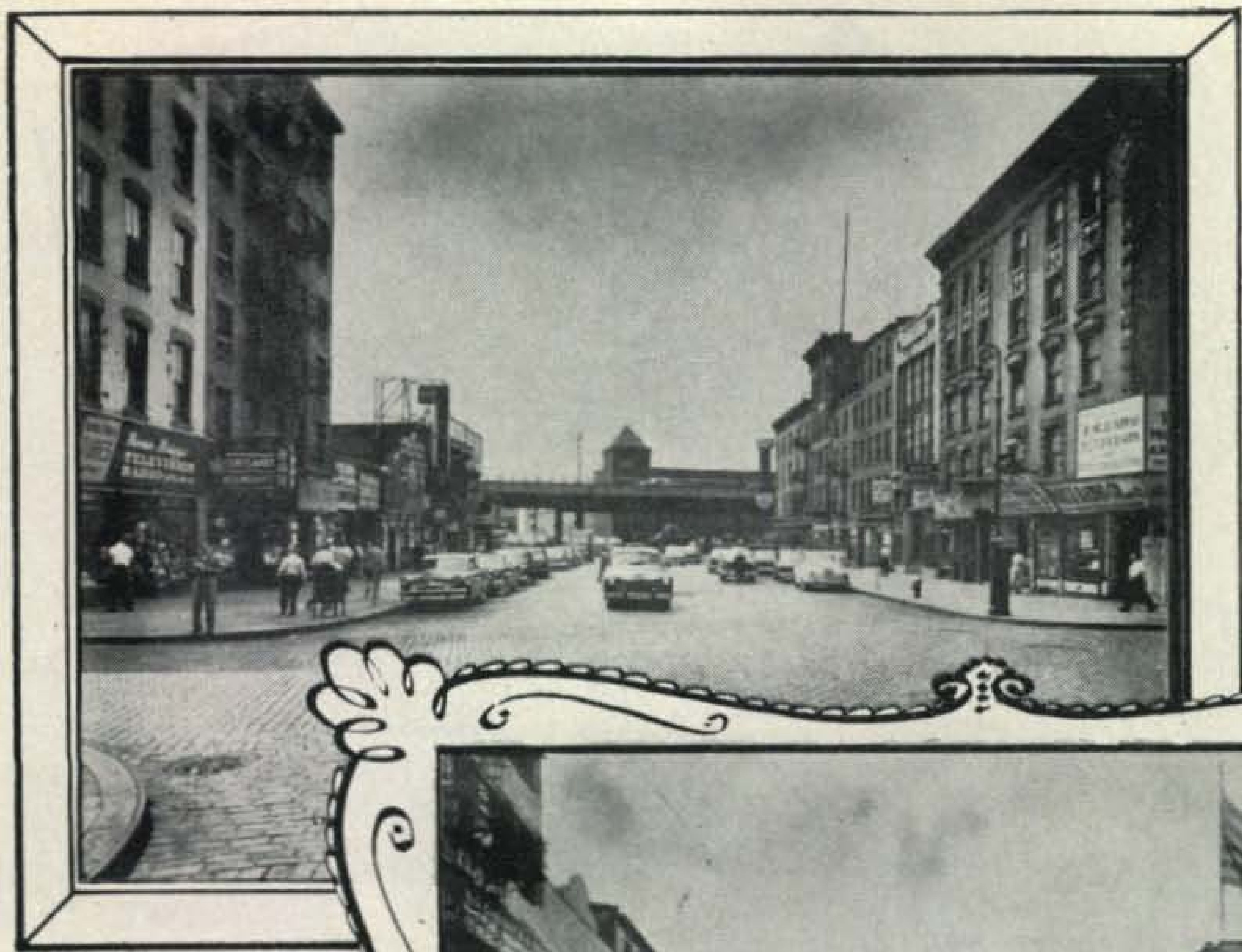
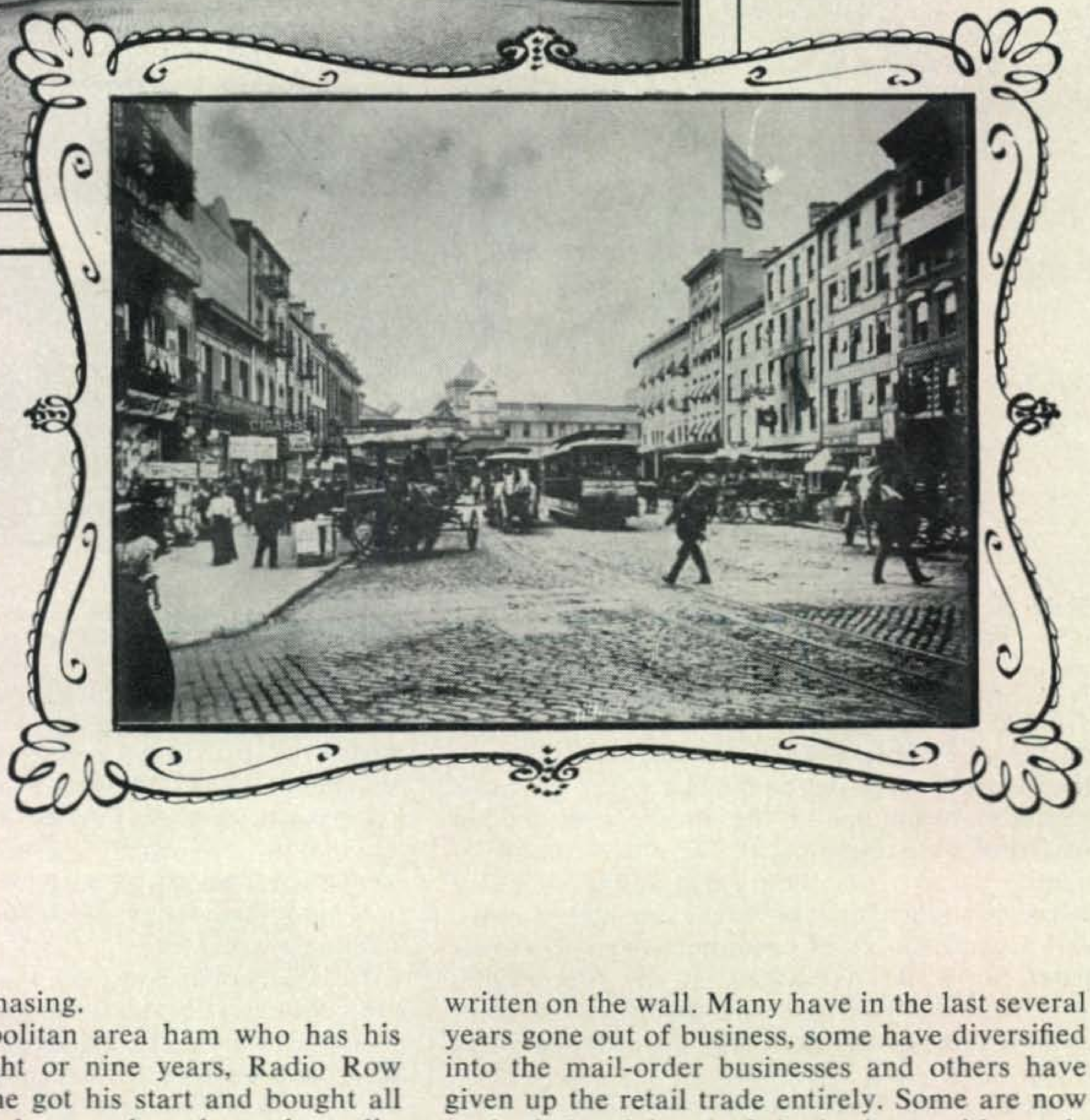


Photo taken during the peak of Cortlandt Streets activity as Radio Row, about 1955. Some of the stores shown have already disappeared uptown to Canal Street or have gone out of business entirely.



This photo of Cortlandt Street was taken on May 28, 1904. The picture, looking west, shows a busy street that led to the ferries that cross the Hudson River. The ferry was completed and put into operation in 1904.

massed club purchasing.

For the metropolitan area ham who has his ticket at least eight or nine years, Radio Row means the place he got his start and bought all his parts. Today, he travels only a short distance to a local distributor or uses the mail, but somehow it's not the same.

During these same ten years the amateur ranks have grown into entirely new markets, new demands, and represent the largest number of potential customers in the industry's history. There is business available, customers available and waiting, its just that the old familiar store has changed or is no longer available.

Where To?

In a short while, possibly within the year, Radio Row will cease to exist. The signs are there already; a few old timers hold out but the end is inevitable. Where they will go is already written on the wall. Many have in the last several years gone out of business, some have diversified into the mail-order businesses and others have given up the retail trade entirely. Some are now in the industrial end of the business with exotic test equipment and specialized components.

Those who remain on Radio Row represent the minority. The once familiar names are no longer here except on some faded sign or in someone's memory. The exodus has started to mid-Manhattan, New Jersey, Nassau county, and other divergent points. Canal Street now supports more surplus stores than Cortlandt Street, although they are being displaced by an increasing number of surplus hardware and discount stores. The question, "Where To?" no longer seems correct, for it now seems very unlikely that any resurrection of a Radio Row is about to take place in any other location. It is truly the end of an era and the beginning of a legend.

Some of the stores along Cortlandt Street and in the Radio Row area. At the turn of the century these stores housed the heart of the cigar industry and will soon give way to the new World Trade Center.

The Business Itself

What of the people who own or run these businesses? General speaking, the old-timers in the business represent a clannish group having a common beginning in the Brownsville section of Brooklyn around 1920. Originally, many of them worked from their garages, before being attracted to the Cortland Street area by low rents, and a good source of customers from the Cortlandt Street ferry, docking at the foot of the street, on the Hudson. The thousands of commuters passing by each day provided a brisk trade.

Most of the current crop of businessmen on Radio Row don't date back to that early era, but instead represent the second generation of the old Brownsville group, in addition to a large number of "graduates" from the old Radio Wire Co. (now Lafayette Radio Electronics) at 100 Sixth Ave. A few of the current owners found their way into the business by accident, but generally the trade is a tight, closed affair with very little new outside blood.

The old-timers prospered in an industry devoted to component sales and customer contact. If the customer had a problem in some construction project, the salesman or owner was able to answer his need with the correct part and/or engineering involved. The entire business was founded upon the fact that people *built* because there was no great quantity of commercial equipment available. For the most part the sales help fostered building and were instrumental in bringing many newcomers into the hobby. Many amateurs today can recall the salesman who sold them their first set of parts and offered suggestions and who was available for counseling when it didn't work.

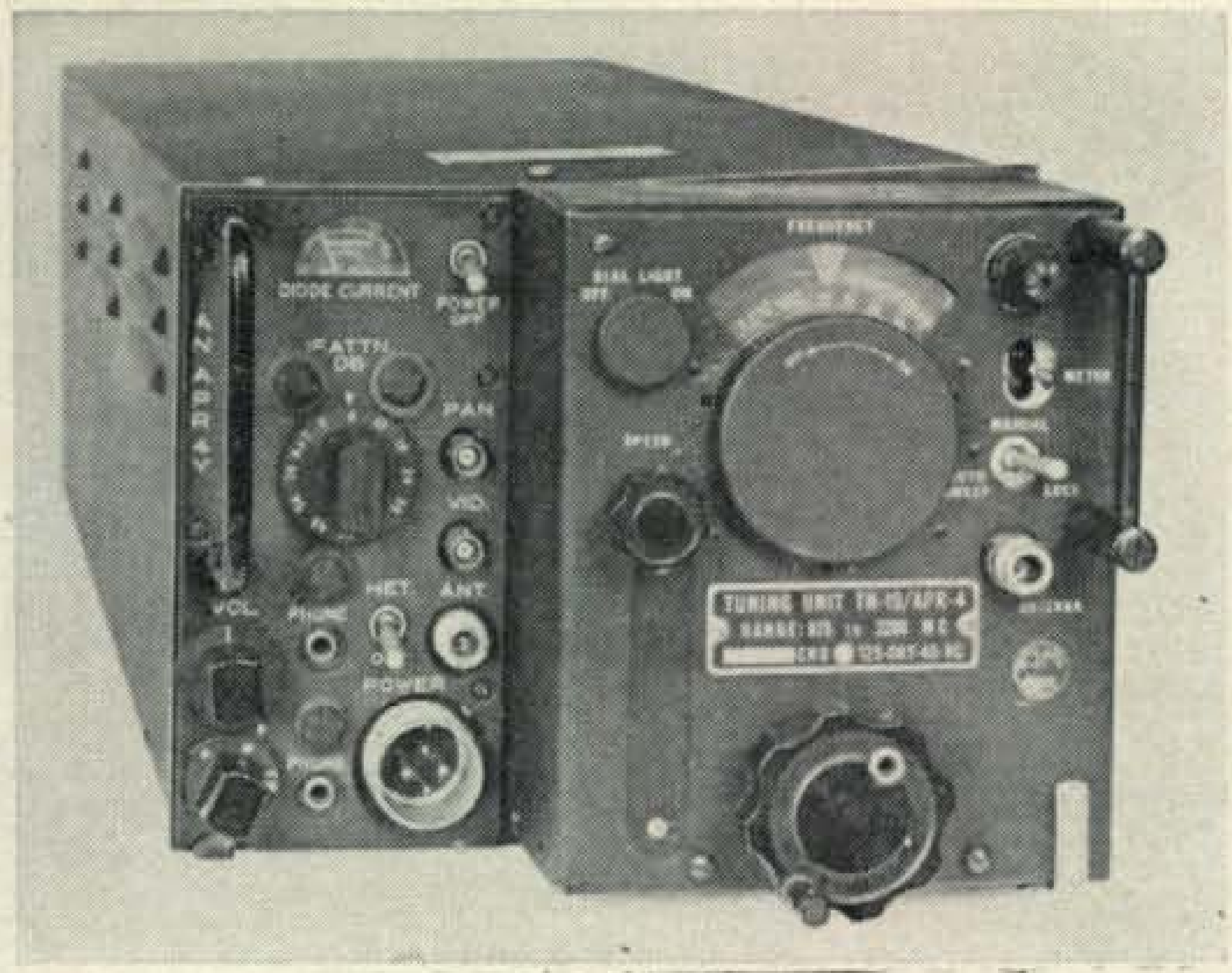
Today, people consider a kit as home-brew, and commercially made equipment is prevalent.

As the state of the art grew and matured, the equipment became increasingly difficult to construct without elaborate test equipment, and so, building began to subside in favor of buying. As increased buying took hold and building slackened, the oldtime sales help changed with the times and most stores now employ a younger sales staff oriented towards selling equipment rather than developing builders. It's a sad fact of life.

Surplus

What is commonly referred to as "surplus" had its roots in amateur radio from about 1917. A huge distinction should be brought up at this point that not all surplus is military surplus. Surplus constitutes any manufacturer's excess, or material remaining after a business failure. The great upsurge of military surplus came shortly after World War II when enormous

THE AN/APR-4Y RECEIVER



An interesting piece of surplus gear is the AN/APR-4Y receiver. It is a 115 volt a.c. operated a.m./f.m. job that covers the entire frequency range of 38 to 4000 megacycles. As such, it should have wide appeal to radio amateurs, particularly those interested in future satellite activity at 432 or 1296 mc, or for other amateur work on these bands. Experimenters, schools, *etc.*, also should find many uses for these sets which were originally employed for intercepting and determining the frequency of enemy radar signals.

The AN/APR-4Y consists of a basic unit which is a fix-tuned 30 mc receiver that is used for the i.f. with five different plug-in tunable converters. The converters cover separate ranges that collectively provide continuous coverage over the frequency spectrum given above. Each converter has an accurately calibrated frequency range with manually-operated vernier tuning. A reversible motor also provides automatic band scanning.

The amplifier in the basic unit has five 30 mc stages, using 6AC7's, with which a bandpass of either 600 kc or 4 mc may be selected with a panel switch. A 6H6 detector/a.v.c. is used and is followed by a compensated video amplifier ahead of a 6AG7 a.f. output amplifier that has a transformer for 600 or 8000 ohm output. Jacks are provided for panoramic and video output to allow visual analysis of received signals. A b.f.o. is included and there is an i.f. gain control calibrated in 6 db steps up to 74 db. A power supply is built in and it operates from 115 v., 60 cycle a.c. (The APR-4Y is originally 400 cycles but is converted by the supplier.) However, 28 v.d.c. is required for operating the band-scanning motors in the converters.

The plug-in converters that go with the AN/APR-4Y are as follows:

TN-16/APR-4 (38-95 mc): Uses a 6AK5 r.f. stage, a 9002 mixer and a 9002 oscillator. A 4 gang capacitor and adjustable iron-core coils are used in conventional circuits and a 30 mc trap is located in the antenna circuit for i.f. rejection.

TN-17/APR-4 (74-320 mc): Uses butterfly units for a mixer and the oscillator, each of which uses a 955. There is no r.f. stage, but there is an i.f. rejection trap in the antenna.

TN-18/APR-4 (300-1000 mc): Butterfly units are used in the mixer and the oscillator. The mixer is a 1N21B crystal diode and the oscillator is a 955. The second harmonic of the oscillator is used to provide the necessary h.f. injection to produce the 30 mc i.f. from the mixer. There is no r.f. stage, but a high-pass filter in the antenna cuts out lower-frequency r.f. signals that might otherwise beat with the fundamental of the oscillator.

TN-19/APR-4 (975-2200 mc): Uses a tuned resonant cavity for r.f. preselection and a 703A tube in a butterfly circuit for the local oscillator. The oscillator output is fed through four 1N21B diodes to produce a harmonic-rich voltage which is coupled to the r.f. cavity. A third loop in the cavity couples both r.f. and oscillator outputs into another 1N21B which mixes the r.f. signal with the 3rd harmonic of the oscillator to produce the 30 mc i.f.

TN-54/APR-4 (2150-4000 mc): This is similar to the TN-19 above, except the 5th harmonic of the oscillator is used instead of the 3rd.

The converters are somewhat difficult to locate, except the TN-19 and a limited number of TN-16 and the equivalent of the TN-18 which, together with the AN/APR-4Y basic unit, are available from G & G Radio Supply So., 75-77 Leonard St., New York 13, N.Y. ■

COMMAND SETS

BY GORDON ELIOT WHITE*

The following discusses some of the lesser known accessory and auxiliary command set equipment that turns up from time to time to intrigue most amateurs.

When the Type K Command sets were conceived in 1935, they were to be a complex of modular components which could be assembled in flexible arrangements to suit the requirements of a wide assortment of combat aircraft. Before World War II ended ten years later, that plan was realized with a proliferation of gear that even its designer, Dr. Frederick Drake, could not have foreseen.

Some of the less-ordinary parts to the command sets are truly rare, and seldom turn up in surplus. Others are common, but few hams have realized just what function they serve. A few are highly interesting, their design of possibly unrealized value today.

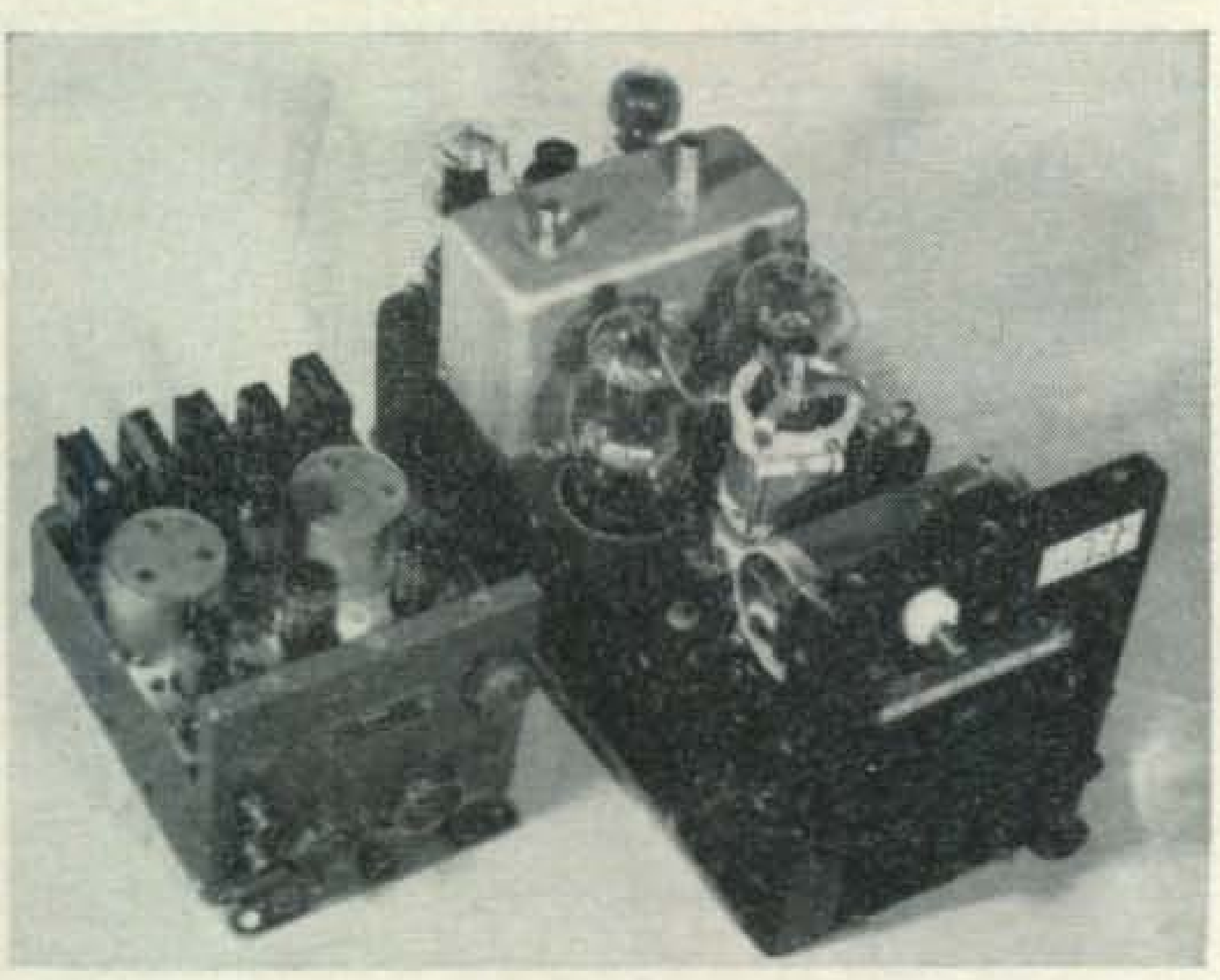
The purpose of this account is to list these lesser-known parts, outlining the wide scope of the command concept with an eye to providing information the author believes has not previously been available.

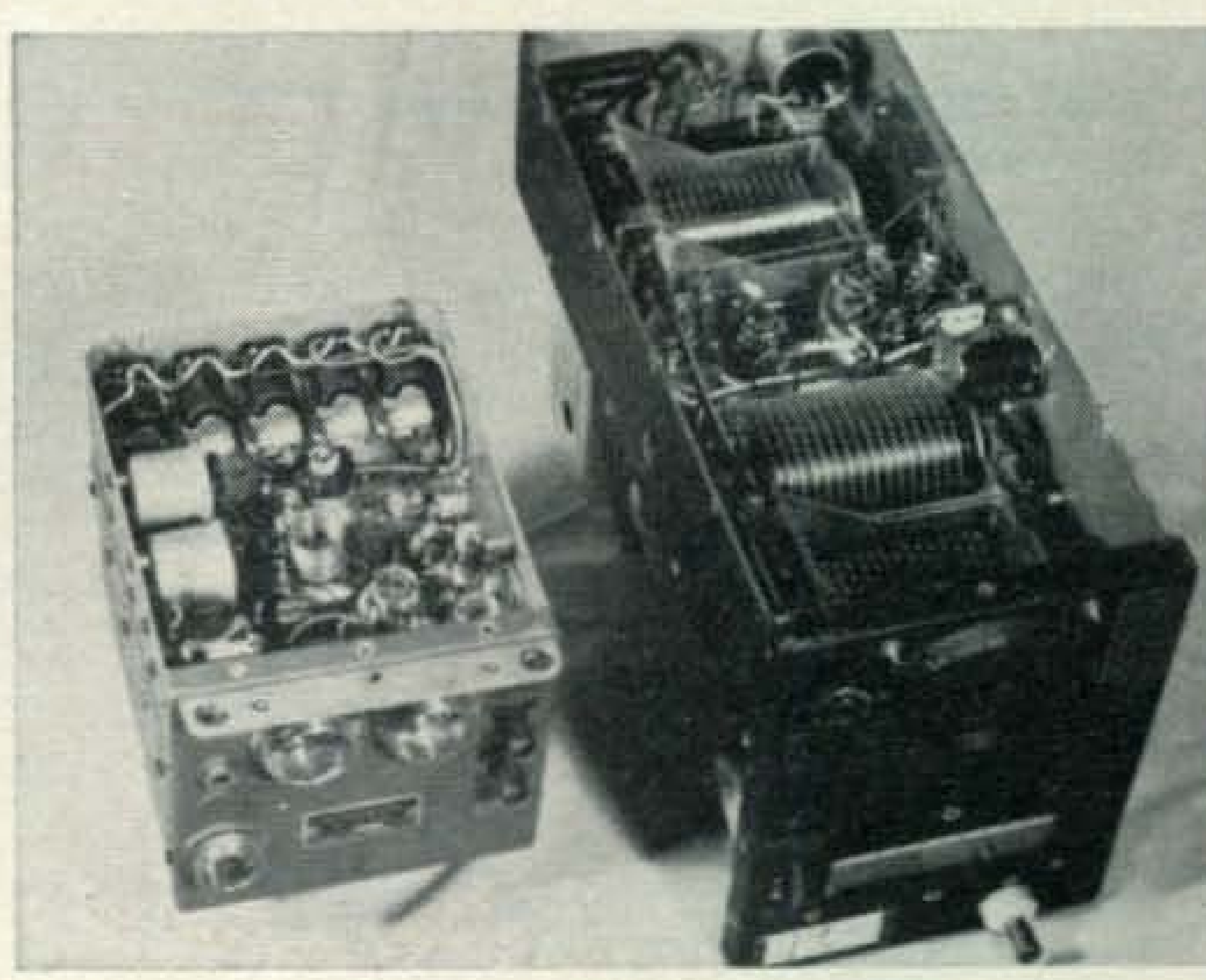
The spectrum of Command Receivers originally covered seven bands reaching from 200 kc to 20 mc. A 20-27 mc unit was designed on a 1939 Navy order, but the highest three bands were never bought in quantity. Reserved for relatively long-range liaison communications, the frequencies between 9 and 27 mc were covered by the more bulky RAX sets, used in heavy aircraft. The RAX of course had space for an additional r.f. stage, important at high frequencies.

Only an aggregate of about 350 command receivers were built in the ranges 9-13.5, 13.5-20 and 20-27 mc, with the 9-13.5 mc set seeing only production of 46 units in 1941-42, under RAV nomenclature.

Although this total seems small beside the million-set out-pouring of receivers in other bands from 1941 until 1945 and later, the author has seen these high-frequency sets in the surplus market from time to time. They are capable of the same excellent performance as the more common units, except for the upper end of the 20-27 mc area, where sensitivity with the original single 12SK7 r.f. stage is inadequate by present standards.

*3716 North Kings Highway, Alexandria, Virginia, 22303.





Upper and lower views of the common h.f. ARC-5 transmitter and the T-11, postwar v.h.f. transmitter.

In another article the author will cover conversions of the common command receivers to the h.f. bands using original engineering data to provide accurate, tracked tuning and sensitivity.

There has been an impression that a 9-18 mc receiver was built in small quantities. Design records and military archives show only that the Signal Corps considered such a band for air-ground liaison, but that no design work was ever undertaken. It is possible that a 9-18 mc unit was put together at Wright Field for test use, but none were ever manufactured.

A 30-40 mc receiver was built in England from a BC-455 command set by Eighth Air Force radiomen. It was to receive the then-current British instrument landing signals, but a design proposal for such a receiver was killed in Washington.

A special keyer, built to work with early British equipment, was known as the "pipsqueak," BC-608. It keyed the command transmitter in a special code for identification-friend-or-foe by ground direction-finding stations. About 500 BC-608 units were built before radar transponders outmoded the system.

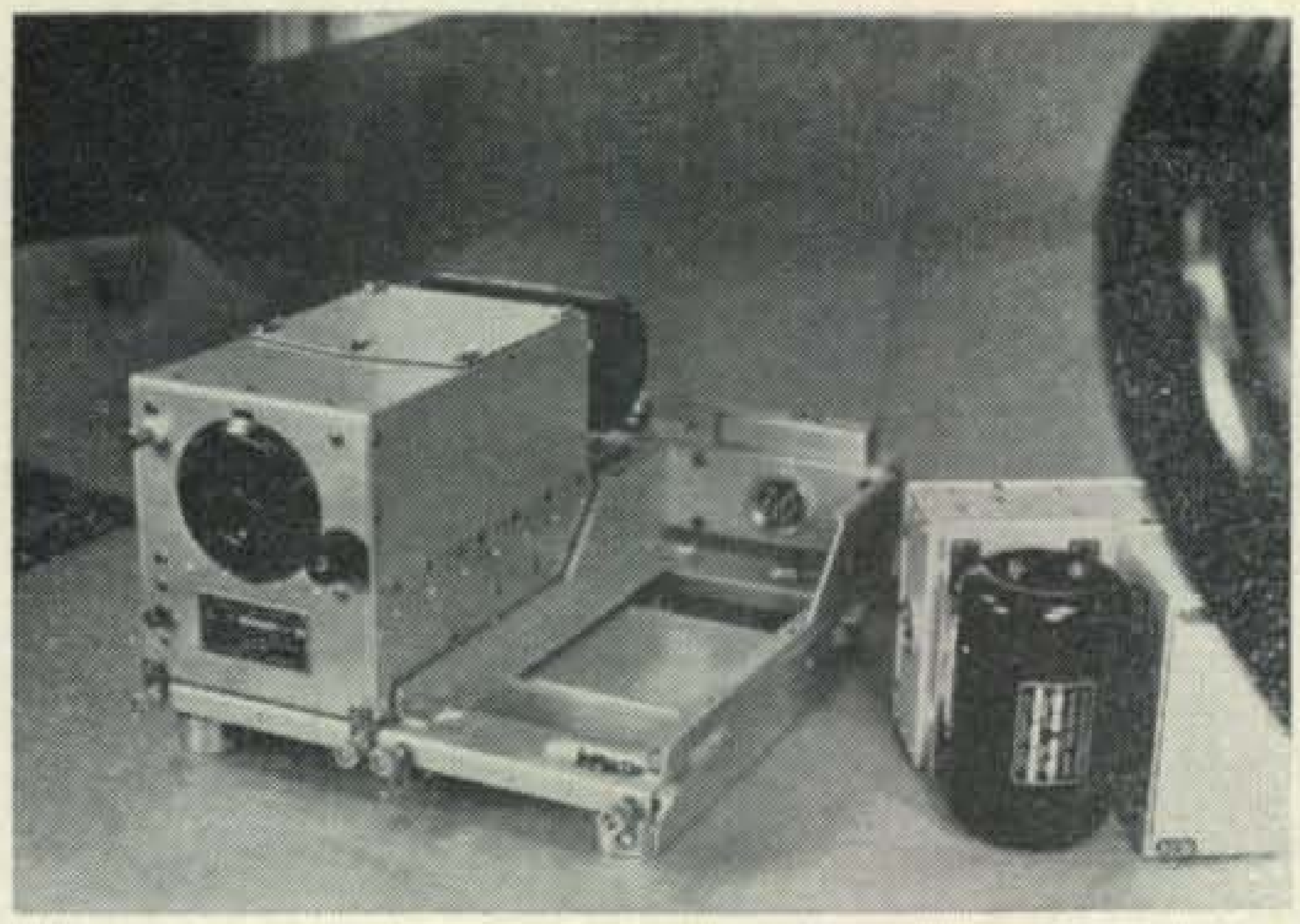
The Navy, in 1943, modified 300 Command receivers, and 450 transmitters, for optional crystal control. The program, undertaken by the Navy Research Lab, was dropped when the more stable AN/ARC-5 equipment came out. Although the modification was successful, it still required manual tuning to the vicinity of the desired signal.

Both 200-580 kc and 3.5-7 mc receivers were built during 1939 for the Air Corps, on a test basis, by Aircraft Radio Corporation; they were never manufactured in quantity.

After the v.h.f. bands were opened to military use, the first American-designed set to operate above 100 mc was a Western Electric-built command prototype for the SCR-274-N system. The BC-695 receiver and the BC-699 transmitter were crystal-controlled, manually-tuned units in the 100-156 mc band. They were made only in test quantities. Motor tuning was added in 1943 and the crystal v.h.f. SCR-274-N sets were eventually built as BC-942 (receiver) and BC-950 (transmitter).

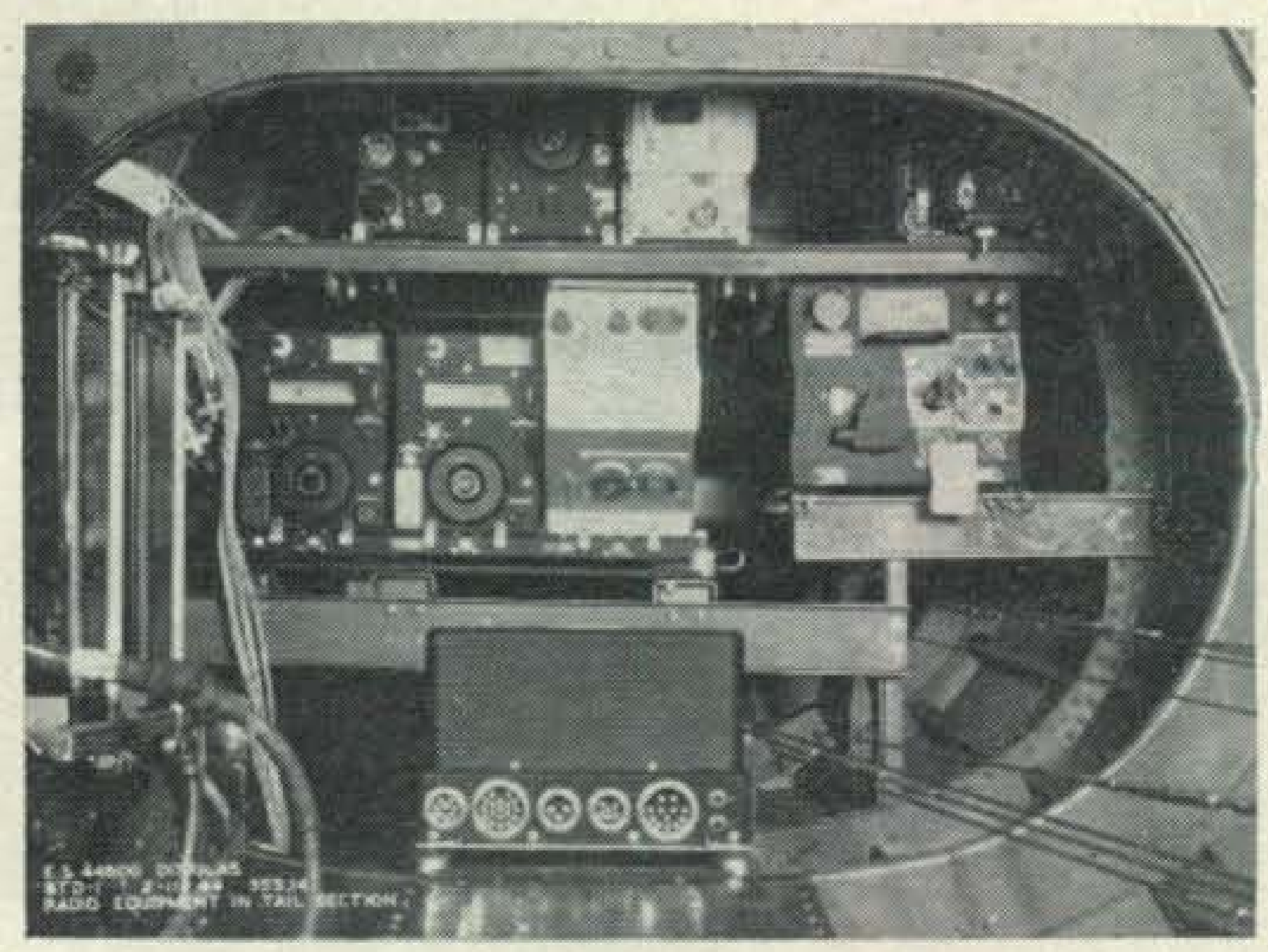
About 1,000 sets of these units were built for the Army before the Navy took over the contract, re-naming the units R-28/ARC-5 and T-23/ARC-5. The latter was modified to work with the MD-7/ARC-5 modulator, but both units resembled the SCR-274-N sets in most details. A T-126/ARC-5 transmitter was later built which covered any four channels between 100 and 146 mc. (The T-23 was restricted to certain segments of the 100-156 mc band.)

The Aircraft Radio Corporation tuneable v.h.f. sets were bought late in the war, and designated R-112 and R-113 and T-89 and T-90/ARC-5. No more than 200 were made. Many still lie in dusty corners of surplus dealers' shelves, by-passed in part because they are hard to identify as part of the more common equip-

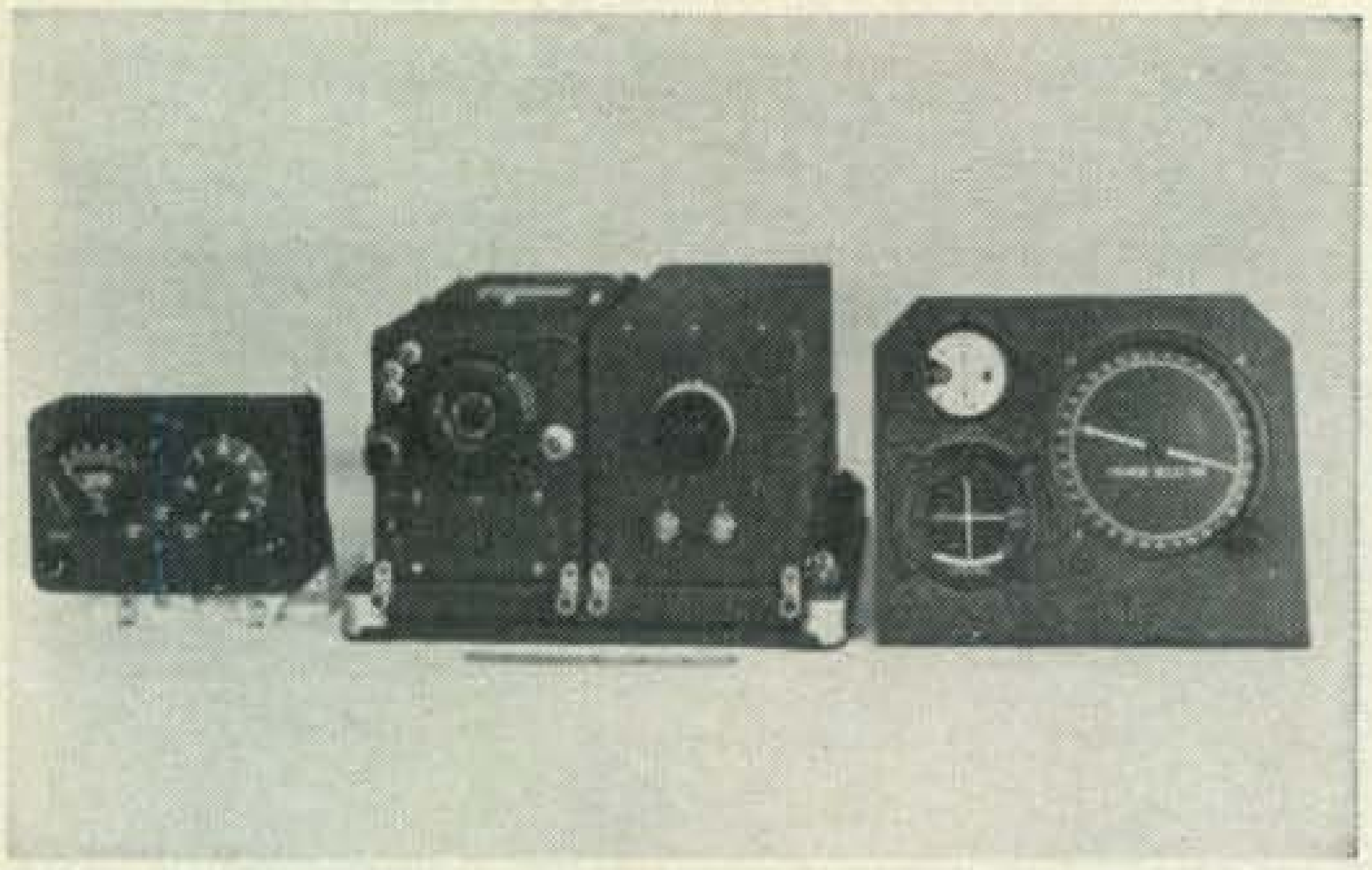


This photo shows the original SCR-274 prototype of 1939. The receiver on the left is the 200-580 kc unit; the receiver at right was 3.5-7 mc. Note the difference between this and the SCR-274-N units brought out two years later.

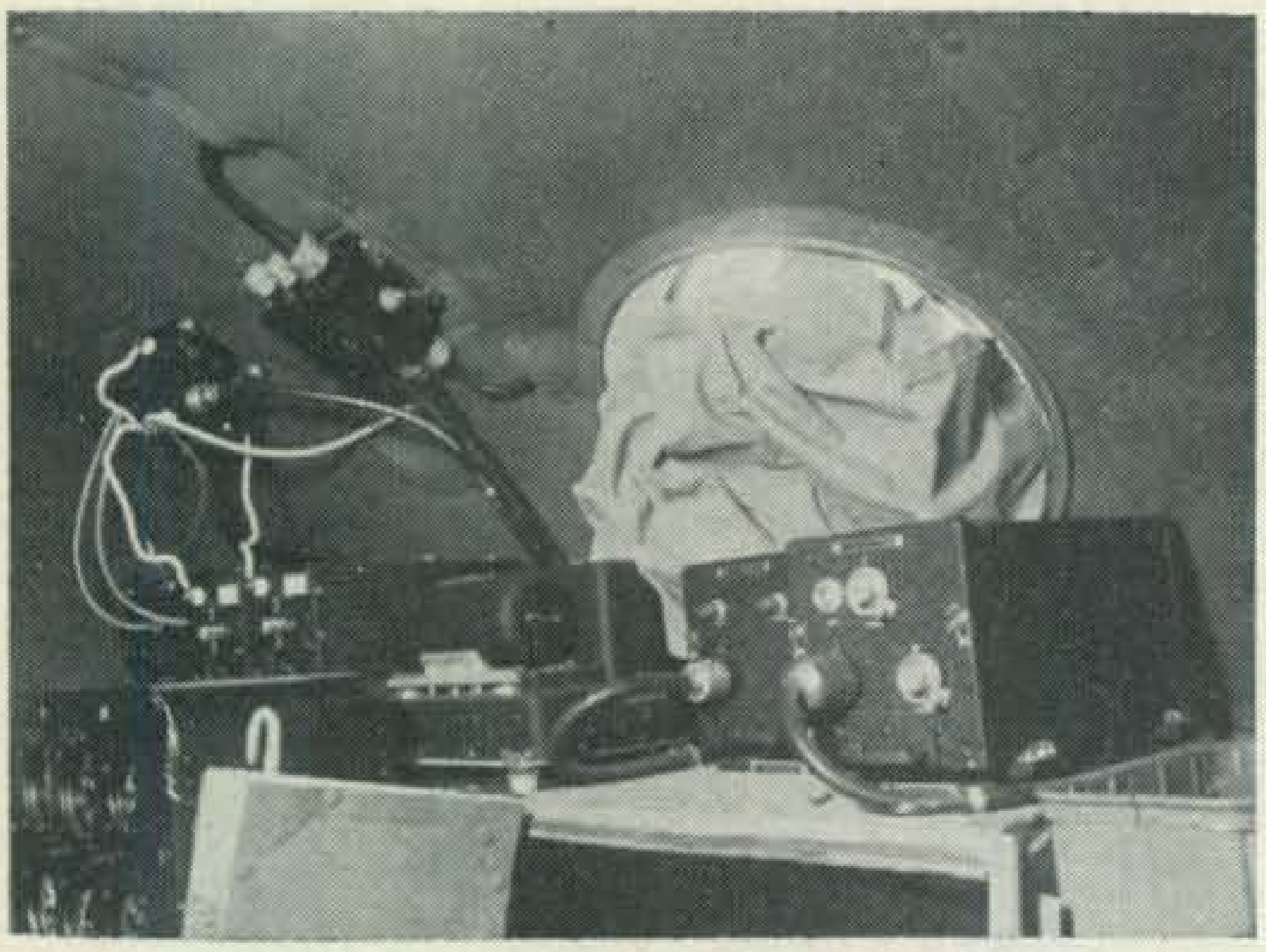
This T-90/ARC-5 was the last of the WW II command transmitter designs, covering 125-156 mc.



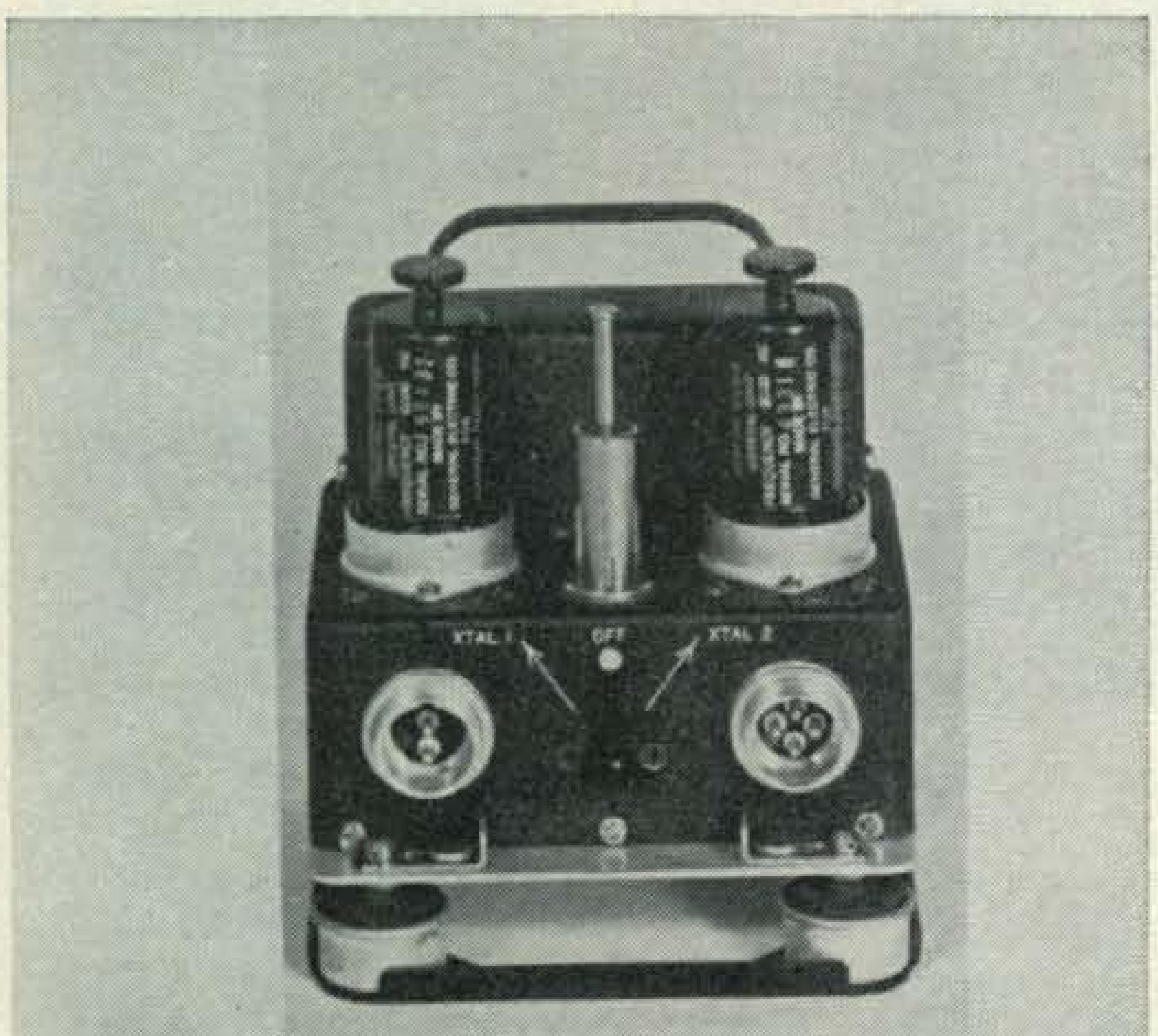
A typical command set system is shown in this photo of a 1944 Douglas Navy torpedo bomber. Top row l. to r. are an R-4/ARR-2 navigation receiver (234-258 mc), R-26/ARC-5 receiver (3-6 mc) and an R-28/ARC-5 v.h.f. receiver (100-156 mc) followed by an RE-2/ARC-5 antenna relay for the h.f. sets. In the middle row l. to r. are the transmitters, T-19/ARC-5 (3-4 mc), T-21/ARC-5 (5.3-7 mc), T-23/ARC-5 (100-156 mc) and an ARB liaison set, (190 kc to 9 mc). The bottom unit is a MD-7/ARC-5 modulator. Most of these are covered in the *Surplus Conversion Handbook*.



Designed in 1947, this A.R.C. type 17 navigation set was a low frequency "omni" receiver, using the R-23-A command receiver from the AN/ARC-5 command set. The converter on the right derived the navigation information from the audio signal of the R-23-A. A glideslope could be fed to the cross-pointer as well.



This is a photo of the interior of a Navy PBY patrol plane taken in July 1942 by the Martin Co. It shows an ATA/ARA command set and a ZA installation. The ZA "localizer" is on the left; it took the audio signal from the 190-550 kc command receiver and filtered the 90-150 cycle modulation to give course information. The 93 mc ZA glidescope receiver is on the right. A self-contained portion of the system, it provided information on the pilot's cross-pointer instrument.



Extremely stable AN/ARC-5 communications receivers were set and lock-tuned to tactical frequencies by this 28 volt crystal frequency meter, O-4/ARC-5.

ment. These sets covered the 100-156 mc band in two parts; 100-125 and 125-156 mc.

Another receiver, the ZB, was closely associated with the command sets. This was a homing unit for carrier planes which may have saved this country a year or more of fighting in the Pacific. Without it, the Battle of Midway and the other carrier fights could not have been won.

Even in peacetime, using radio direction finders, the Navy had been losing carrier planes which could not find their ships after over-the-horizon flights. In wartime, communications silence would have made carrier flying suicidal. The little ZB set picked up 246 mc signals. too high in frequency to be detected by the Japanese. Transmitted by a rotating, directional yagi antenna on the carrier, the signal was keyed in 15 degree segments to indicate homing azimuths.

To make the ZB system even more secure, the signals were double-modulated, the second frequency falling in the 540-1240 kc area. The ZB thus was a tuned radio frequency u.h.f. "tuner" which attached to the 520-1,500 kc band command receiver. So successful was the device that the old DU loop, designed to attach to the command receiver loop terminals was made obsolete before the war began.

The ZB became AN/ARR-1 under joint nomenclature, and was used by the Army to some extent with radiocompass receivers. It was superseded by the AN/ARR-2, a set which fit the command receiver rack and carried its own low-frequency and audio channels. It still used a t.r.f. u.h.f. front end.

The original ZB and AN/ARR-1 adapters had been powered through special plugs on the front of the appropriate command receivers. The Army Air Corps bought the BC-946, broadcast band receiver, strictly to work with the ZB, and original BC-946 receivers all carried the FT-310 adapter for this purpose.

The ZA was also used with the command sets. An instrument landing system, it was the first operational, all-weather landing aid, and it led the way to the current world standard ILS.

The ZA used a pair of transmitters for "localizer" information. One was modulated at 90 cycles, the other at 150 cycles. The centerline of the runway was marked by the point where the two signals were equalized. The carrier frequency fell in the 190-550 kc band of the command set. In the plane the ZA audio filter split the output from the receiver into left and right indications, shown on a cross-pointed instrument on the pilot's panel. At the same time a 93 mc glideslope fed height information through a separate receiver, controlling the second needle on the panel. The MX-19 adapter in the command receiver series was part of the ZA hookup.

The ZA was later outmoded by the SCS-151 ILS system, which had a 108 mc "localizer" and a straight-line 333 mc glideslope. Despite its demise during WW II, the ZA made its mark as the first successfully-tested aircraft carrier blind landing system (1935) and was an important aid at fog-bound Navy patrol bases in 1940-42. Its development was chiefly Navy. Engineering and production was carried out by the Washington Institute of Technology and the Air Track Corporation, of College Park, Maryland.

A third navigation component was the BC-1159, a compass-modulator built under sub-contract to Stewart-Warner Corp., for the Air Corps. Also known as the AN/ARA-1, the set fit a receiver rack next to a low-frequency command receiver. Attached mechanically by a geared linkage through the tuning shaft, the AN/ARA-1 provided loop and compass circuits for automatic direction finding, a concept much cherished by the Army.

Only about 500 BC-1159's were made, according to Signal Corps records. Its small iron-core loop, a German invention, was designed here by Dr. Polydorff, of Chicago. The loop design later was adapted to the AN/ARN-6 and most subsequent RDF units used until quite recently in commercial aviation.

Although not a military design, the R-13 v.h.f. receiver was bought postwar by the military for navigation work as AN/ARN-30. Aircraft Radio Corp. engineers Paul Farnham, Norman Anderson and Dr. Paul King had redesigned the R-112/ARC-5 and added the B-10 converter, for reception of the new C.A.A. "omni," in 1946. Together the receiver and converter made up the Type 15, the first commercial omni set for v.h.f. air navigation.

The R-13 was an improved version of the wartime AN/ARC-5 receiver, with extensive use of ceramic dielectrics and loctal tubes. The 15 mc i.f. transformers were modified from the brass-wire wartime units to provide a higher Q, narrower bandpass. Equipped with a dial, the R-13 closely resembled AN/ARC-5 equipment, but was generally produced in a gray paint job. The R-13 was part of an "omni" navigation set; the companion R-15 was a communications version. Generally the only difference between the two involved care to avoid unwanted phase reversals in the navigation version. About 2,500 R-13 sets were made through 1949, when the design was radically overhauled and crystal control instituted.

A low-frequency omni, Type 17, was built in very small numbers in 1947, but suffered from phase-reversal due to night effect, and was dropped.

Briefly, both omnis provided multiple "tracks" inbound or outbound from the station in much the way a lighthouse gives azimuth indications. While the rotating beam of light turns, another flashes as the revolving beam passes through north. At one revolution per minute, an observer can find his compass bearing to the station by timing the delay between the flash and the arrival of the beam.

On the omnirange, the reference "flash" is a stable-phase signal and the "revolving beam" is a varying phase signal "rotating" at 30 cycles per second.

Aircraft Radio Corp. also built an R-19 receiver, covering 118-148 mc, much like the R-15 and R-13, but all three, in later versions, were made without dials, and designed to be tuned remotely. The T-11 and T-13 transmitters were part of this postwar equipment, and provided low-power v.h.f. communications in the 118-148 mc area.

The AN/ARC-60 set used the R-19 receiver and a "transverter," the TV-10, which transmitted in the 228-258 mc band and converted u.h.f. signals into the R-19. It was widely used in Army aircraft in the 1950's.

Although not strictly a part of the Type K command line, the AN/ARC-39, made in the early 1950's, used a great number of command components. It was a transceiver covering the 2-9 mc band in 12 crystal-controlled channels. About 400 were made. The set had an i.f. of 750 kc.

Aircraft Radio Corp. built several interesting items of test gear out of command equipment, including a 10-20 kc variable oscillator and a 6-13 mc oscillator in receiver cases. JAN units included a two-crystal frequency meter, O-4/ARC-5 used to set lock-tuned receivers. A receiver test set, #7869, was also built for field test work.

Other little-known components included the TN-6/ARC-5, a loading coil for the 500-2,100 kc transmitters, and the RE-16/ARC-5, a coax relay for the v.h.f. transmitters. (A.R.C. at first tried an iron-core loading coil in the LF transmitters, but went to the external unit to save weight.)

The rare T-89 and T-90 transmitters are still occasionally found. These use a v.f.o. plus multiplier stages with 832A tubes and the same sort of antenna coupling and final tank tuning as the h.f. sets. A crystal calibration arrangement was also used as in the more common units.

Of all of these accessories, the AN/ARR-2 probably represents the best surplus bargain. At prices ranging from 35¢ without tubes, to $6 in excellent shape, this little set can be used as a broadcast band receiver, a fairly sharp 200 kc i.f. strip, or a v.h.f. double-conversion receiver. Ken Grayson wrote up one conversion in the August, 1959 *CQ*. The present author has additional conversion data on this set which he plans to put together in the near future for *CQ* readers.

The R-13, R-15, and R-19 v.h.f. receivers, tuning from 108 to 148 mc, represent the cream of the postwar command gear. Capable of sensitivity of less than 1 microvolt, stable, and with extreme tuning accuracy, these make top-quality 2-meter receivers at prices ranging around $30. ■

BY GORDON E. HOPPER,* W1MEG

The Navy LM frequency meter (and Army BC-221 version) are still available on the surplus market. However, the accuracy of calibration is not always satisfactory. Described below is a method for measuring frequency using only the lower band of the LM thus improving its accuracy to a higher degree.

Although the Navy LM frequency meters were developed for use during World War II, they are occasionally found in quantity on the surplus market today. As received, they will measure frequencies from 125 kc to 20 mc without any modification other than the addition of a suitable power supply. The actual percentage of accuracy leaves something to be desired, but for the more seriously inclined individual who wants to get as much accuracy from the instrument as is possible, there is a simple method of improving the accuracy figure. No claim is made here for a specific percentage of accuracy, but the accuracy will be increased to a point where participation in the ARRL Frequency Measuring Tests will result in very satisfactory measurements of the frequencies involved.

The actual electrical changes are very simple and require only the addition of a 2.5 millihenry r.f. choke, a 1,000 ohm potentiometer, a 100 mmf mica capacitor, and an output receptacle (BNC or equivalent type).

*75 Kendall Avenue, Framingham, Mass.

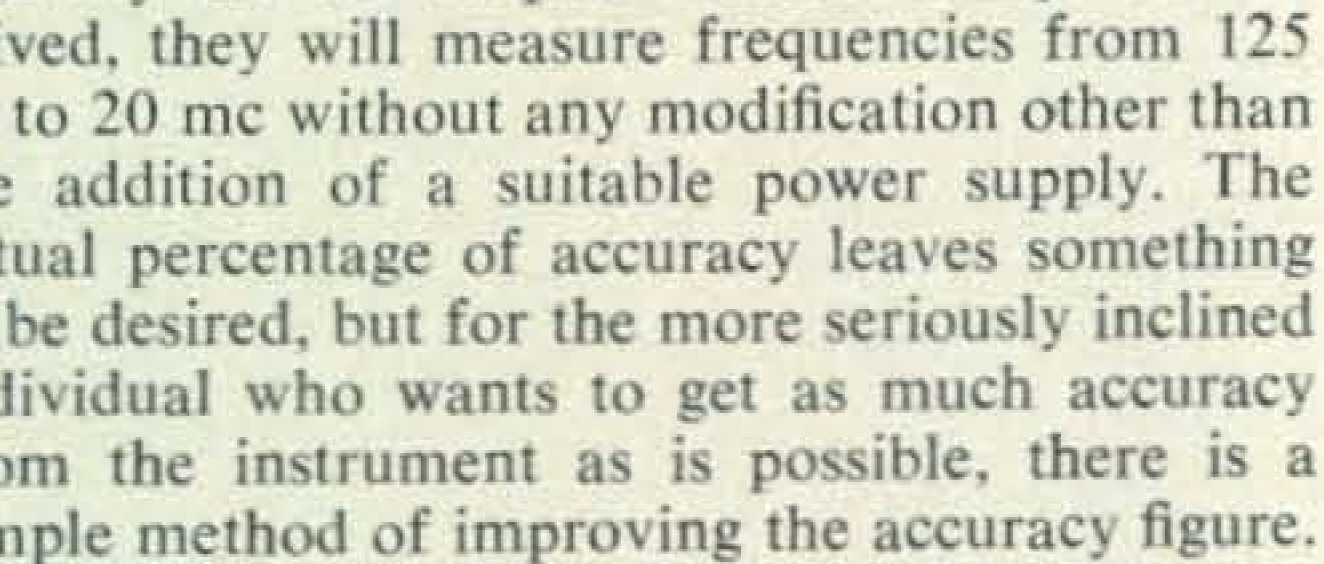


Fig. 1—The bold lines show the components added to the frequency meter for improved accuracy. The new output connector is fed to the receiver antenna terminal or a short antenna.

Make the following modifications to the LM meter (see fig. 1).

1. Open the connection at the plate of the 6A7 tube and insert a 2.5 millihenry r.f. choke in series with this lead.

2. Install a 1,000 ohm potentiometer on the front panel of the instrument.

3. Install an r.f. receptacle (SO-239 or BNC) on the front panel.

4. Connect a 100 mmf mica capacitor between the plate of the 6A7 tube and the top of the 1,000 ohm potentiometer.

5. Connect the bottom of the 1,000 ohm potentiometer to the common ground (chassis).

6. Run a lead from the arm of the 1,000 ohm potentiometer to the new r.f. connector.

At this point, turn on the frequency meter and check a receiver to determine whether or not the unit is delivering an r.f. signal with the CRYSTAL SWITCH placed in its ON position and with a short antenna connected to the new output connector. If a signal is present, the modification is complete. If no signal is heard, connect a jumper between the high side of R_{106} and the

[*Continued on page 94*]

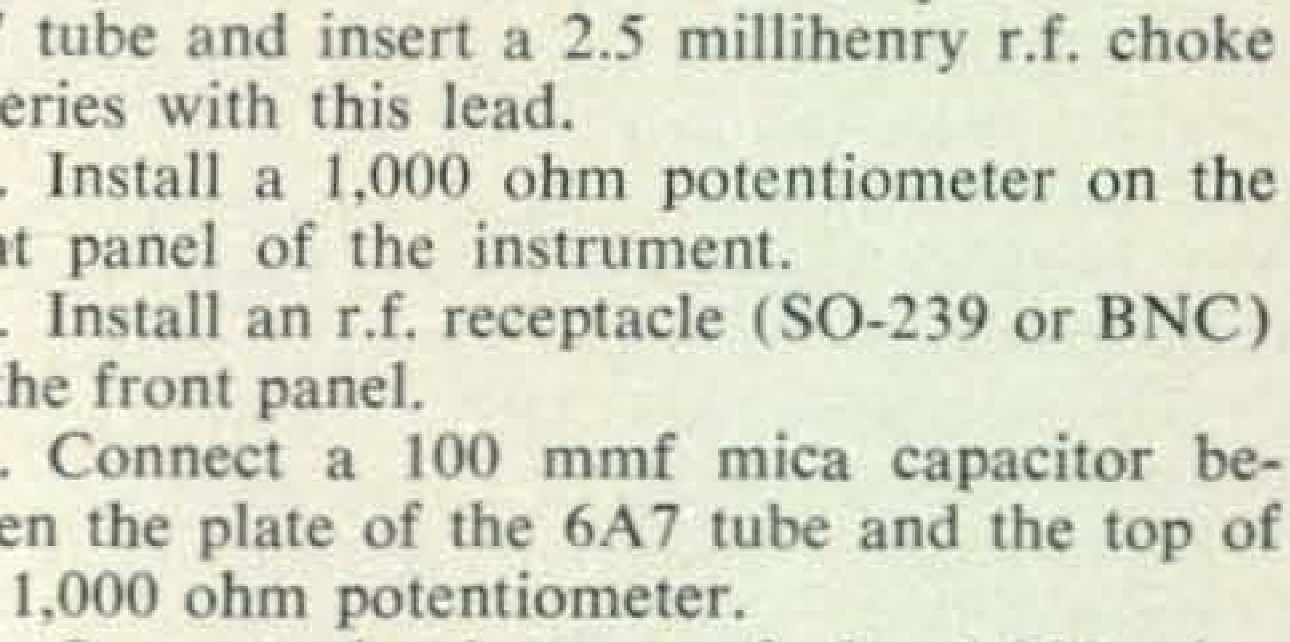


Fig. 2—Modification of switch S_{104B} is shown above. It consists of connection of a jumper across the switch section to connect C_{106} and R_{106}.

Modifying the BC-652A Receiver

or

The Ten Dollar Wonder

BY ROGER H. TAYLOR,* K9ALD

Front view of the BC-652A receiver used to cover 40 and 80 meters.

SINCE I have spent some years in apartments and have moved frequently, I have often wished for a small receiver to hang a piece of wire on just to listen. When a nearby surplus house had a BC-652A on sale for $10.00, I couldn't resist. My wife eyed the odd looking contraption with her usual misgivings and suggested I use it for a boat anchor. Undaunted, I sat down and stared at my prize. The BC-652A is a two band receiver covering 2 to 3.5 mc and 3.5 to 6 mc. It has a a.v.c. and b.f.o. It provides both earphone and speaker outputs.

Power Supply

The first problem is supplying power. The receiver comes with two decks (chassis). The top deck contains a dynamotor and a multivibrator for calibration. As the top deck is pretty useless, simply remove it and throw it away.

A ⅛″ aluminum panel is used to make a new second deck to mount the power supply. The power supply circuit is shown in fig. 1 and connects to the main deck through the Jones plug, P_{251}. The connection points can be traced from the schematic found on the bottom plate of the receiver.

The front panel is covered on top by another piece of ⅛″ aluminum panel. An "S" meter is mounted in this panel and wired as shown in fig. 2. The on-off switch is rewired in series with the a.c. line which is then connected to terminals 1 and 12 on J_{304}. Terminal 8 is connected to 5 (both) on P_{302}, to provide a ground to pin 8. The receiver should now work. For higher gain, rewire the socket for the 12SG7 r.f. amplifier for six volts by connecting pin 2 to terminanl 6 of J_{304}, and substitute a 717-A.

To cover the 80 and 40 meter bands, a simple modification is used. Remove the covers from $T_{301, 302, 303, 304, 305}$, and T_{306}. Clip the wire going to the hot side of each transformer and solder in small silver mica capacitors as shown in fig. 3. Now get a signal generator and align the receiver. The 80 meter band will fall at about 2.7 –3.4 mc on band 1. The 40 meter band will be about 3.9-4.4 on band 2. The measured sensitivity was: Band 1; 0.7 μvolts for 6 db s/n, Band 2; 1.3 μvolts for 6 db s/n.

Remove the little brake lodged behind the main tuning knob. You will now have a re

*2811 William Street, Champaign, Illinois.

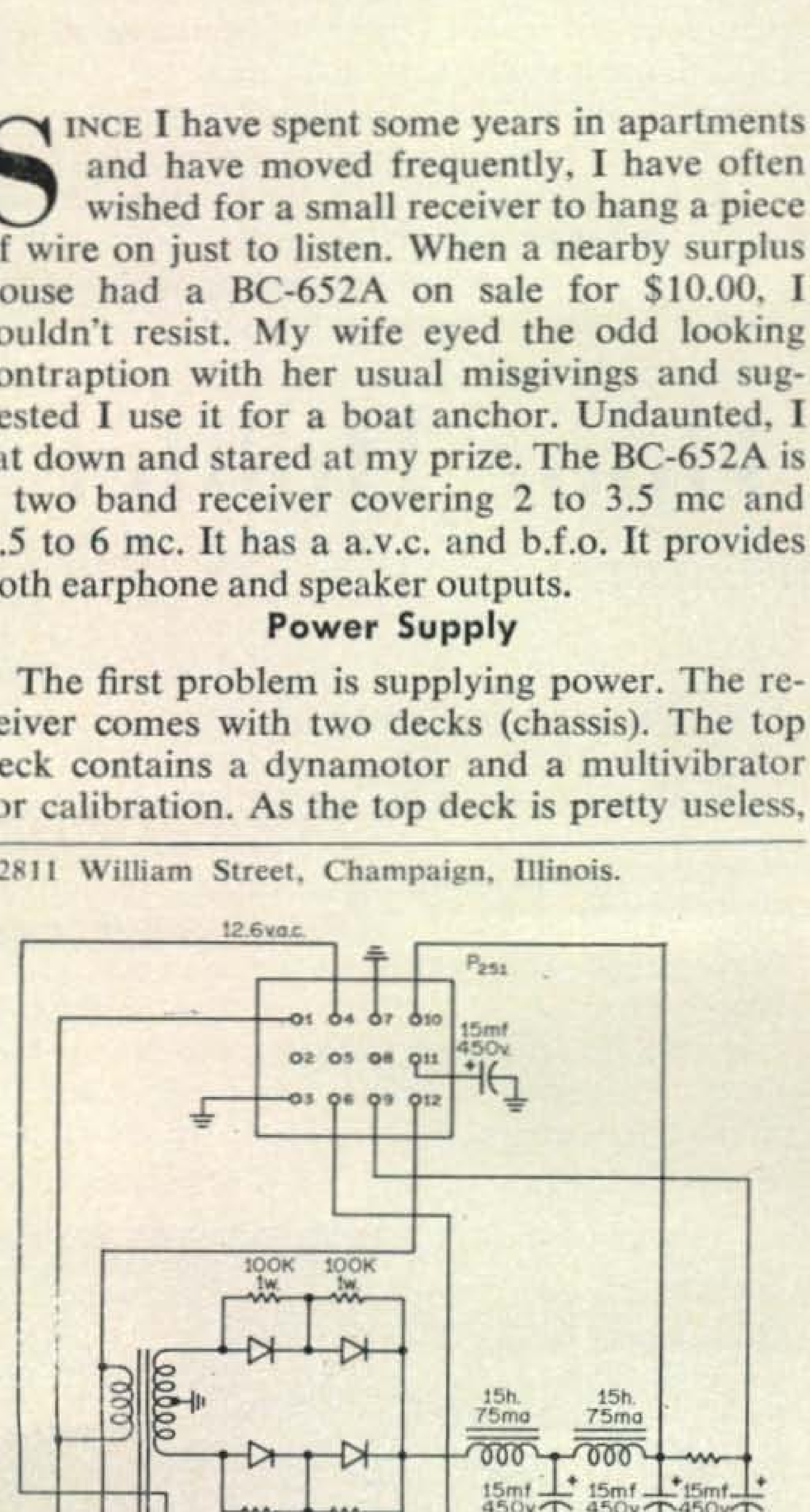


Fig. 1—Circuit of a power supply for the BC-652A receiver. The power transformer is a Thordarson 22R02. The diodes are Sarkes Tarzian F6's and the filament transformer is rated at 3 amps.

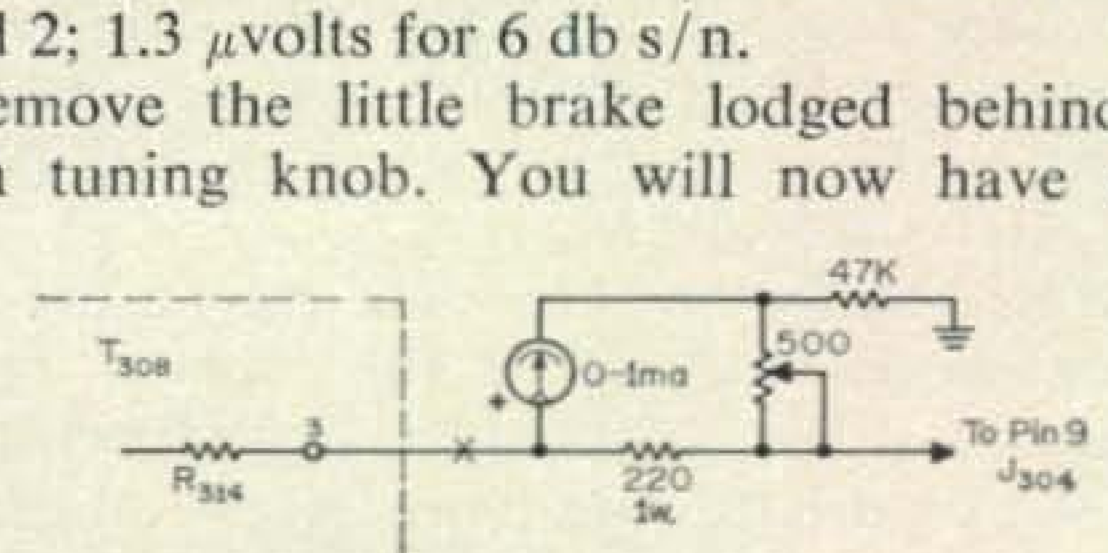
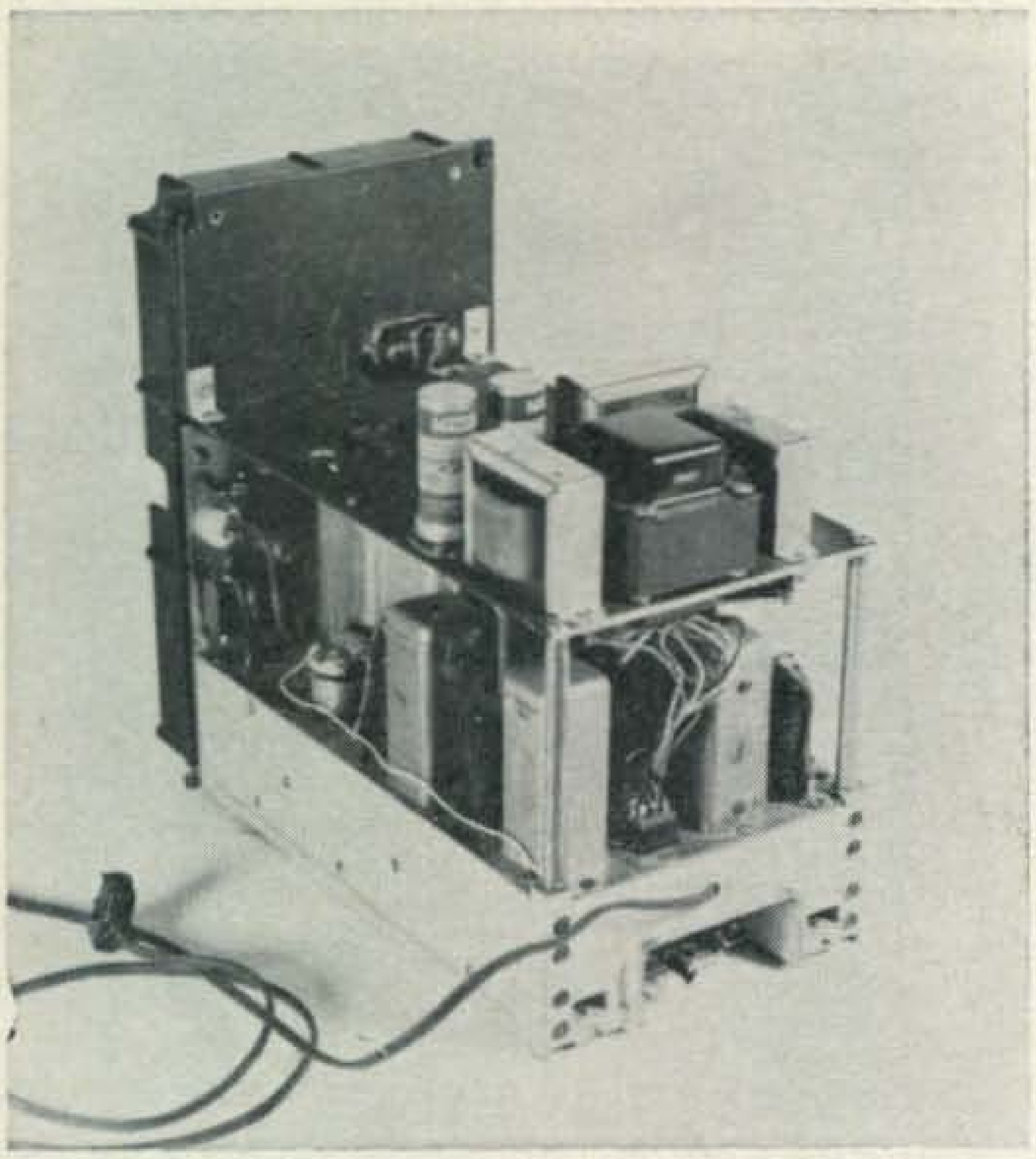


Fig. 2—The circuit above shows how the S meter is connected to the BC-652A receiver.



Rear view of the BC-652A shows the new power supply built on the second deck and an aluminum plate covering the front panel openings.

ceiver with about 20 kc per revolution tuning rate. I did not expect very good results on s.s.b. because of the lack of a b.f.o. pitch control,

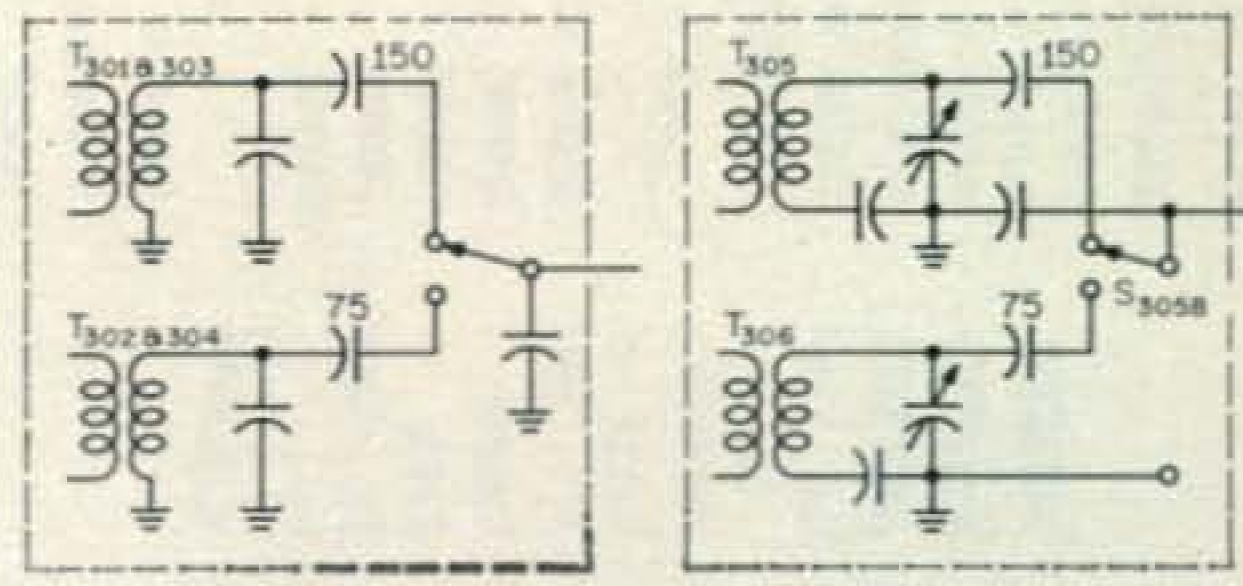


Fig. 3—Shown above is the method of modifying the coils to provide 40 and 80 meter coverage.

no product detector, and wide bandwidth. However, I was astonished when I tried it. With the slow tuning rate, it is very easy to tune in s.s.b. The b.f.o. pitch was just right. Other signals could be heard, but as there was no filter splatter, it was not unpleasant. The s.s.b. signals were as easy to tune as on the best receivers. I believe they sounded clearer than any receiver I have ever used.

This receiver is not as stable as the more expensive receiver, but I did not find the small drift objectionable. Much of this could be cured by simply regulating the oscillator voltage with a vr tube. The rest of the front panel was left blank to accommodate a 20, 15, and 10 meter converter, if I ever get around to it. This would be an ideal novice receiver for practically no investment. I am very pleased with my boat anchor. ■

Rack Cabinet Door Holder

BY RONALD L. IVES*

REAR doors on standard rack cabinets are quite loosely hinged, so that, unless the floor under the rack cabinet, and the cabinet itself, are absolutely level and true, the door will tend to swing. It will usually attain a half-open position, regardless of where you want it to be. As few floors are either level or completely rigid, and most rack cabinets are a trifle out of square, this is a very common annoyance.

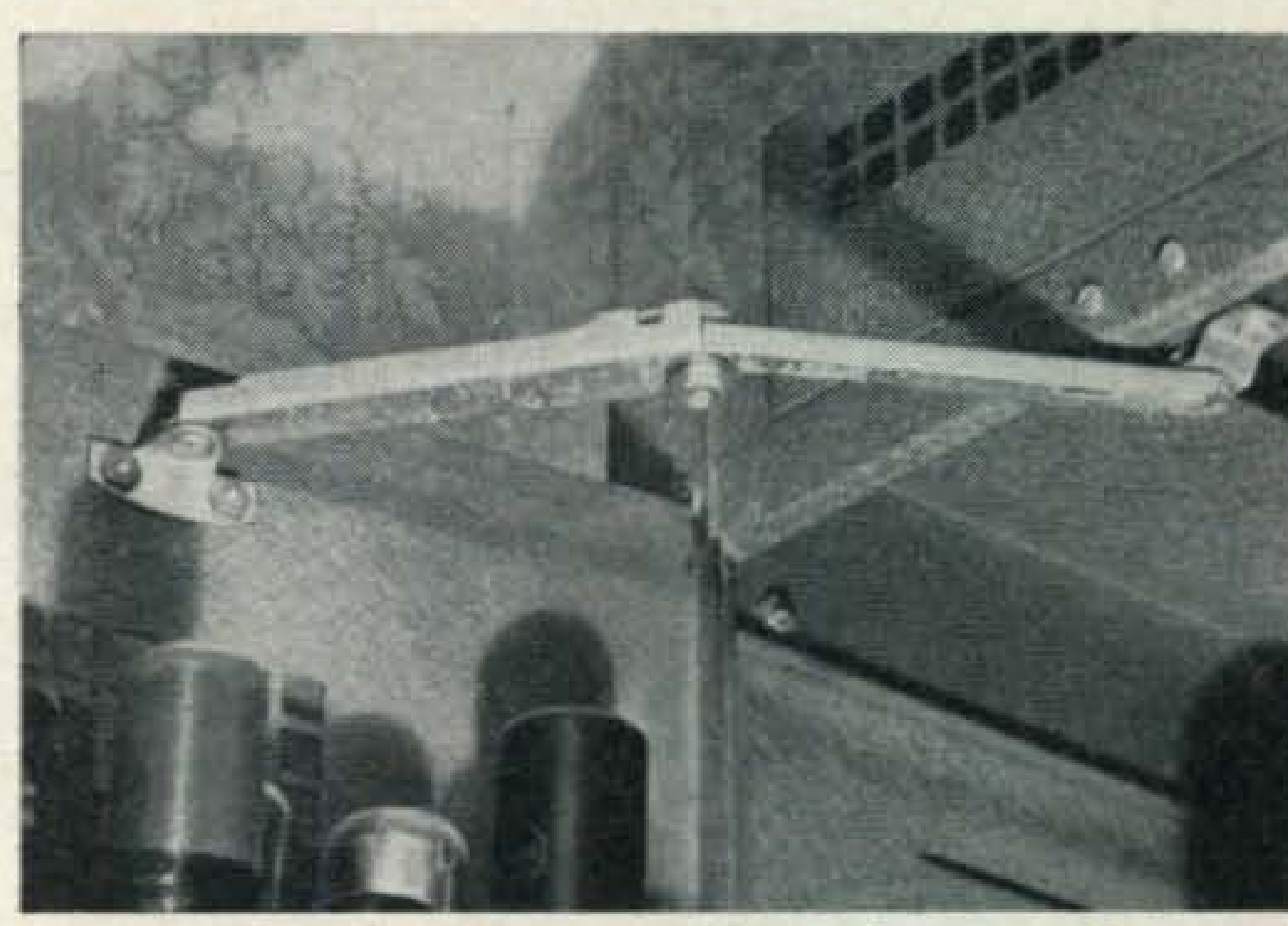
Rack cabinet doors can be locked in open position quite easily by use of one of several standard hardware items. Best for most purposes is the storm sash adjuster, a hinged device which has a toggle action, so that there is a definite "lock" position at full open. This can be mounted at the top of the rack cabinet by means of six bolts and a small angle bracket, as illustrated. With this adjuster in place, the door can be opened and closed as usual, and can be firmly locked in the open position, so that it will not slam shut suddenly when someone steps on the floor directly behind the rack cabinet.

For similar locking of the tops of cabinets of the chest type, stay hinges, or support hinges, also standard hardware items, perform a similar locking function, as do drop leaf supports. Choice of hinge type depends upon the specific application, and the exact configuration of the cabinet.

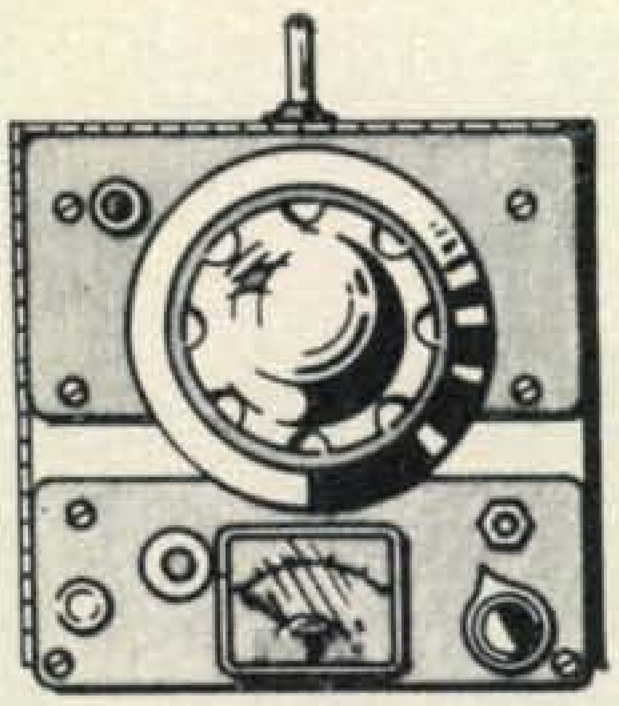
Where the opening must be adjustable, locking at any position is possible by use of a casement adjustor, normally used to hold casement windows in place.

These fittings come in a variety of finishes, most common being painted (black or gray), brass-plated and chrome (or nickel) plated. Where chrome is not wanted, the painted fittings can be refinished to match the rack cabinet finish. Brass-plated fittings, in general, are too subject to corrosion to be used in most parts of the country. ■

*2075 Harvard Street, Palo Alto, California.



Storm sash adjuster mounted at the top of a rack cabinet door.



THE ARC PORT ON 40 METERS

BY E. H. MARRINER,* W6BLZ

The ARC-Port on 80 proved to be very popular and the author was beseiged with inquiries, "Why not 40 meters?" Well, here it is for 40. The mechanical approach is much the same and a good deal of the circuitry is also. The same power supply and keyer is used and the other simple differences are carefully described.

A PREVIOUS *CQ* article[1] described how to convert an ARC-5 for transmission and reception on 80 meters. It was called the ARC-Port. There were many inquiries as to how the ARC-Port could be put on 40. There are two ways in which it can be done. The easiest solution would be to buy a 6-9 mc ARC-5 and modify it as described in the original article. The b.f.o. crystal would have to be changed to 2831 kc because the i.f. frequency is 2830 kc. The rest of the circuits would be essentially the same.

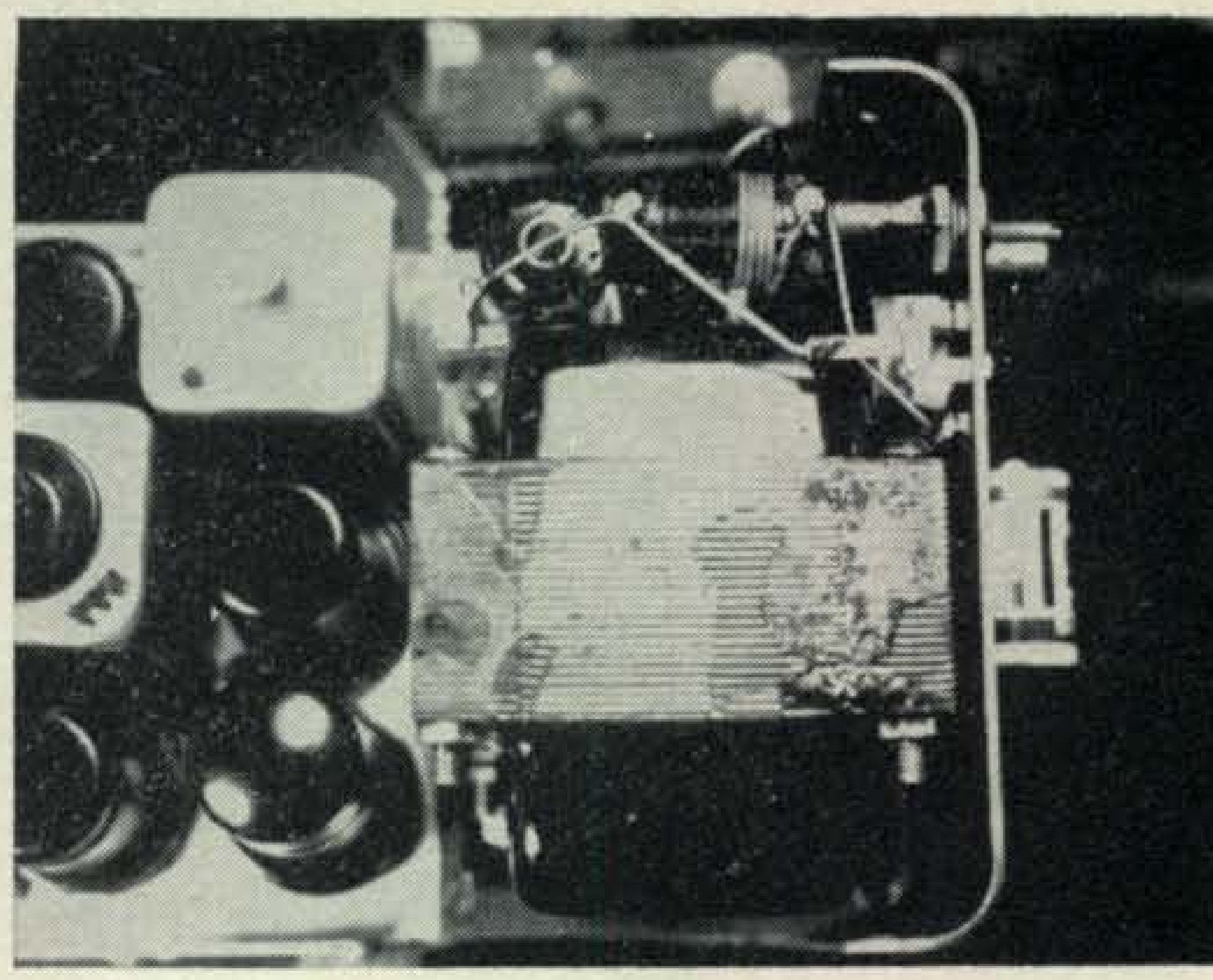
The second method of getting on 40 meters involves the modification of a 3-6 mc ARC-5 and is discussed here. It seems that most amateurs have this unit anyway. The conversion is easy and it is only necessary to replace the receiver tuning capacitor. No coil modifications or rewinding is necessary for the receiver section.

Receiver Section

Remove the old three gang tuning capacitor. Clean off the panel by drilling out the rivets holding the index indicator and remove it. Take a small nail or brad and use it as a drift pin punch, hammering from the inside of the panel on the two small pins holding the bushing nut. Remove the bushing when these pins are out.

Salvage the little button capacitor on the side of the tuning capacitor and re-solder it, as shown in fig. 1, across the coil pins to ground. A ground lug can be put under each of the 4-40 screws holding the grid insulator bracket. Next salvage the 200 mmf capacitor which was mounted vertically from the coil to the tuning capacitor and solder it directly across pins 1-2 on the oscillator coil. This is where it actually was connected anyway.

The antenna coil is not touched because the panel ANTENNA TRIMMER will tune forty meters. The mixer and oscillator coils have to be tuned by putting a 7-45 mmf ceramic capacitor across each of them. The oscillator coil has, in addition to the ceramic, a 40 mmf silver mica and a 2-15 mmf tuning capacitor across it. The oscillator frequency has to be 1415 kc lower in frequency than the mixer coil. A grid-dip oscillator will help to make a rough adjustment with the ceramic tuning capacitors. This can be done

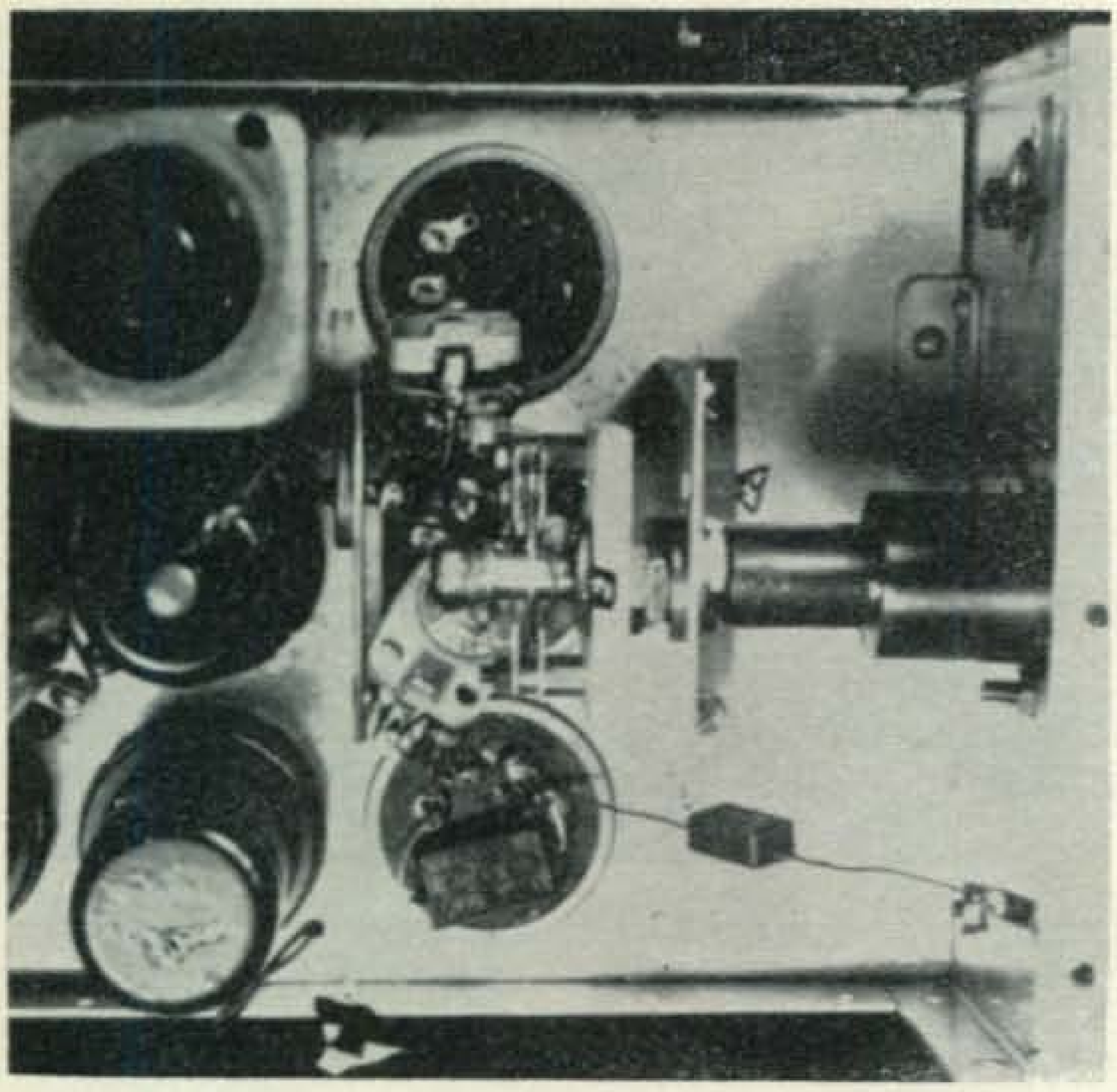


Top view of the ARC-Port on forty shows the tank coil and the ceramic tuning capacitor. The power supply and keyer is identical to the 80 meter unit.

Front view of the ARC-Port on forty. The tuning knob is a Millen #10006 or equivalent.

*528 Colima Street, La Jolla, California.

[1]Marriner, E. H., "The ARC-Port," *CQ*, December 1964, p. 26.



Top view of the ARC-Port 40 meter unit shows the tuning capacitor and vernier drive assembly.

before the 2-15 mmf capacitor is mounted in place.

The main tuning capacitor is used to tune the oscillator section only, while the mixer is set to the middle of the c.w. band and left untuned. An Epicyclic ball-bearing 10-1 driving head makes a good vernier tuning dial, fitting in the center of the old dial hole. If a new panel is used, a ⅞" punch will take care of the mounting (when a British Radio #892 is used). I made my own dial plate which has to be 3⅛" in diameter. A complete assembly #843 could be used but the dial is 4" in diameter and does not exactly fit. It could be trimmed down on a lathe.

The main tuning capacitor has to turn very easily or the epicyclic dial will not turn it. The APC type capacitors are not satisfactory. Try to find a capacitor that will turn easily by using your fingers. I used a ZH-35-AS or MCA-35-S Hammarlund and removed all of the plates except for one rotor and two stators. This band spreads the dial 7000 kc to 7100 kc. With only a 10-1 ratio dial the tuning would be more difficult

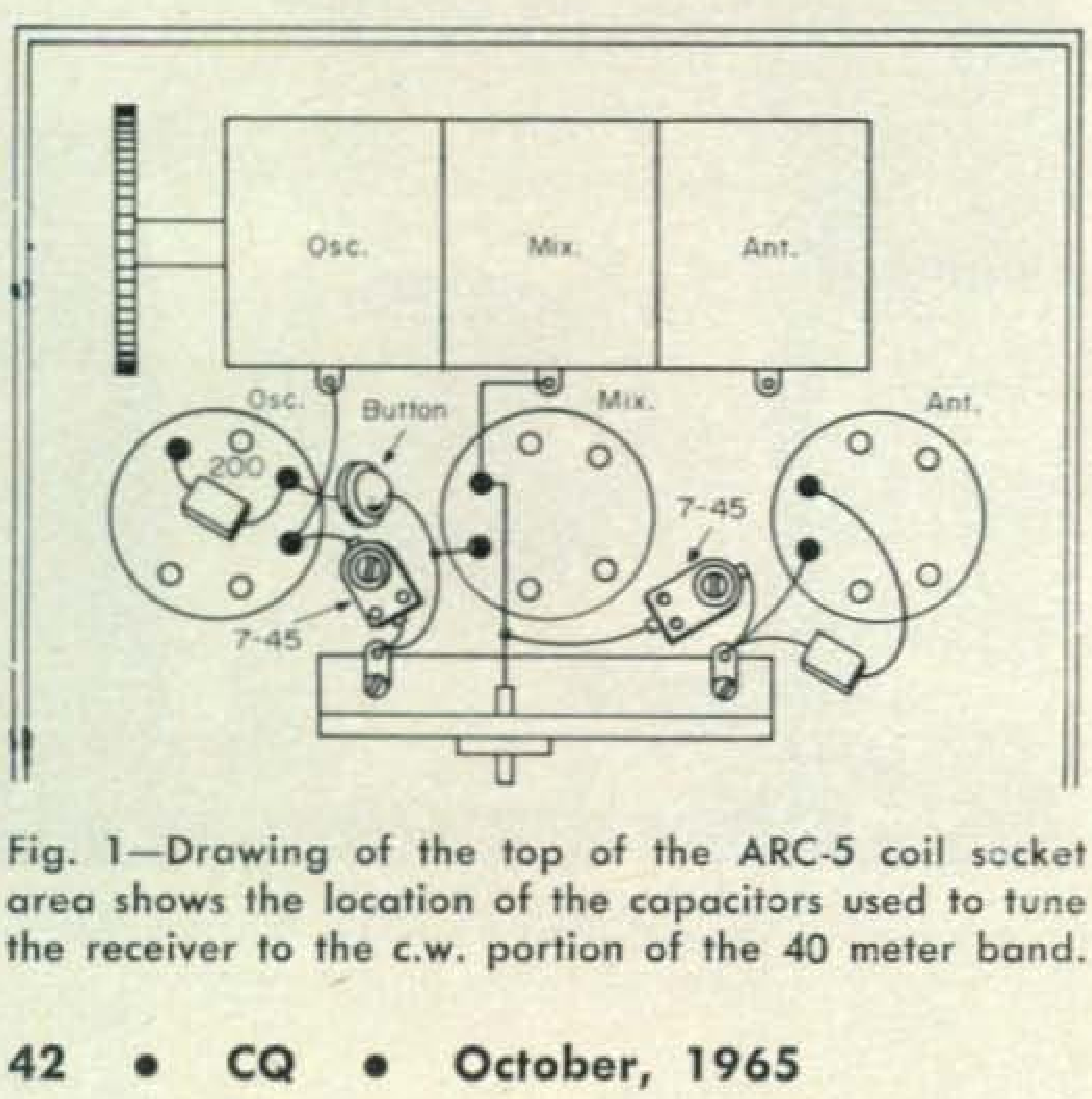


Fig. 1—Drawing of the top of the ARC-5 coil socket area shows the location of the capacitors used to tune the receiver to the c.w. portion of the 40 meter band.

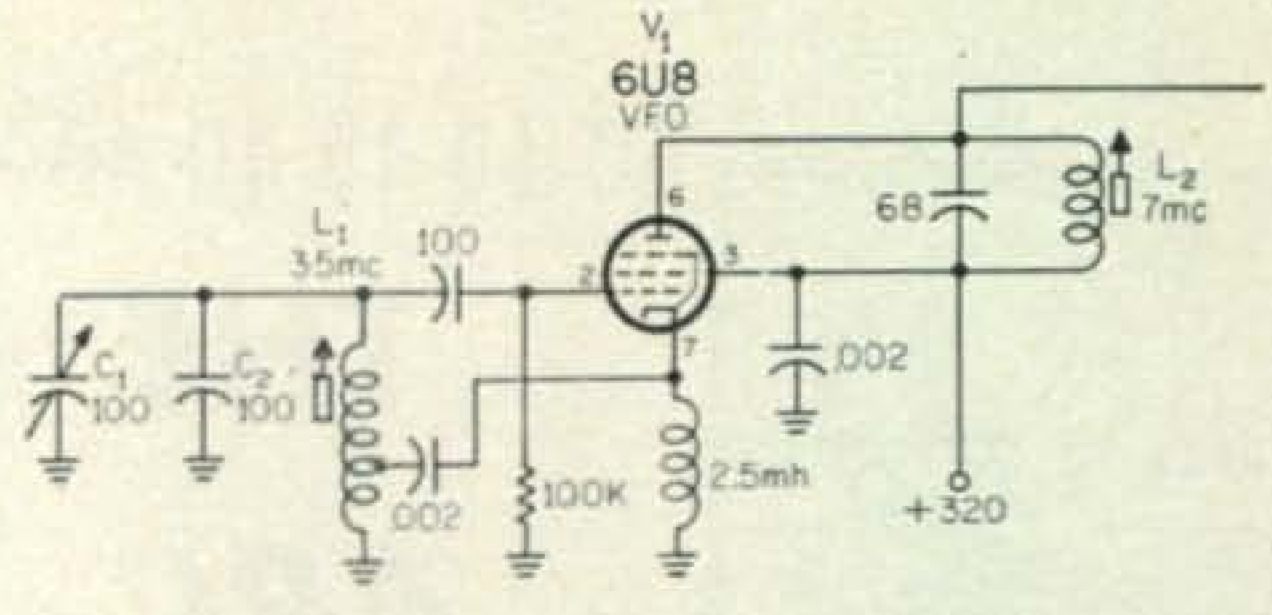


Fig. 2—Circuit of the 40 meter v.f.o. It is essentially the same as that used for 80 meters. The capacitor shunting the tuning capacitor is now 100 mmf.

L_1—31t #26 e. tapped 6 t. up from ground, wound on a National XR-50 form.
L_2—22t #23 e. wound on a National XR-50 form.

if the whole forty meter band were covered and the dial would be too hard to read.

Transmitter Section

Only a few changes are made in the transmitter as used in the 80 meter ARC-Port. The v.f.o. is placed on 3.5 mc and doubles in the plate to forty meters. The final tube was changed from a 6360 to a 5763 which is less expensive and drives easily with 3 ma of grid current from the v.f.o. No neutralization is required and the original socket is just rewired. The final tank coil is wound with larger wire and the compression tuning capacitor used for 80 is replaced with a ceramic Centralab N650. Resonance on forty takes place at about 75 mmf with a 50 ohm resistive load.

These changes can be done in the following sequence. The grid of the v.f.o. is changed to 3.5 mc by replacing the 410 mmf silver mica with a 100 mmf glass silver mica. Turns on this coil are removed from the top end so that only 25 remain above the top. The plate of the v.f.o. is put on 7 mc by removing turns from the bottom end of the coil so there are 22 turns left on the coil. The fixed capacitor is replaced with a 68 mmf silver mica. Before going on, check out the v.f.o. by listening on a receiver and adjusting the slug with the tuning variable fully meshed so that a signal is heard on 7.0 mc. The final v.f.o. circuit is shown in fig. 2.

The final tank coil is wound with 22 turns of #23 and the slug adjusted for resonance

[*Continued on page 93*]

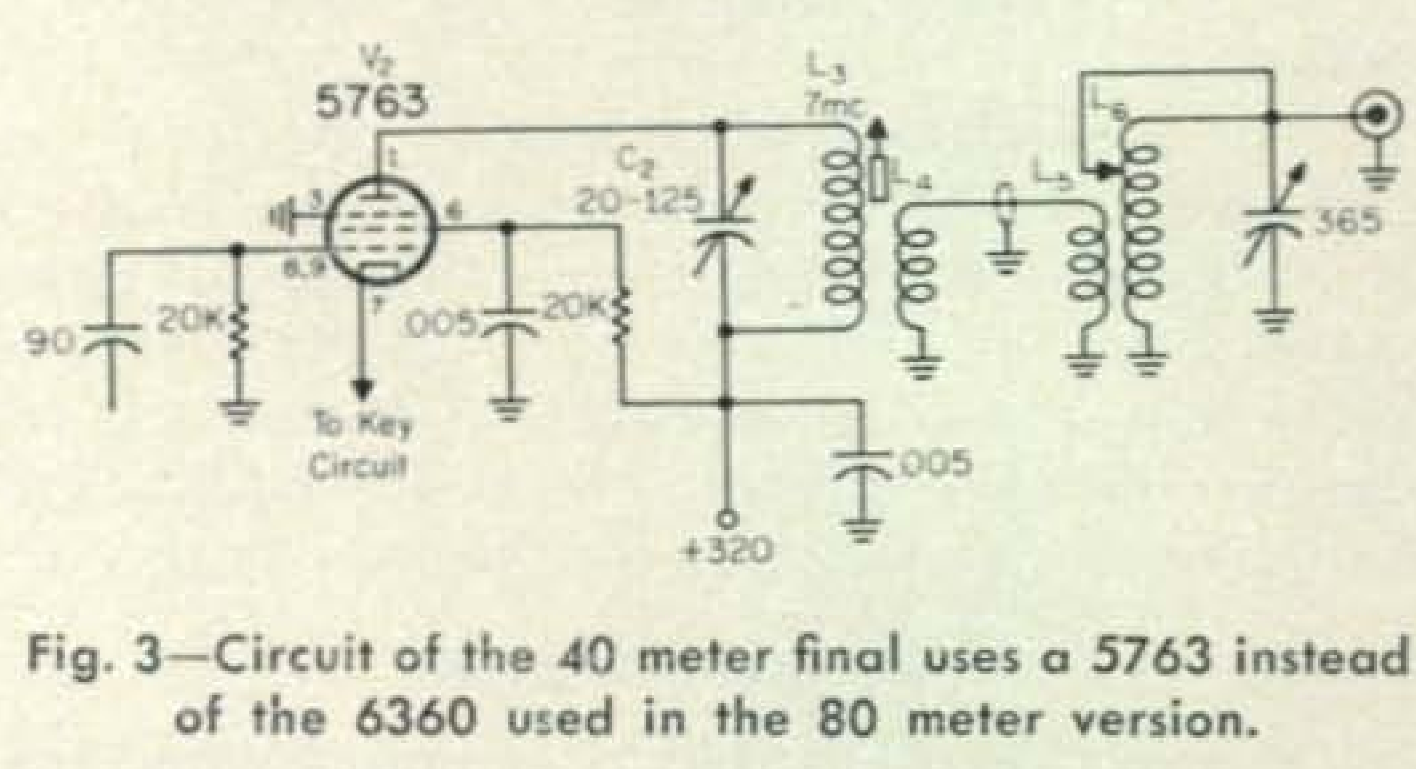


Fig. 3—Circuit of the 40 meter final uses a 5763 instead of the 6360 used in the 80 meter version.

L_3—22t #23 e. wound on a National XR-50 form.
L_4—4t Hookup wire on cold end of L_3.
L_5—4t hookup wire on cold end of L_6.
L_6—15t Air-Dux #1010 (1¼" dia., 10 t.p.i.).

Crystal Controlled Command Sets

BY GORDON ELIOT WHITE*

THE flagship of the mighty U.S. Atlantic Fleet rode gently on the calm surface of the tropical Caribbean, just off the Cuban coast. The warm summer morning, late in the nineteen twenties was peaceful. Dawn broke clear, with a light breeze.

As the chief communicators—lieutenants, commanders and a few four-striped captains from two-score ships, climbed the gangways of the flagship, they were grim-faced and quiet. Each was accompanied by a seaman carrying a small metal case holding tiny fractions of the problem which had immobilized the fleet.

For the mighty U.S. Navy had been brought near to chaos by quartz crystals.

Communications plans, painstakingly worked out ashore had broken down as radiomen tried to shift channels according to the intricate orders, avoiding "enemy" jamming, or to cover secret messages by frequency shifts, only to find that they lacked the correct crystal. Unforeseen tactics called for new, unplanned channels for which the crystals were not available.

Aboard the flagship, the problem of channel allocation finally brought the collected communicators to their knees beneath the 16 inch guns on the foredeck, shuffling crystals like dominoes. Shortages in one band vied with excesses in another to confound the Navy's best communications men. By sundown, senior Navy officers had a profound distrust of the "rock-bound" inflexibility of crystal control which was to last more than 14 years, until the luxury and instability of variable frequency transmitters and receivers was blasted by the Pacific war.

Its anti-crystal bias was a factor which helped lead the Navy to buy the Aircraft Radio Corporation Type K Command set in 1939, a non-crystal aircraft radio system. The design was excellent, but required manual tuning.

The Army had tried crystal control in its ill-fated SCR-240 set of 1937-38, apparently proving that crystal designs were not ready for use in combat radio equipment.

*5716 N. King's Highway, Alexandria, Va.

Although both services eventually bought vast numbers of the Type K command equipment, combat soon showed that pilots were too busy fighting to tune coffee-grinder radios. Push buttons were the answer.

The Army bought the British TR-1143, and had it built by Bendix as the SCR-522, a four-channel, v.h.f., push-button transmitter-receiver. A v.h.f. version of the Command Set was ordered.

The Navy, slower to see the advantages of the push-button, began to suspect in late 1942 that crystal control might be useful in a small way.

It can now be revealed that the first Navy crystal-controlled aircraft radios of WW II were modified command sets, rebuilt by the Naval Research Laboratory, at Bellevue, in Washington, D.C.

The NRL design worked out in early 1943 involved elimination of the b.f.o. for c.w. reception, the addition of a delayed automatic volume control circuit, and two crystal-controlled channels in the receiver.

Transmitters were re-wired to make the calibration crystal control the frequency. The operator could choose either channel or continuous tuning at will.

In early 1943 crystals were still in drastically short supply, but Captain Frank Akers, chief of

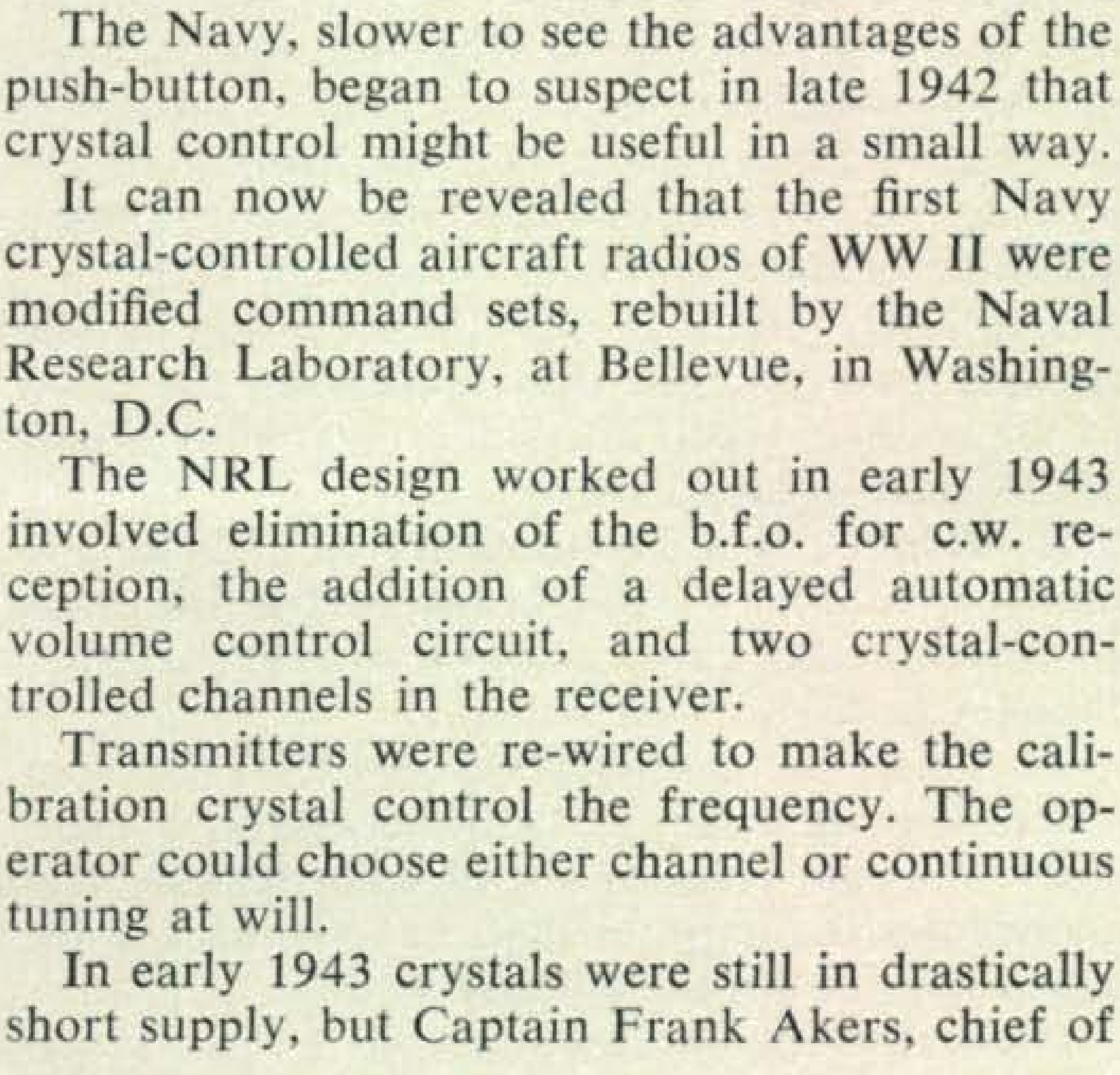


Fig. 1—The 12K8 mixer circuit with NRL modifications for 2 channel crystal control operation. Relay contacts, K_1, selects crystal or variable frequency control and relay contacts K_2 selects the desired crystal. The 28 volt relay coils are not shown.

the radio section of the Bureau of Aeronautics wrote the Naval Research Laboratory on March 23 in a confidential letter that "the practicability of the subject modification having been satisfactorily demonstrated, it is now requested that the laboratory convert 150 complete sets of ATA/ARA radio equipment to optional crystal control.

Between April and July 1943, 300 receivers and 600 transmitters were changed over, stamped "modified" in white ink; the rear connecting plugs were rotated 90 degrees to prevent their being used in unmodified racks.

Although the NRL design was tested by Aircraft Radio Corporation, it was never manufactured under contract. Instead, A.R.C. tightened up the frequency drift of their ATA/ARA sets, issuing them under the joint nomenclature AN/ARC-5, for lock-tuned operation. The frequencies were set on the ground and apparently stayed accurately on-frequency even during combat operations.

The Navy adapted a motor-driven tuner to about 5,000 3-6 mc receivers in another AN/ARC-5 configuration, the "Yardeny" spot-tuner C-131/AR, which was bolted to the front of the set.

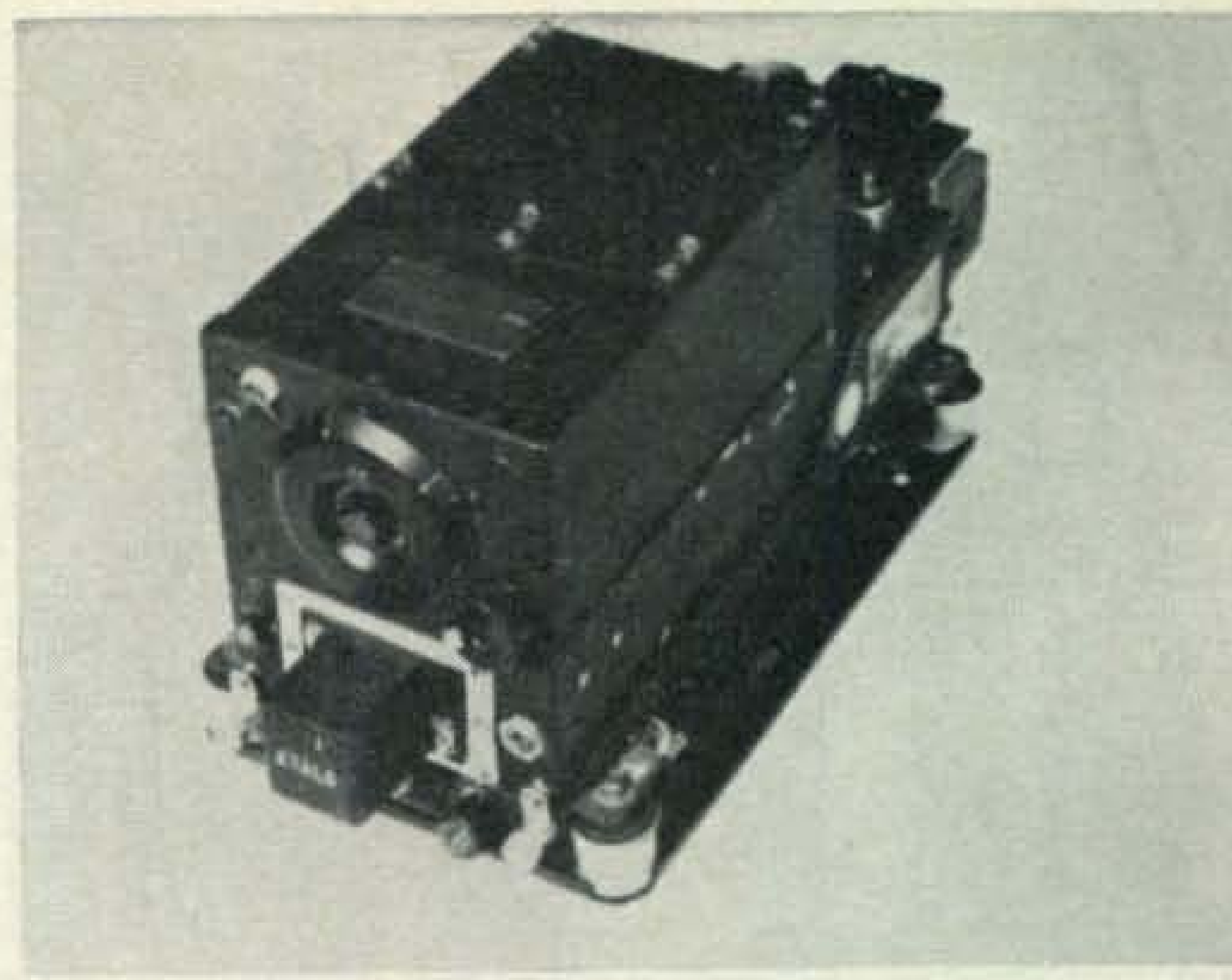
The NRL crystal modification however, remains of interest to radio amateurs who have adapted so many command sets to their peacetime use. Fairly simple to build into the receiver, the NRL modification permits ease of operation on nets, or other frequencies requiring accurate setting, possibly beyond the .04 percent tuning accuracy of the Command equipment dials.

The NRL circuit is reproduced in fig. 1. The crystals were plugged into sockets on the front of the receiver; their switching is done by a pair of 28 volt relays.

It probably will be necessary to re-align the tuneable oscillator (by means of the trimmers on the condenser gang) to offset stray capacitance changes in the altered wiring.

Although the modification gives crystal control of the oscillator, it is still necessary to manually tune the receiver to the approximate frequency desired in order that the antenna and r.f. stages may be properly peaked.

Oscillator crystal frequency of course is determined by adding the receiver i.f. to the frequency you desire to receive. (Common i.f.'s are 2830 kc for the 6-9.1 mc set, 1415 kc for the 3-6 receiver, 705 for the 1.5-3 mc unit)



Front view of the converted ARA receiver. The two crystals are mounted in the front enclosure.

The NRL circuit providing a.v.c. in the ARA receivers is shown in fig. 2. It increased useable receiver output as well, but eliminated the c.w. oscillator. Audio level was set by a pot on an external control panel.

A positive voltage is taken from the 12A6 cathode circuit and divided down to the required 2 or 3 volts by R_{17} and R_{19} and applied to the cathode of the 12SR7, the detector and a.v.c. rectifier. The detector diode (pin 4) is returned directly to the cathode so the applied d.c. voltage does not affect this circuit.

The a.v.c. diode (pin 5 of the 12SR7) returns to ground through the 2 megohm resistor, R_{20} so the plus d.c. voltage applied to the cathode is effective in this circuit. The small positive voltage on the cathode blocks the rectifier action of the a.v.c. diode until the signal exceeds this d.c. voltage. This delays the a.v.c. action for weak signals only and effects a desirable control action on the stronger signals.

For almost all amateur use, additional audio is not required if the output impedance is properly matched to the headset or speaker. All except the earliest Army -A model receivers had provisions for 600 ohm outputs. (The early Army equipment had 4000 ohm output, and later Army gear provided optional 4000 ohm taps. Late Army and all Navy receivers had low impedance audio circuits.) By using a cheap universal audio transformer between the receiver and a speaker voice coil, enough power is available to drive an 8" speaker with all the audio you can stand. ■

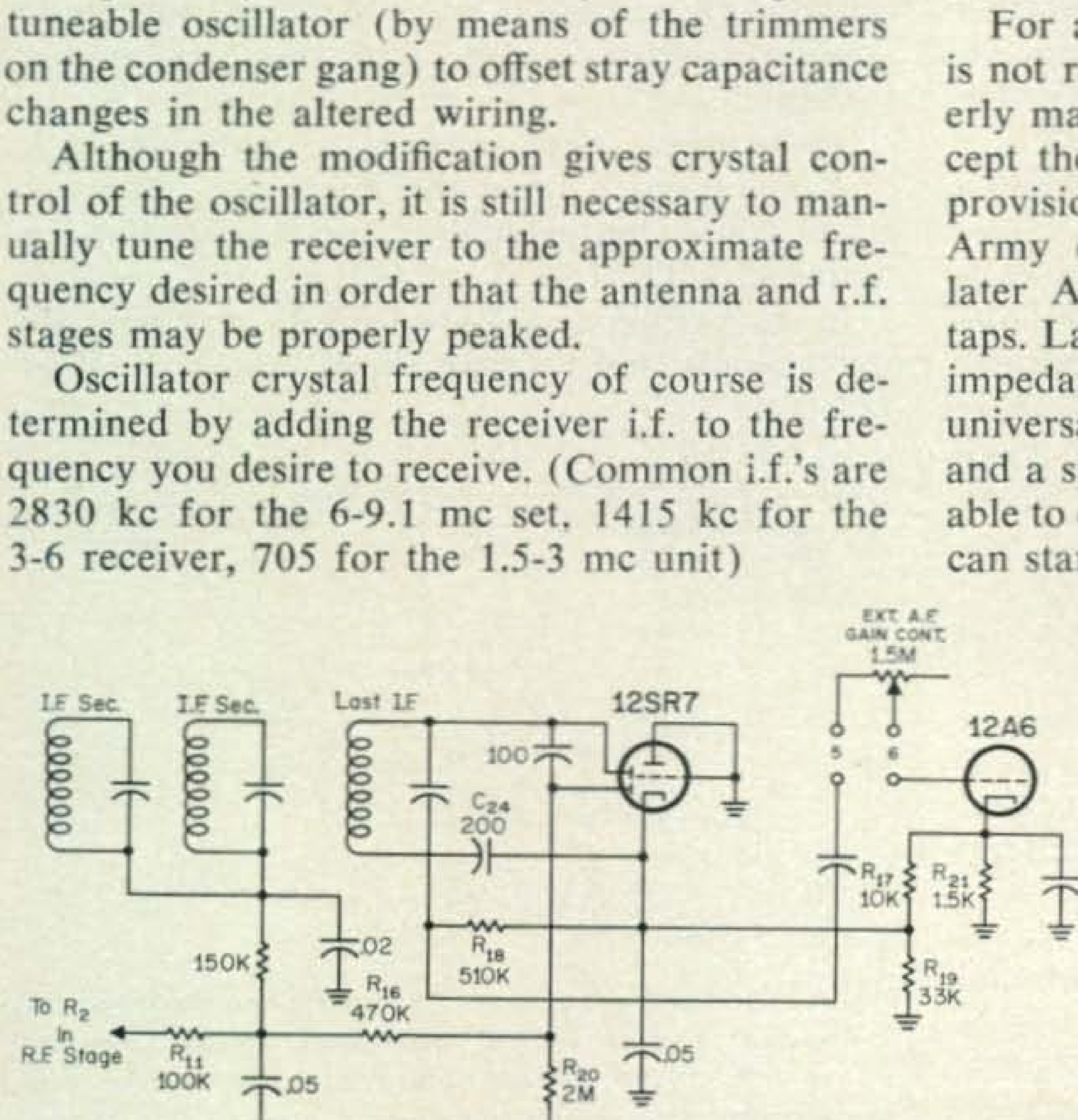
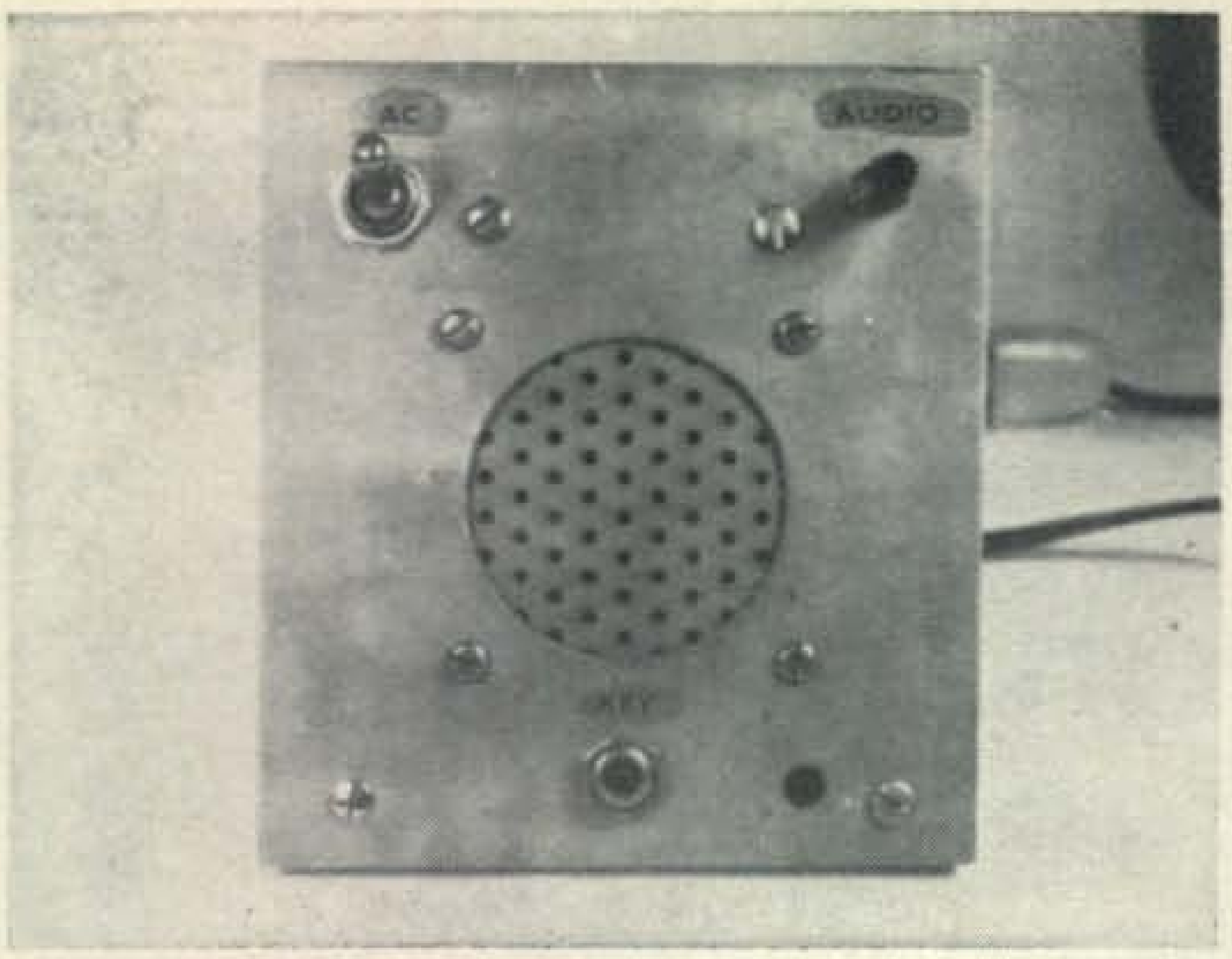


Fig. 2—The delayed a.v.c. circuit as installed by N.R.L.



◀ Front view of the keyer relay and monitor.

Side view of the keying relay and monitor shows the relay and 6CX8 tube. The edge of the power transformer may be seen just beyond the filter capacitor.

Keying Relay and Monitor

BY E. H. MARRINER,* W6BLZ

I needed a way to key my commercial rig which used block grid keying. The difference in contact resistance between the dot and dash contacts on my bug brought some choppy reports. The solution was to use a keying relay; then only the one contact would be doing the keying and it could also key a monitor. It had to be a good clean sounding monitor, because I was tired of those buzzy neon bulb jobs. A twin tee audio oscillator seemed to be what was needed, with a 1000 cycle tone.

The circuit is shown in fig. 1 and a quick glance will enable you to see that most of it is the audio oscillator. The keying relay is a C.P. Clare type HG-1002 mercury with wetted contacts and a 5K coil. This unit (or the Adams and Westlake job) has appeared in the surplus listings at a very reasonable price so keep your eyes on those ads. The output transformer is an 8K to voice coil (Stancor A-3329 or equiv.) and the speaker is a Utah 25415 Micro.

How It Operates

When the key is pressed, the keying tube conducts closing the key relay. The relay has a grounded arm and the two contacts in the closed position operate the monitor and the transmitter. If the relay is in the open position the receiver contacts are closed letting the receiver function; the grid of the keyer tube is blocked by a negative voltage.

The keying relay will clip along just about as fast as anybody desires to send. Just don't turn the chassis upside down or the relay will stay closed because it is full of mercury that shorts the contacts. Keep it mounted in the vertical position.

There should be no trouble constructing the oscillator if 1% resistors are used. The capacitors *must* be silver mica; disc type will not work. The value of the cathode resistor depends on the plate voltage used, and it is suggested that a 500 ohm pot be put in temporarly and varied until the oscillator functions. There is also a slight adjustment for tone; a value of 150 ohms peaked the audio just right for my ears.

This monitor keyer unit is small, can be used with any c.w. rig and will improve your sending. Try it! ■

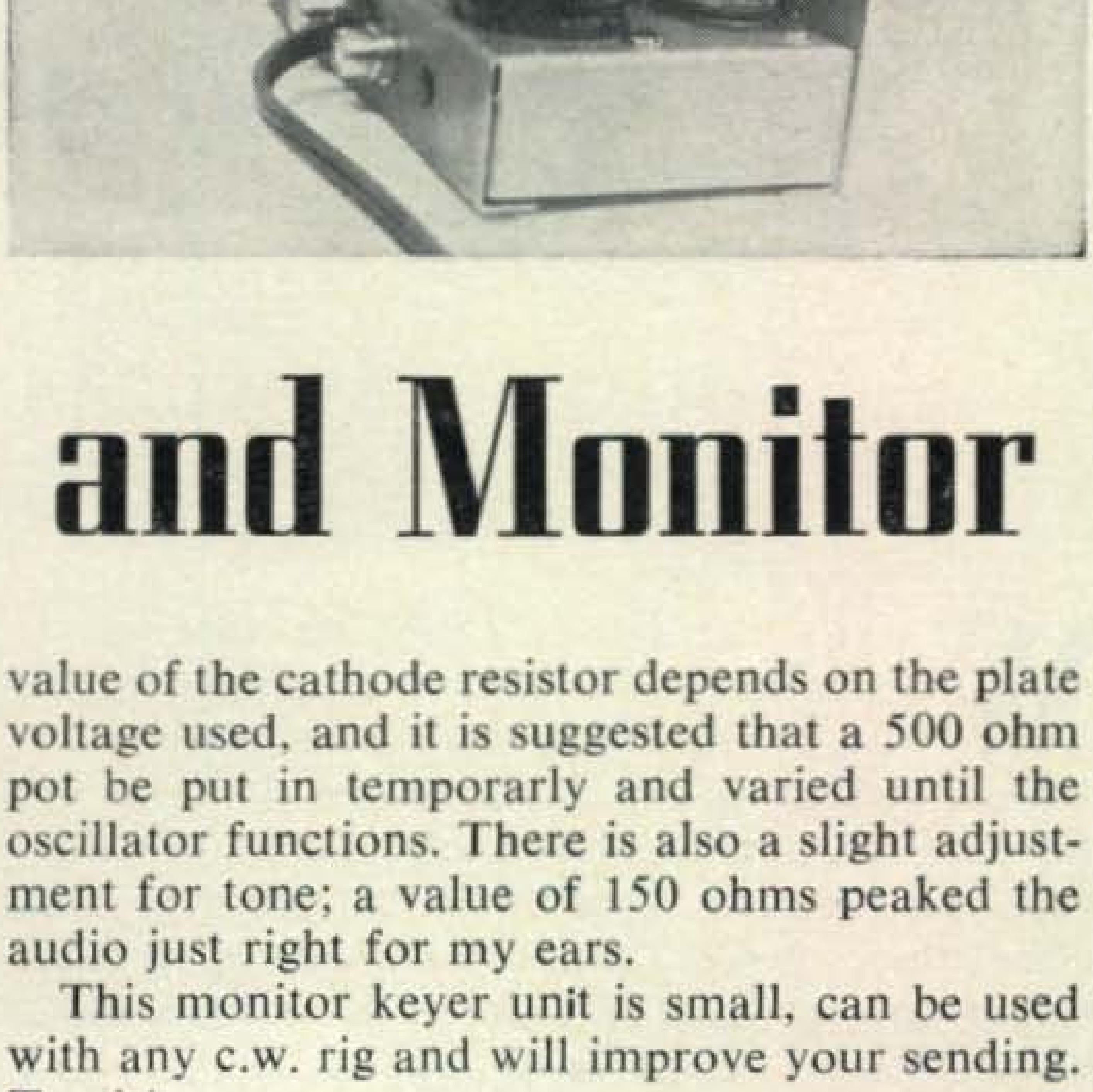
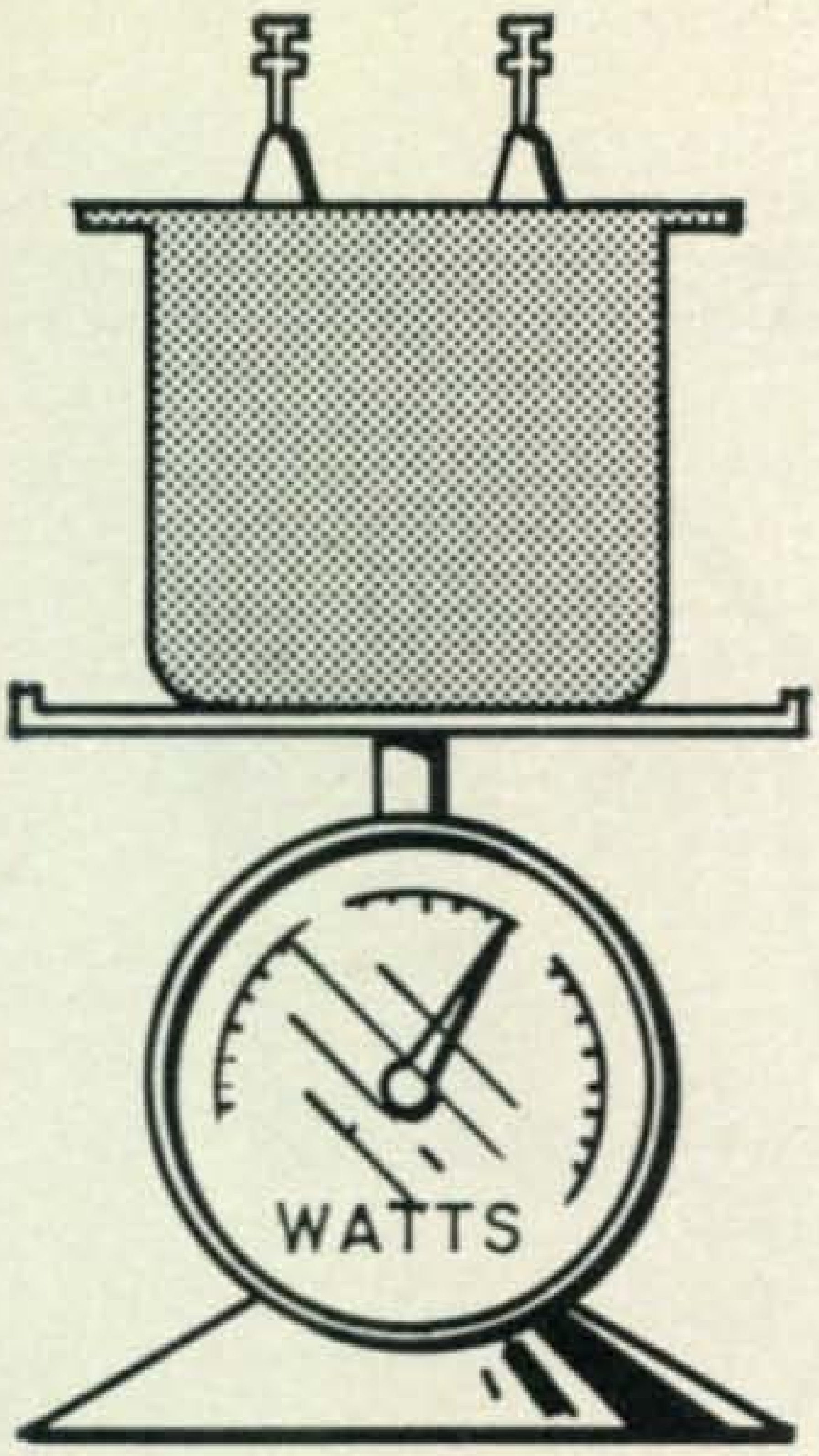


Fig. 1—Circuit of a keying relay and monitor. All capacitors with values greater than one are in mmf and those with values less than one are in mf unless otherwise noted. All resistors are ½ watt unless otherwise noted. The diodes, CR_1 and CR_2, are rated at 300 p.i.v.

*528 Colima Street, La Jolla, California.



Surplus Power Transformers

Weighing Their Value

BY WILLIAM I. ORR,* W6SAI

What's the power rating of that good looking surplus power transformer? Is it a treasure or is it a boat anchor? Just because the rating is not marked on the case, or the data sheet is not available—don't despair. You can make a reasonable "guesstimate" of transformer power capacity based upon the weight, core size and wire size of the transformer. No one has yet been able to miniaturize the watt, so the power capacity of a given transformer can shrewdly be determined to a close approximation by the "heft" or weight of the transformer.

Weight vs. Power Capacity

The power transformer should be weighed and a reasonable allowance taken from the total weight by virtue of fixtures, case or other auxiliary attachments. What is to be determined is the overall weight of the core and windings. Figure 1 provides an approximate estimate of "watts per pound" for intermittent or amateur service for an average 60 cycle transformer. (This estimate applies, more or less, to large modulation transformers, too). The author admits there is room for argument in this graph, as it is merely an average figure for a lot of transformers that have delivered their rated power without burning up. In any event, it is a good place to start, and does not represent a wild guess! Thus, the graph shows that a 40 pound transformer is good for about a kilowatt of secondary power. The power may, of course, be divided between several windings. Intermittent duty, such as in a sideband power supply could probably provide 2000 watts or so of peak power from the same weight transformer.

*Amateur Service Dept. Eimac Division of Varian Associates, Inc., San Carlos, Calif.

An equipment designer with a sharp pencil could probably achieve the same power level from a smaller transformer designed for a particular purpose, with the result that the transformer would run quite warm during use. However, this technique is not recommended unless the experimenter has had plenty of experience in the cautious and risky art of overloading equipment! It is a technique not recommended for the beginner!

Core Area

If the transformer under examination isn't sealed in tar or embalmed in an iron jacket it may be possible to make a closer estimate of the

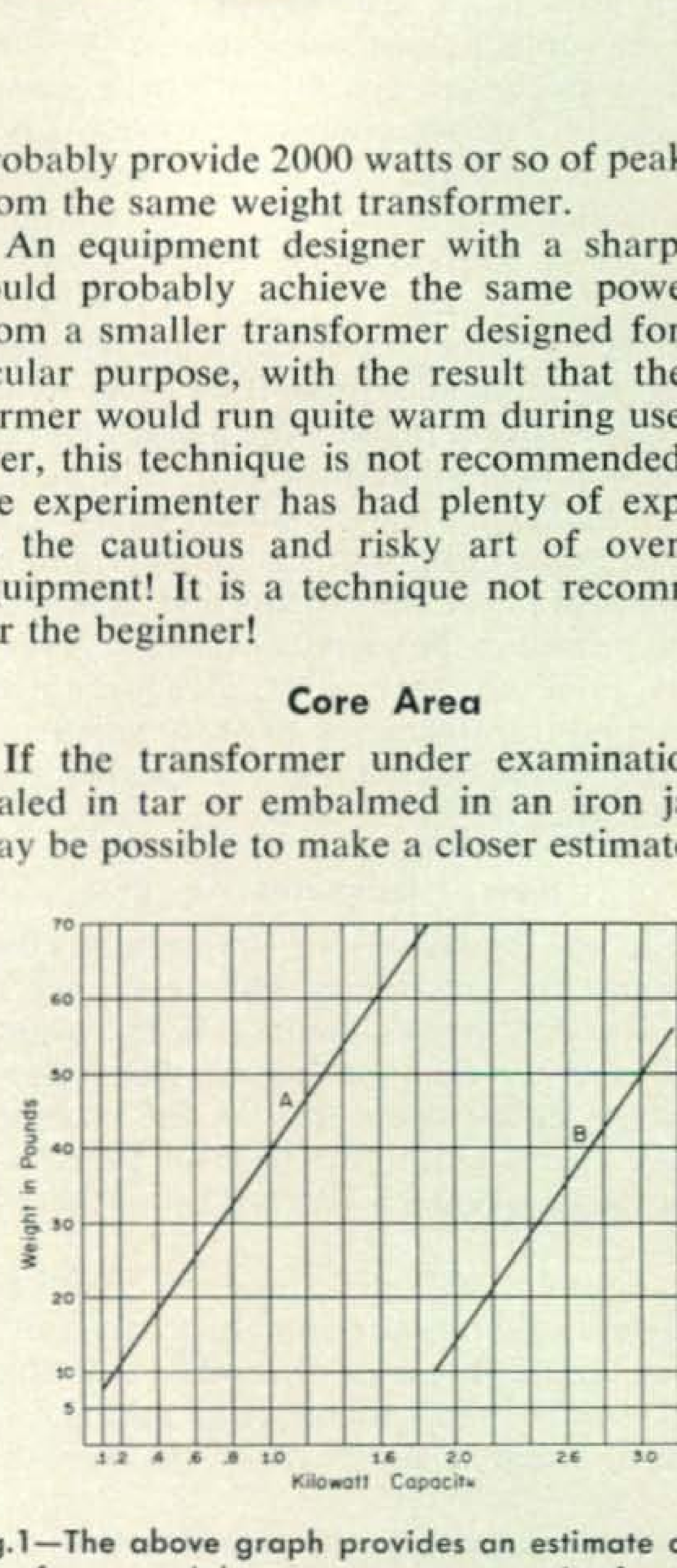


Fig.1—The above graph provides an estimate of power transformer weight versus power capacity for the average 60 cycle unit for intermittent or amateur service. The graph is also suitable for large modulation transformers. Read line A on the left axis and line B on the right axis.

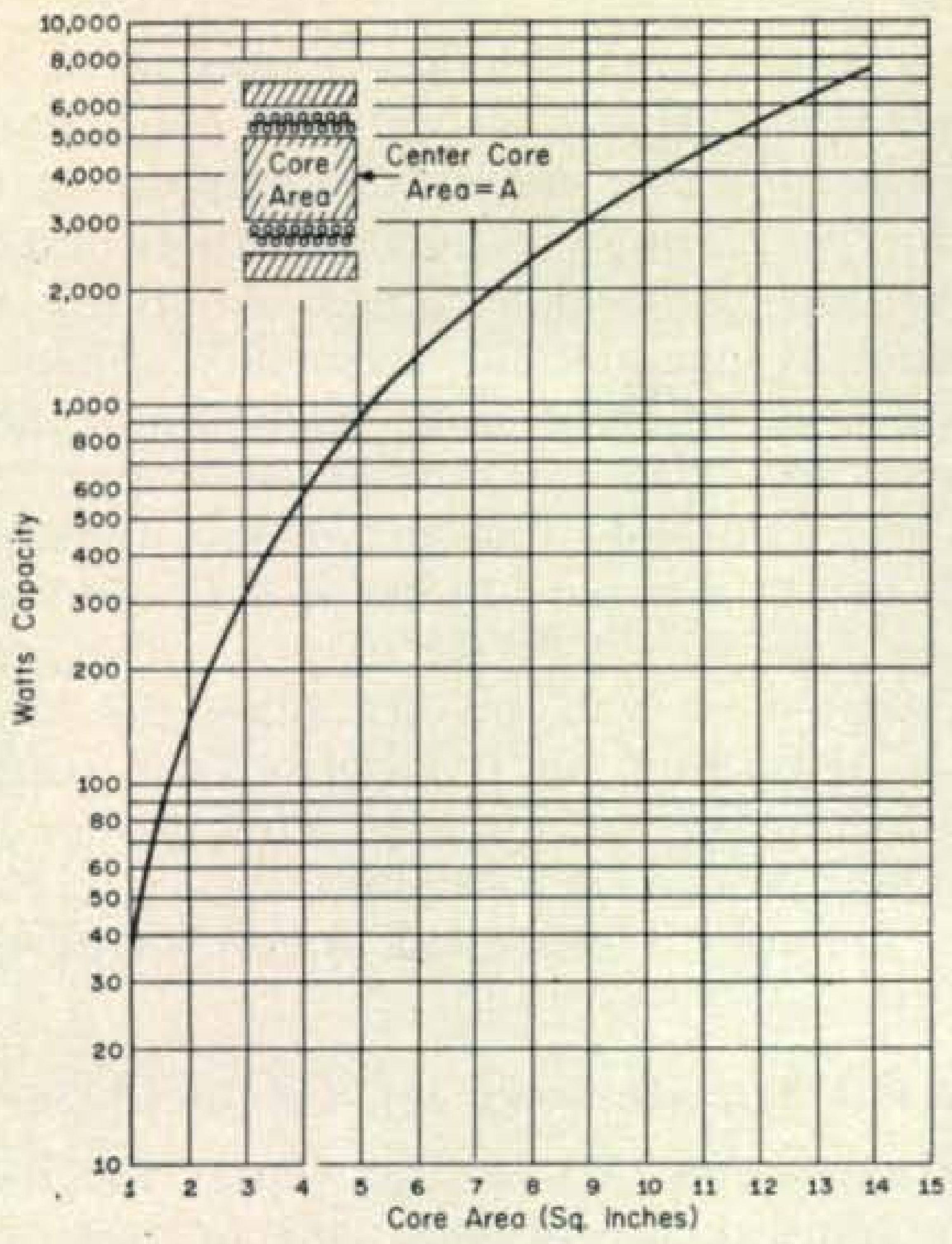


Fig. 2—An accurate estimate of transformer power capabilities can be made from measurements of the center core area. The power in watts is equal to $(A6)^2$ where A is the center core area in square inches.

total power capacity by measuring the center core area of the transformer, as shown in fig. 2. The area of the iron core within the winding (as measured at right angles to the winding) determines the power capacity quite rigidly. This graph is valid for transformers having core material of 60,000 lines per inch (a common figure for large power transformers).

Once the approximate total wattage of the transformer has been established within reason, it is possible to determine the amperage capacity of the various windings.

Wire Size

The diameter of the wire of a given winding should be measured with a micrometer, or by visual comparison with a known gauge of wire. Figure 3 shows the relationship between current carrying capacity and wire size, based on #20 wire carrying 1.8 ampere (a conservative figure). For intermittent duty, this graph is conservative by 10 per cent or so.

Some types and makes of transformers parallel two windings to achieve high current capacity rather than using a larger size of wire. Doubling the winding in this fashion doubles the current capacity. Two #20 wires in parallel will carry 3.6 amperes, for example and are equal to a #17 wire. Don't be surprised to find that many transformer windings make use of odd wire sizes (#21 or #19, for example).

Determining the Windings

The various windings of the transformer may be determined with the aid of a low range ohmmeter. By trial-and-error, the resistance between the terminals and leads may be found. Filament windings may be readily determined by their relatively large wire size and by their low d.c. resistance. High voltage windings are very often center-tapped which is an aid in establishing their identity. Often, the resistance of one half of the winding will be slightly different than the other half, indicating that the windings (although providing identical voltages) are not wound symmetrically about the core, and one winding has slightly more wire in it than the other. The resistance of the high voltage windings may be relatively high (tens of ohms as compared to tenths of ohms for filament windings).

Once the filament windings and high voltage winding have been found and marked, the primary winding may be identified by a process of elimination. Perhaps a tapped (105-115-125 volt) winding will provide the clue. If the winding has voltage adjustment taps, the portion of the winding between the taps will have very low d.c. resistance compared to the rest of the winding.

A pitfall to avoid is mistaking a 115-230 volt dual primary winding for a center-tapped secondary winding. Even the best of us have done this on occasion! Often (but not always) the d.c. resistance of the secondary winding will provide the clue to the solution of this puzzle. As the high voltage secondary winding has more turns and a lower current rating than the primary, it stands to reason that the d.c. resistance of the secondary winding should be appreciably higher than that of the primary winding.

A word of caution should be interjected at this point. The author nearly met his Waterloo some months ago trying to use a transformer that had two center-tapped windings that were nearly identical. An educated guess indicated that the unit had a 115-230 volt primary and a 150-0-150 volt center-tapped secondary winding (just the ticket for a bias supply!). In service, the transformer ran as hot as the proverbial baker's apron and additional detective work proved the transformer was wired in reverse and actually had a 115-230 volt primary winding (originally thought to be the secondary) and a 60-0-60 volt secondary winding (thought to be the primary winding). No wonder the 60 volt winding ran red-hot on 115 volts!

The 400 Cycle Trasformer

The "surplus hound" always runs the risk that he will unknowingly pick up a power transformer designed for a 400 to 1200 cycle primary frequency. Placing such a transformer on the 60 cycle power line will cause immediate fire-works, as the inductance of the windings of the so-called 400 cycle transformer is low compared to that of the 60 cycle transformer, and it is conspicuously lacking in core iron. The 400 cycle transformer will draw extremely high primary current (even when unloaded) when placed on a 60 cycle primary supply, and will probably overheat and destroy itself in a matter of seconds if unfused.

The "Smoke Test"

The transformer under test may be protected from damage by placing a 115 volt lamp in series with the primary winding. The bulb will light to

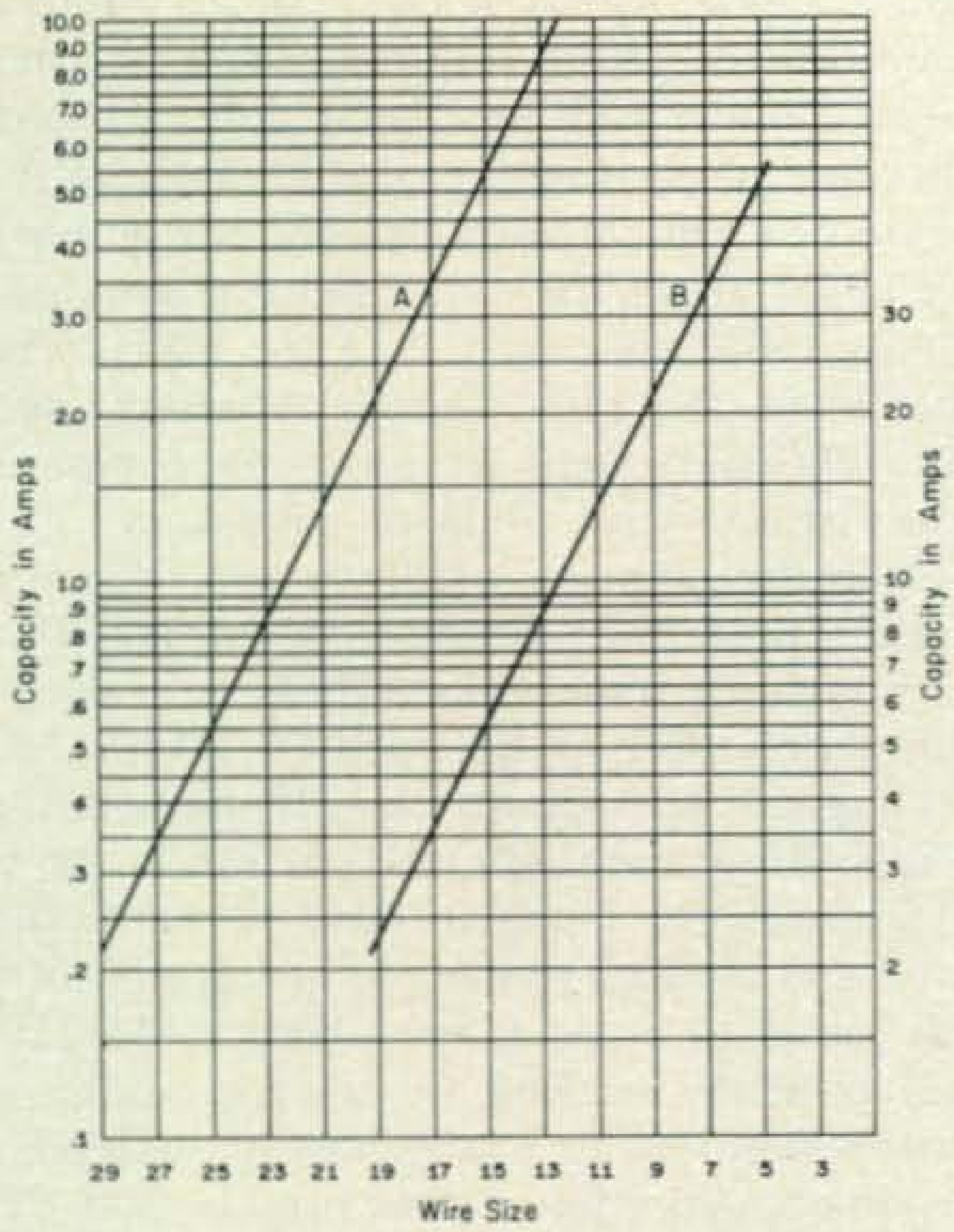


Fig. 3—The current capabilities of each winding may be determined from this graph after the wire gauge has been estimated or measured. Line A is read from the left axis and B from the right axis.

almost full brilliance if the transformer is a 400 cycle device. A 60 cycle transformer, on the other hand, will show a noticeable dimming of the bulb as compared to normal brilliance. Experimentation with bulbs of various size and a transformer or two of known wattage will soon provide the experimenter with the feel of difference between transformers.

Once the d.c. ohmmeter has yielded all its secrets, the primary winding of the transformer may be safety fused and connected to the power line. The various secondary voltages are then measured with an a.c. voltmeter. Caution! The high voltage winding of even a modest receiving or TV-type transformer is a lethal device and should be approached with care. *Do not* touch the meter leads or the transformer when power is applied to it and *always* remove primary power before making connections to the transformer!

If doubt exists as to which winding is the primary (as well as when a 115-230 volt center-tapped primary winding is confused with a medium voltage, center-tapped secondary winding), the primary voltage should be applied through a fused, variable auto-transformer, and the a.c. voltage across a secondary winding monitored with an a.c. meter.

A Bridge Power Supply?

The temptation often exists to employ receiving-type and medium voltage power transformers in a bridge-style power supply to obtain higher secondary voltage. This stunt should be tempered with caution, as many transformers are made with the idea in mind that the center tap of the secondary winding will operate at *ground potential*. As a result of this assumption, it is possible for the manufacturer to save a few cents in cost by skimping on insulation at this point in the transformer. This is all well and good, until the unsuspecting user attempts to employ the transformer in a bridge rectifier system (wherein the center-tap of the high voltage winding is above ground by one-half the secondary voltage). In some cases, the secondary insulation at the center-tap area will break down, shorting the secondary winding to the core of the transformer. This can be a hazard to life if the core happens to be ungrounded. If the core is grounded, the internal short will merely blow the primary fuses. If floating, the transformer can become a death trap for the unwary experimenter. So if you *must* bridge your surplus transformers, *make sure* the core is grounded in case of insulation failure.

Power Transformers for Sideband Service

Today's trend in s.s.b. transmitter design seems to emphasize use of high current, low voltage transformers in voltage multiplier circuits. It is a pity that no commercial transformers are at hand as "off the shelf" items for this use. TV-style power transformers may be pressed into service in voltage multiplier supplies, keeping the idea in mind that the insulating material between windings, or between winding and core may be subjected to potential levels beyond those originally designed into the unit. The duty cycle of sideband hovers around 30 percent or so, and a so-called one kilowatt p.e.p. sideband supply may be built around a 300 watt continuous duty TV-style transformer. In particular, these transformers (often obtainable in dubious condition on a give-away basis from TV servicemen) may be rewound to provide suitable windings for voltage doubler service in the 800 volt range.[1] ■

[1] McCoy, L. G., "Tailor-Made Volts," *QST*, February 1964, p. 36.

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

Part XV

This installment covers the Schmitt Trigger circuit. In addition, some of the general requirements of a simple device to be used in connection with actual RTTY distortion measurements will be given and discussed.

Discussion of the Schmitt trigger circuit in this section will complete the coverage of the multivibrator family. All members have a number of things in common, the most significant of which is *regenerative feedback.*

Schmitt Trigger

First, there was the astable type multivibrator, whose regenerative feedback was sufficient to make it a free-running, or oscillating type. This type switches from one state to the other in an oscillating fashion. Next there was the monostable type, with one stable state and one quasi-stable state, then the bistable type, with two stable states.

Under discussion now is the *Schmitt Trigger* circuit, which is even more important to the RTTY'er than the flip-flop bistable type. Actually the Schmitt trigger is also a bistable regenerative device, except that *its state* depends upon the input voltage *amplitude.* In fact, in some respects, the Schmitt trigger can function somewhat as a relay or switch such as covered in figs. 81, 82 and 83, and in the associated text.

Essentially the Schmitt trigger circuit is a two-stage pulse-shaping circuit whose output has a rectangular waveform. The versatile Schmitt trigger circuit has many other applications, several of which can be combined in one two-stage circuit. The circuit is useful in squaring non-rectangular or sinusoidal waves, detection of d.c. levels, signal level shifting and wave-form restoration. A typical Schmitt trigger circuit is shown in fig. 96. There are other variations of this circuit, some of which will be covered in this discussion.

The question that naturally arises is, "What does a Schmitt trigger have that the others (astable, monostable and Eccles-Jordan flip-flop) do not have?" It has already been pointed out that it has some of the characteristics of a bistable multivibrator, except that it is amplitude-sensitive to the input signal. One might then reason that it is some kind of a monostable multivibrator, since it reverts back to its original state the instant that the input signal is removed.

In the monostable circuit the two stages are capacitive coupled, whereas direct coupling (through resistor R_3) is used in the Schmitt trigger circuit (fig. 96). Regeneration in the Schmitt trigger circuit is through the common and *unbypassed* cathode resistor R_5 to ground. Regeneration of the monostable circuit (fig. 93) is through plate-to-grid coupling capacitors C_1 and C_2. The Schmitt trigger changes state the instant a triggering pulse is applied to its input and so does the monostable.

At this point they begin to differ. The Schmitt trigger state stays changed as long as the triggering pulse is present; the monostable may be triggered by an extremely short pulse and its state stays changed for a period of time as determined by the circuit time constant. The monostable can actually be used as a time delay circuit. The switching time of a Schmitt trigger can be considered as being practically instantaneous so far as the usual RTTY applications go. Its action time is a matter of a fraction of to a few microseconds, depending upon the circuit. The purpose of the dashed capacitor C_1 (fig. 96) is to speed up the circuit switching action, and is not usually needed for RTTY applications.

It was noted that the Eccles-Jordan flip-flop circuit, with a common input (figs. 94 and 95), operates from either a positive or negative pulse. The circuit of fig. 96 operates from a positive pulse but can be modified so that it requires a negative trigger pulse.

The waveform from an astable, monostable, or bistable circuit, depending upon the circuit component values selected, is generally rectangular, but not necessarily square. Quite often one top edge may be rounded and the other have a narrow but sharp "spike".

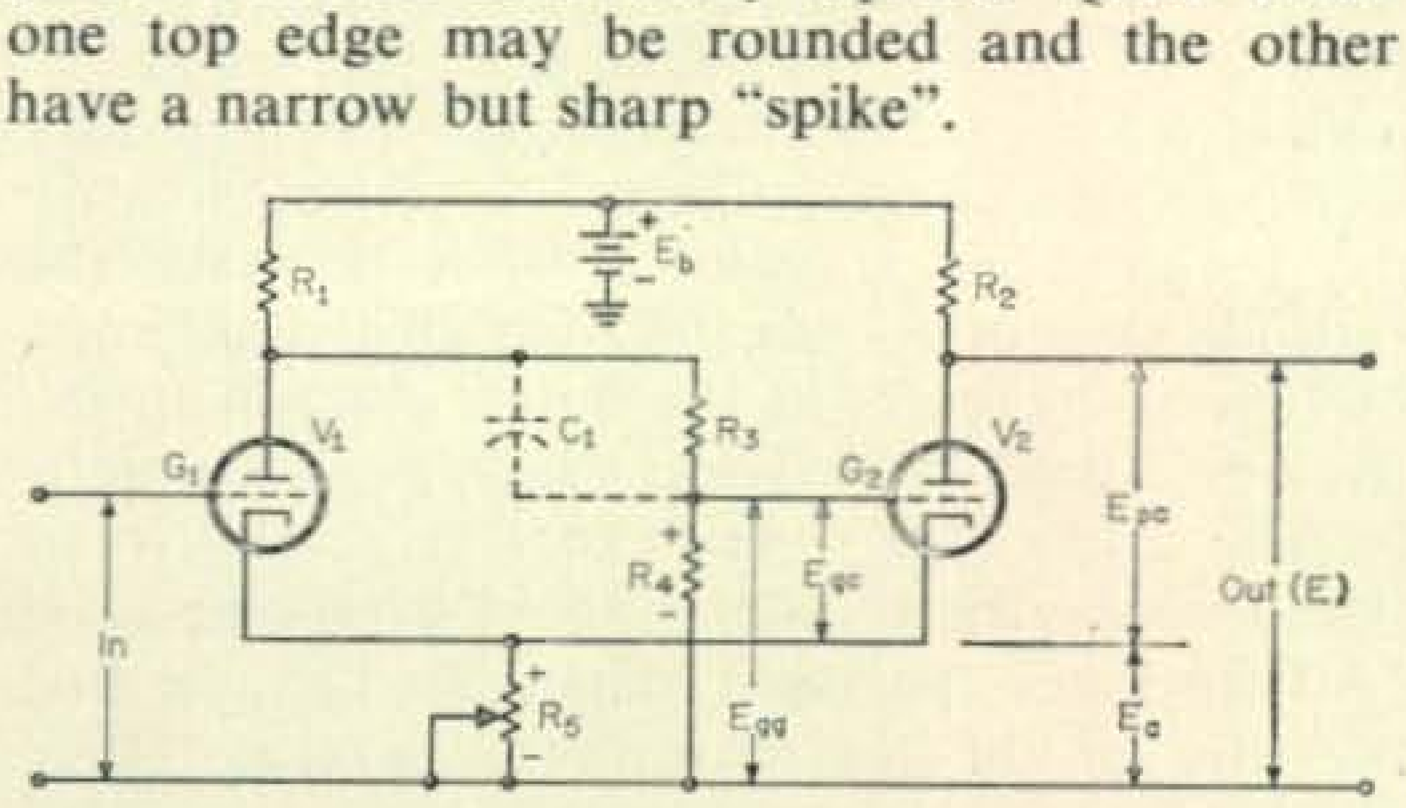


Fig. 96—A typical Schmitt trigger circuit. See text for operation. There are others depending upon circuit requirements.

*6906 Kingsbury Drive, Dallas 31, Texas.

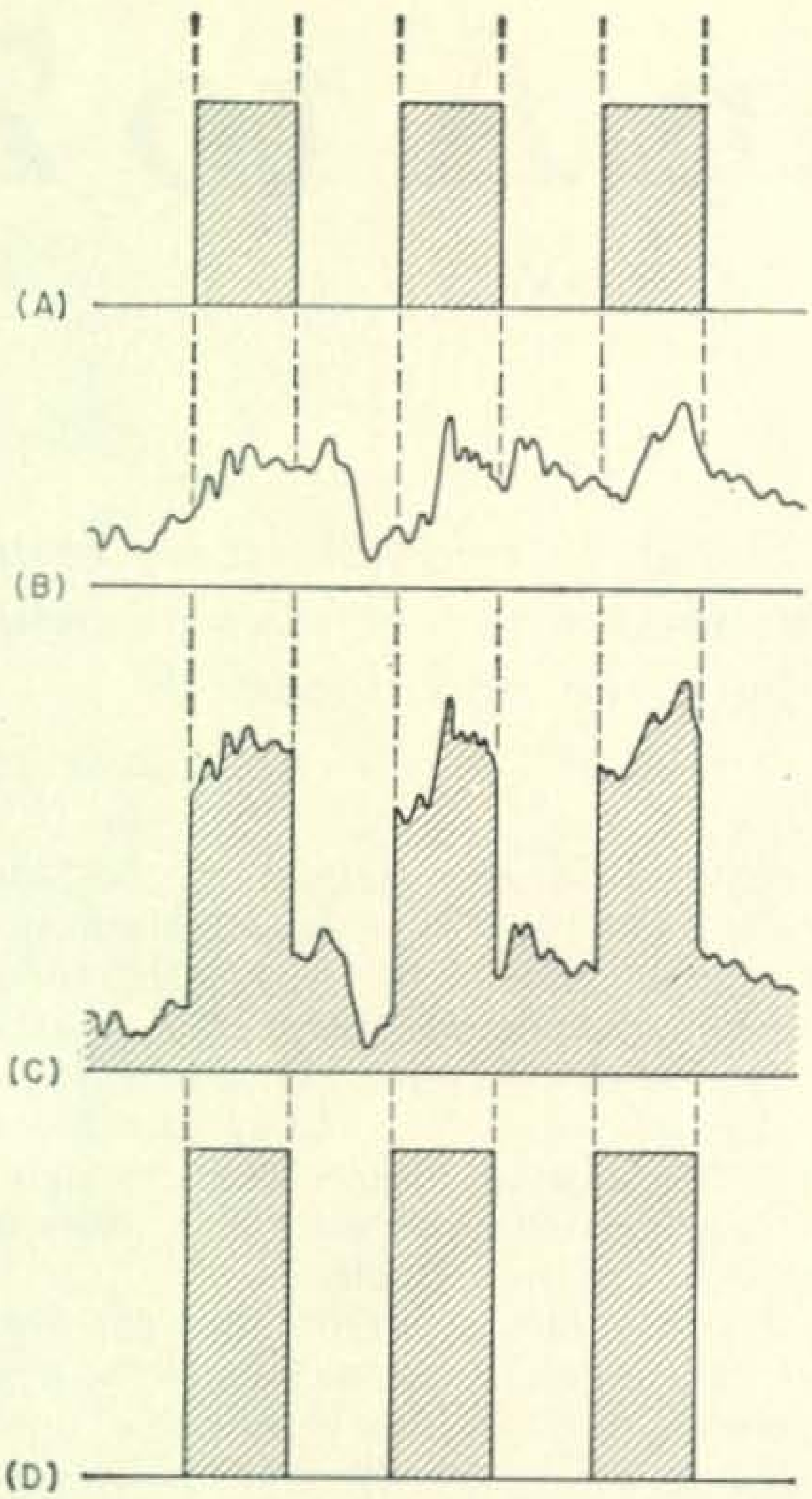


Fig. 97—(A) Teletype character *R*; (B) noise; (C) combination of signal (A) and noise (B) which is fed into Schmitt trigger; (D) output of Schmitt trigger. This demonstrates the use of a Schmitt trigger as a signal detector as explained in the text.

The output from a Schmitt trigger is rectangular and essentially square under almost all conditions. In fact, one of the important features of a Schmitt trigger is its pulse shaping and wave squaring characteristics. Regardless of the shape of a wave going in, it invariably comes out square. This is graphically illustrated in fig. 97. The noise, as represented in (B) is added to the teletype character "R" signal (A) which results in the distorted R signal shown in (C).

Let's review in detail exactly what took place in the Schmitt trigger circuit as graphically illustrated in fig. 97. Since a Schmitt trigger circuit is sensitive to the amplitude of the input signal, it is usually so designed that it will not trigger until a certain pre-determined input level is reached or exceeded. In this instance, the amplitude of teletype character R in (A) of fig. 97 indicates the predetermined amplitude necessary to trigger the circuit. The practical way to vary the pre-determined input level is to make the cathode resistor R_5 (fig. 96) variable. The noise, (B), is also present at the input, along with the teletype signal (A). These two signals combine to give a resulting input signal (C). Any input signal above the pre-determined triggering level (A) saturates the input stage tube, V_1, so that the tops of the waveform (C) have no effect on the output waveform (D). Neither does the noise, graphically shown between successive signal pulses (C), affect the output wave, since none of the noise fluctuations reach up to the peak value necessary to trigger V_1. In this case the Schmitt trigger is functioning as a signal detector as well as a pulse shaping device. Obviously, the output signal (D) does not necessarily end up with the same amplitude as the input signal (A).

Let us review, in detail, the cycle of action that takes place in the circuit of fig. 96, although its general function may be pretty obvious. The main point is that this or any other version of the Schmitt trigger circuit *should be so designed* that it does not end up as an ordinary switch *minus* the desired regenerative *switching action*. At the instant that power is applied to the circuit of fig. 96 there is a tendency for both tubes, V_1 and V_2, to draw plate current even though no signal is present at the input. This current tends to build up a negative bias, E_c, for both tubes. A positive bias is applied to the grid G_2 of V_2 from the power supply voltage E_b through the voltage divider formed by resistors R_1, R_3 and R_4.

This further increases the plate current of V_2, which in turn increases the negative bias (E_c) to V_1 which biases V_1 to cutoff. The voltage drop across resistor R_1 is small, since it is only due to the small current to ground through it and resistors R_3 and R_4. The positive bias to V_2 is greatest under this, the rest, or static conditions (no signal to its input), of the circuit. The net bias voltage E_{gc} to grid G_2 of tube V_2 is considerably *positive*, where V_2 is drawing maximum current and is determined from the expression:

$$E_{gc} = E_{gg} - E_c$$

Likewise, when the V_2 plate current is at its highest value, the circuit output voltage, E, is at its *lowest value* (due to the high voltage drop in resistor R_2). When an *a.c. signal* or a *positive d.c. signal* applied to the input of the circuit of fig. 96 equals or exceeds the predetermined triggering level of the circuit, as previously noted, the circuit will trigger. The positive signal to the grid of V_1 counteracts the static negative bias from the cathode resistor R_5 and V_1 starts to draw plate current. The instant that V_1 starts to draw plate current the voltage drop across R_1 begins to increase rapidly, which in turn decreases the voltage E_{gg} and the positive bias voltage to V_2. Voltage E_c stays about the same, since the plate current of V_2 is *decreasing* at the same time that the plate current of V_1 is *increasing*.

A condition will soon be reached where the positive voltage, E_{gg}, no longer exceeds the negative voltage, E_c. In fact, it will be less, so the net bias voltage, E_{gc}, to V_2 will be negative, as again determined from the expression:

$$E_{gc} = E_{gg} - E_c$$

Under these conditions tube V_2 is cutoff and *held* in a cutoff state so long as the triggering signal is present to keep V_1 in a *conducting state*. Under the condition of V_2 plate current cutoff there is no voltage drop in resistor R_2 so the output voltage, E, is essentially equal to the plate supply voltage E_b. If any current is drawn by a load placed at the output, this, naturally would alter the output voltage E.

From the above it is noted that the Schmitt trigger output voltage is *low* in the static (off position) and *high* in the triggered, or "on position". The low and high value of the output voltage naturally is determined from the power supply voltage used and circuit component values. Typical low values range from 30 to 60 volts for a supply voltage of around 300 volts.

Figure 98 shows another configuration of the Schmitt trigger circuit. The output voltage of this circuit is just the reverse to that of fig. 96. The output voltage is *high* in the static (off position) and *low* in the triggered or on position. The output voltage E would be zero with V_2 at cutoff (on-position) were it not for the voltage E_c across R_2 due to the cathode current of V_1. The operation of this circuit is basically the same as that of fig. 96, which was explained in detail. The value of R_1 in fig. 96 is usually in the order of ⅓ megohm, while R_1 is in the order of 3 to 5 megohms in fig. 98.

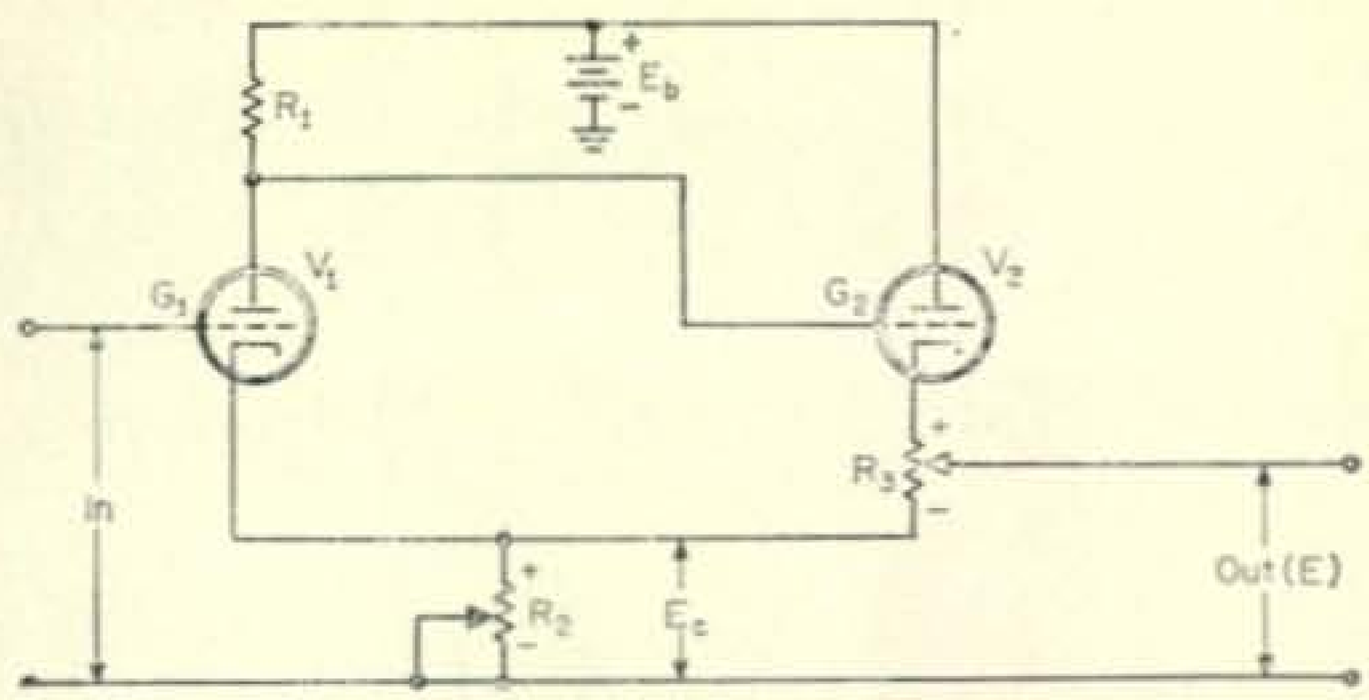


Fig. 98—A Schmitt trigger circuit. Note the similarity of this to the Schmitt trigger circuit shown in fig. 95.

Back To Distortion

The various types of RTTY distortion were thoroughly discussed. This should have given one a good insight into what to look for in the way of distortion, as well as some of the places and conditions under which it exists. Test sets used for adjusting and testing of the 255-A polar relay were also covered.

Need For A Bias Measuring Set

Not being able to actually measure the bias distortion in a polar relay before and after its adjustment can lead to some doubt as to the effectiveness of the adjustments in every instance. We know from practice that proper adjustments of polar relays can be accomplished with the test sets (if you have one) or even without a test set, for that matter. Yet there is nothing better than being able to check the results of adjusting your polar relay by actually measuring the bias distortion before and after.

With the above thoughts in mind, the author set out to develop some means of at least determining if bias distortion existed in polar relays other than by determining its presence by poor copy from the teletype machine. Obviously, this latter can lead to the question as to whether the polar relay, the teletype machine, or something else is responsible.

It was considered that any device or instrument developed should be simple, something that didn't take a genius a year to build and adjust, and above all, not too expensive or too sophisticated. After all, the average RTTY'er is not concerned as to whether the bias distortion from his polar relay is 8% or 8.56%. He wants to know, for instance, if it is 3%, 10%, 20% or maybe nothing. This kind of information (general values) can be determined from the use of a good scope and the instrument that will be discussed shortly. It was also considered that it would be an extra bonus if the simple scope measurements could be readily verified by other and more sophisticated means, if such means were available.

First Considerations

First, one must find some satisfactory way of keying the polar relay that is under test. Perhaps the first thing that comes to ones mind is a square wave audio frequency oscillator or generator capable of putting out 23 cycles per second. This is a good thought except for the fact that such audio frequency generators don't usually have enough output to drive the signal winding of a polar relay directly with the other winding properly biased. It may be possible to drive the relay directly by connecting the two windings series-aiding which is not in accordance with the conditions under which the RTTY'er usually uses the relay. Otherwise, the output from the square wave audio generator must be suitably amplified before it can drive a polar relay.

It is possible to build a square wave generator or "dot generator", as some are called, if one does not have access to a commercially built unit. The design and construction of such devices are to be found in amateur literature. One must have some means of changing the length of the individual plus halves of the signal waves, which at the same time changes the space pulses conversely. The Heathkit Model IG-82 has such a control on the chassis designated as the signal SYMMETRY CONTROL. It is accessible only by removing the set from the cabinet. This control makes it possible to make the positive half-cycle and negative half-cycle, of the square wave, equal in length. It is also possible to lengthen the positive half-cycles, which naturally shortens the negative half-cycles. This gives bias to the positive half-cycle. The negative half-cycle can likewise be lengthened, giving it bias.

After giving this problem some thought, it was decided to build a polar relay driver, or keyer, that duplicated as much as possible the actual conditions under which the polar relay operates when in actual use. For that reason, a part of the output keying portion of the author's Terminal Unit was duplicated in building up a polar relay keyer test set. This test set is not similar to the ones covered sometime back.

The actual design and construction of the test set will be covered next month.

[*To be continued*]

Grinding Surplus Crystals

BY LYALL SHERRED,* K9VHA

Surplus crystals are still available in large quantities and are very reasonably priced. Unfortunately, they are not always at the desired frequency and the Novice passes them by. Explained below are methods that can be used to lower or raise crystal frequencies.

Many hams have acquired a number of surplus crystals or have them from their Novice days. Many Novices use surplus crystals in their rigs. There is an uneven usage of the forty meter Novice band because of these crystals, and every ham finds a time when his available crystals do not fit his immediate need. Often the ham finds that the surplus bargain crystal is worthless because it is not the exact frequency he wants, or it simply will not oscillate.

Shifting Frequency

There are a number of tricks used by hams to change the frequency of a crystal either up or down. A twisted wire (gimmick) capacitor across the crystal will lower the frequency of oscillation, but will stop the oscillation if pulled very far. A standard trick is to remove the crystal from its holder (if it is the common FT-243 type) and to put a small pencil mark on the surface. This sometimes works, but often again the crystal stops working. Crystals cannot stand dirt, and pencil lead is graphite and clay. A better coating is India ink. This will pull the frequency down quite a bit further.

There are also v.x.o. circuits which will pull a crystal down in frequency considerably. However, such circuits are not generally feasible for a crystal controlled converter, and never for a Novice transmitter. Each of the above methods is for pulling the frequency of a crystal *down* and assumes that the crystal is above the desired frequency. The only way up the band is to grind or etch.

Grinding Your Own

Many hams have etched crystals up in frequency, and a far larger group have been afraid to try etching because the only acid that will etch a crystal is hydrofluoric acid which not only eats glass, but people as well.

Fortunately, there are simpler ways of changing the frequency of a crystal. The easiest way is by grinding. Remember that grinding or etching moves the frequency higher and that the process is irreversible without resort to pencil marks and India ink which are only moderately successful.

The first rule of grinding is cleanliness. The crystal must be clean to operate, and it is particularly sensitive to the oil from your fingers. A crystal should be held on a clean dish towel and picked up only by the edges. The holder should be clean. Often the surplus crystal you have in your junk box will work if you just clean it with soap and water, dry it carefully and put it back in its holder. Cleaning and polishing any corrosion from the metal plates of the holder will also often help to get an inactive crystal operating.

The second rule of crystal grinding is to keep the crystal active as it is moved up in frequency. On the first crystal that I ground, I discovered that as it went up frequency it also became less and less active. Fortunately, there is a simple remedy that will keep a crystal active as it is ground and this is grinding the edge at an angle.

Grinding Process

The grinding itself is done on a piece of broken plate window glass. The glass must be completely flat and smooth. The flatness and the thickness of the crystal must be maintained, and an uneven surface on the window glass will

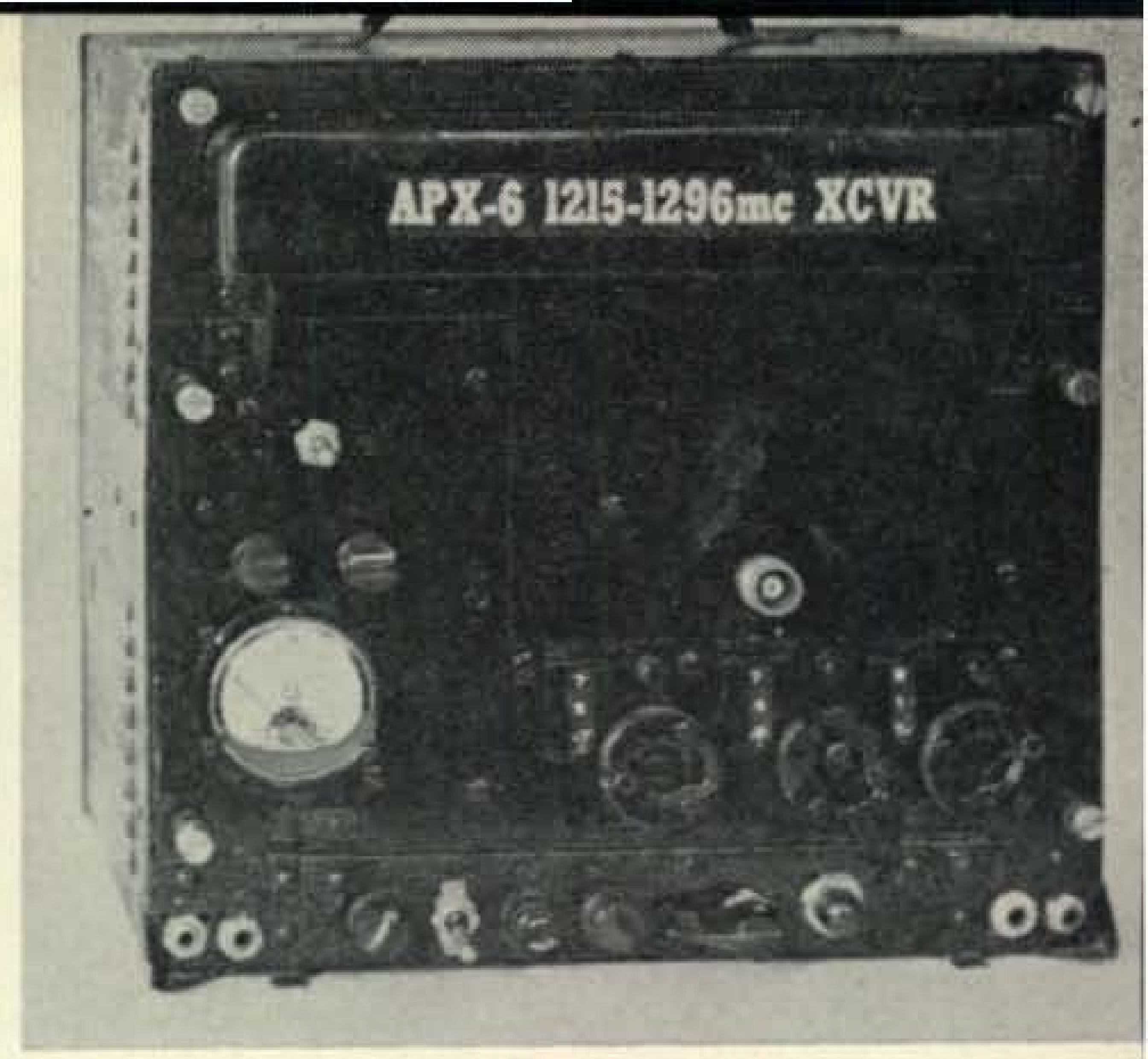
[*Continued on page 92*]

*819 W. Lincoln Blvd., Freeport, Illinois.

Step by step instructions for

PUTTING THE APX-6 ON 1215 MC

PART 1



BY BOB BROWN,* K2ZSQ AND ALLEN KATZ,* K2UYH

The article which follows is a step-by-step conversion to the 1215-1300 mc amateur band of the readily-available and inexpensive RT82/APX-6 surplus microwave transponder. The completed unit is an independent portable transceiver, with built-in modulator, power supply and speaker, capable of communications from a 5 to 75 mile range. The article is presented in two parts.

EVER thought about going 1296? (This unit operates at 1220 in the 1215 to 1300 mc band.) It can be done quite easily with the APX-6, a little-known item that is readily available through surplus outlets at a paltry $25 or less. With this unit, a few spare parts, a homebrew corner reflector or parabolic dish and a crystal microphone, you are in business. Contacts have been made with APX-6's over distances in excess of 175 miles from portable locations, while conventional useage at home can yield anywhere from 10 to 35 mile coverage.

Since the original appearance of this conversion in *The VHF Amateur*,[1] the authors have literally had hundreds of requests for reprints, which, unfortunately, we have been unable to furnish. In addition to republishing that modification with a few minor corrections, we are incorporating here several useful hints extracted from past VHF columns. What follows, then, is a compilation of APX-6 material to make your conversion even more complete and effective.

*Contributing editors, VHF COLUMN.

[1] Katz, A., "Crusade for 1296," *VHF Amateur*, June 1962, p. 22. Out of print.

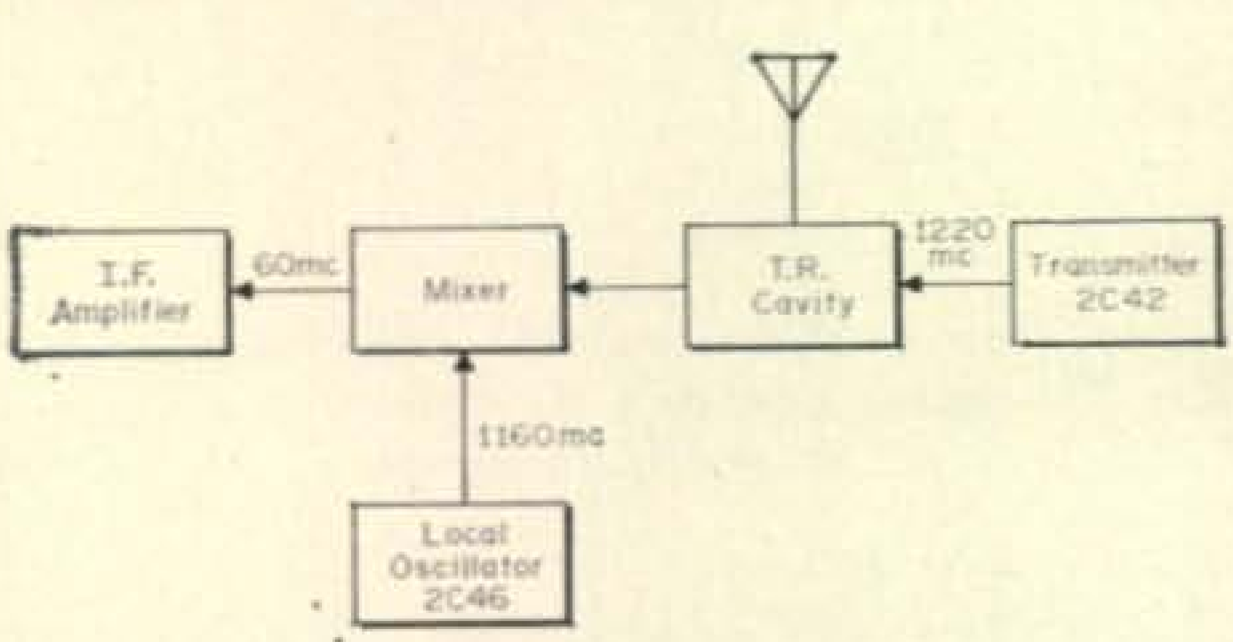


Fig. 1—Partial block diagram of the RT82/APX-6 transponder showing the areas to be modified for 1220 mc operation.

Where to Start First

When you do get your APX-6, at first glance it will appear almost prohibitively complicated. Bear in mind, though, that the greater majority of its insides belong to the pulse modulator/power supply (the large, vertically-mounted chassis) which is not used in the conversion. Actually, the sections necessary to convert are all mounted on the front panel.

A block diagram showing the transmitter cavity, the local oscillator (2C46), and the i.f. amplifier can be seen in fig. 1.

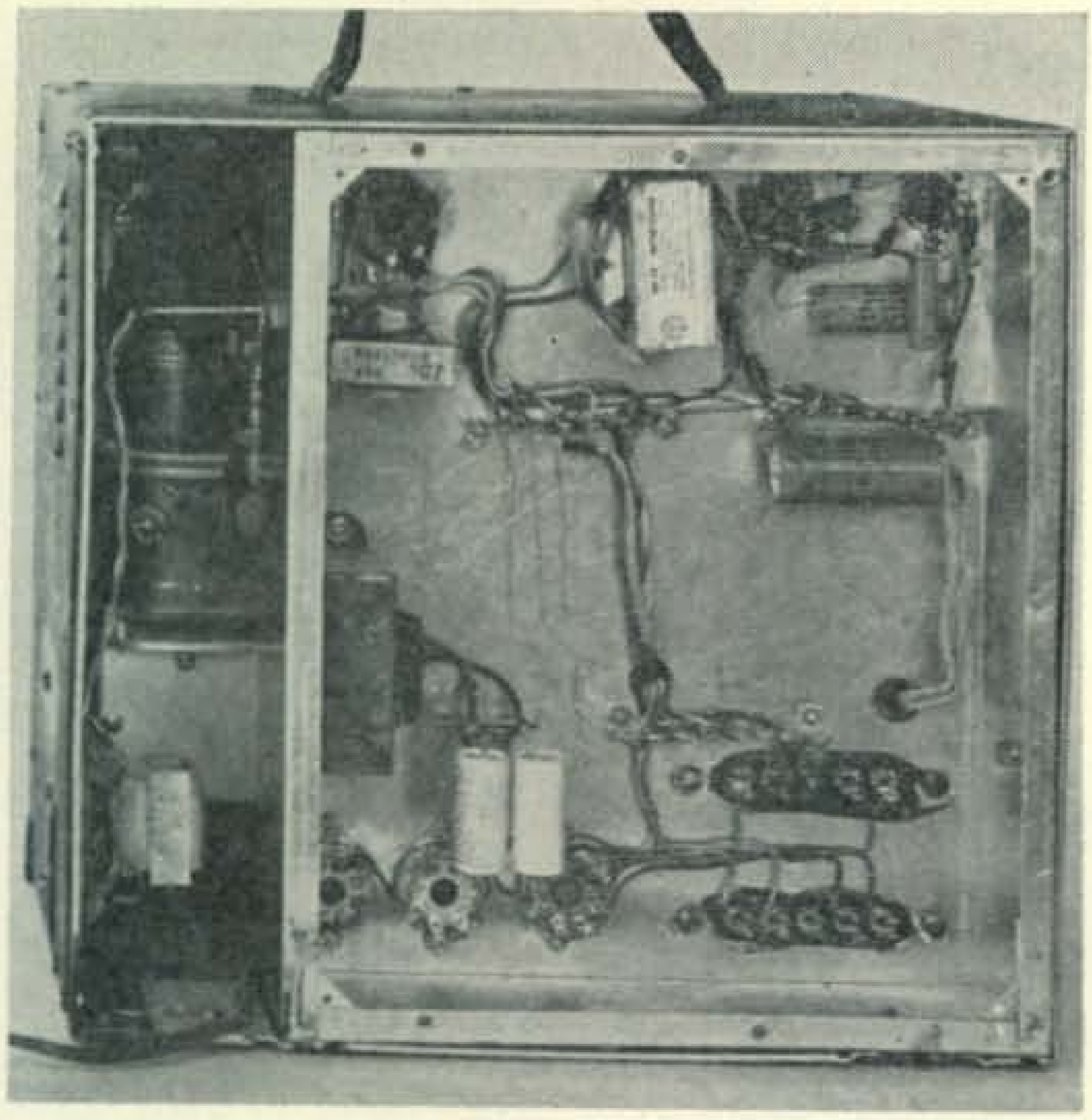
In addition to the actual section modifications, you'll want to construct your own a.m. modulator/power supply section to mount inside the APX-6. This configuration is straight-forward and should present no problems. But more on this later.

Step 1—Initial Parts Removal

As mentioned earlier, you won't need the pulse modulator/power supply, so it must come out. To accomplish this feat, remove: 1) the back cover, 2) all the screws along the sides, 3) the blower, 4) the control and power sockets. After this, cut all wires running from the modulator/power supply to the front panel except those going to the main terminal strip and the thick red wire running to the transmitter cavity. These leads should be unscrewed, since you'll want to use their lugs later on.

Step 2—Building the A.M. Modulator/P.S.

The modulator/power supply section to be constructed is mounted on a standard 10 × 12 × 3″ aluminum chassis. Placement of chassis holes is shown in fig. 2. Holes for the power transformer and tube sockets must be drilled with



Rear view of the APX-6 shows the bottom layout of the modulator/power supply chassis. The speaker may be seen in the lower left corner.

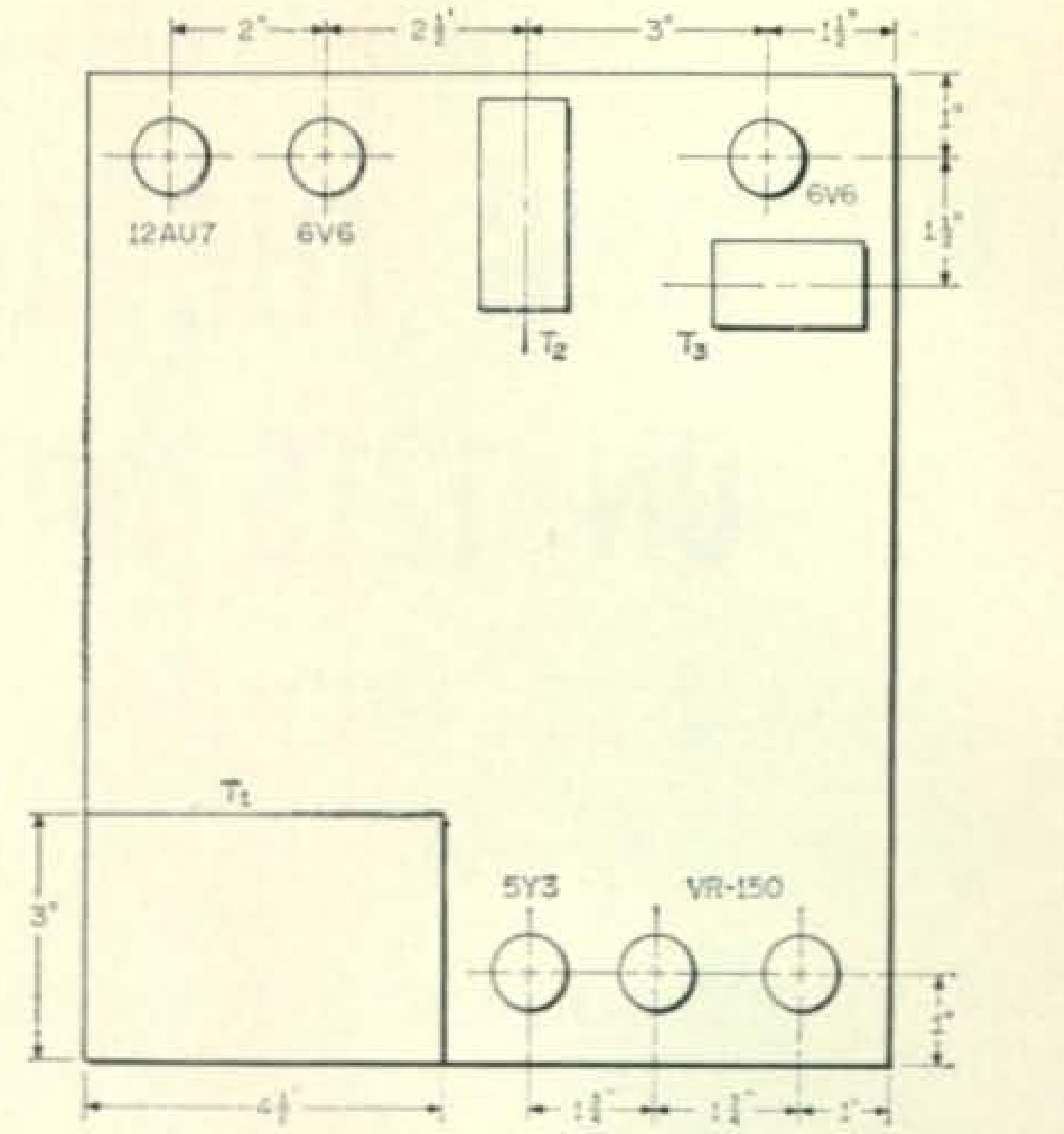


Fig. 2—Layout of the chassis containing the modulator and power supply section. This layout should be followed closely so that the chassis will fit in behind the front panel of the APX-6 when completed.

special care, since poor positioning will prevent mounting the chassis in the case when the front panel is closed.

The schematic diagram of this section is shown in fig. 3. It has been designed to use as many parts from the original pulse modulator as possible. In the diagram the tie points and color-coded wire from the APX-6 were used generously to simplify cabling. Those cables running to the front panel, by the way, should be at least a foot long to avoid problems.

Step 3—More Parts Must Come Out

After the modulator/power supply has been finished, the next step is to prepare the cavities and i.f. strip for conversion. First, detach the cavities from the front panel by disconnecting the coax cable between it and the i.f. strip (the other cables should have already been removed from the main terminal strip). Using an allen wrench (usually provided with the APX-6), remove the three knobs and the five screws around the counter windows.

Next, remove parts not needed in the conversion, such as the BNC connector, fuse sockets, *etc.*, from the front panel. Finally, by loosening the nine screws holding it in place, remove the i.f. strip itself.

Step 4—Converting the I.F. Strip

You will find a diagram and part numbers printed in the case, directly under the i.f. strip. Now turn over the i.f. section and reverse its direction so that it coincides with the diagram. Remove the metal shield in the middle of the i.f. strip by moving a soldering gun along the sides and lifting with a pair of long-nosed pliers.

Clip out the 3.3K resistor (R_{373}) and the 4.7K resistor (R_{374}), since nothing will be soldered in their place. Capacitor C_{374} is electrically out of the circuit after the above modification and can be left in place.

Next, remove the green choke with an orange dot (L_{373}) and capacitor C_{373}, leaving enough lead at the chassis bottom to be re-used as a ground. Also remove capacitor C_{380} and replace it with a 1000 mmf of any type.

In place of choke L_{373}, put a 47K resistor, and

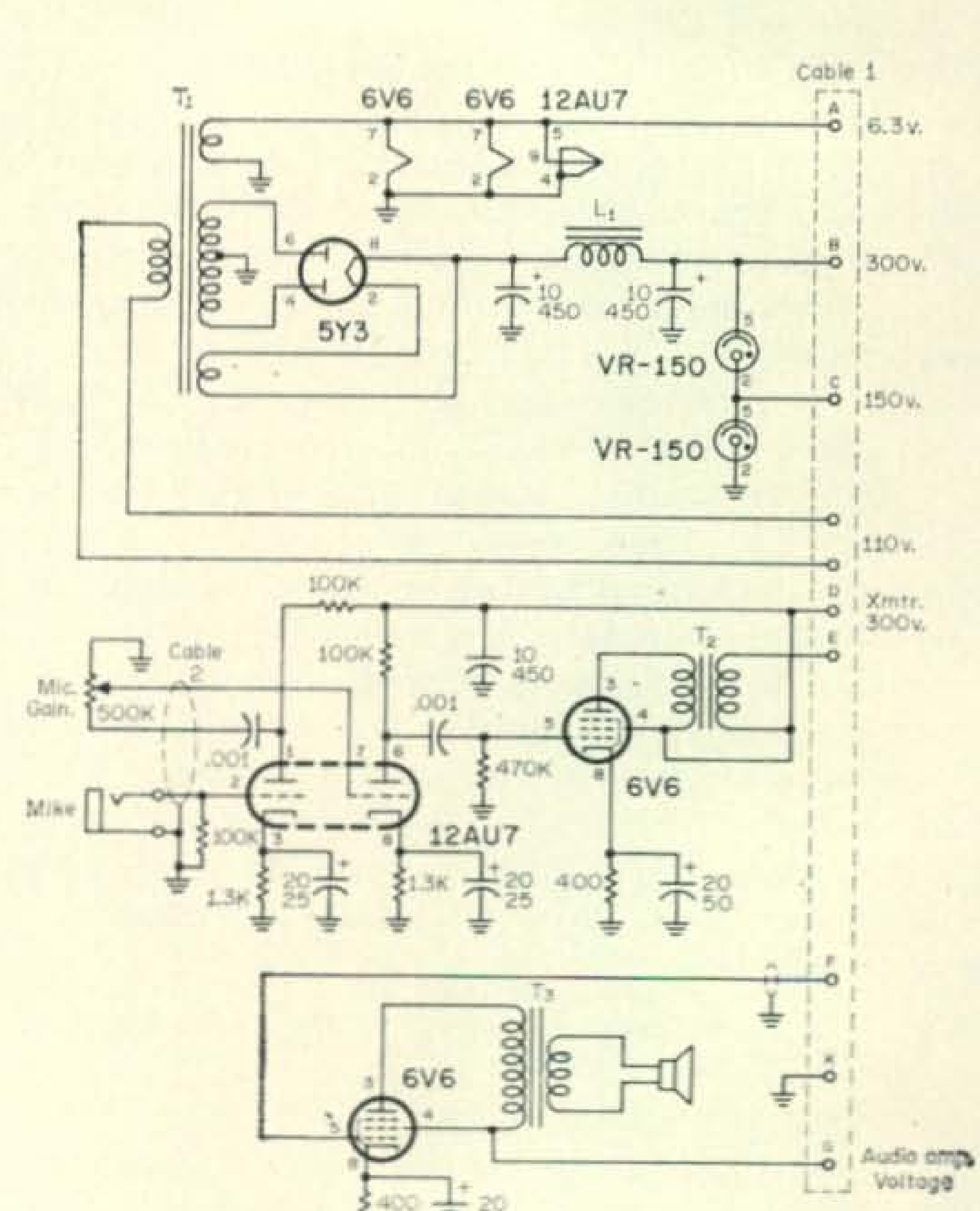


Fig. 3—Circuit of the modulator/power supply for the APX-6. The mike jack and gain control are mounted on the front panel.

L_1—Choke, 6 h, 200 ma.

T_1—Power trans., 600 v.c.t., 200 ma, 6.3 v. 4a., 5 v., 2a.

T_2—Modulation transformer, 8K to 5K, Stancor Chicago IN-16 or equiv.

T_3—Output transformer, 8K to 4 ohms.

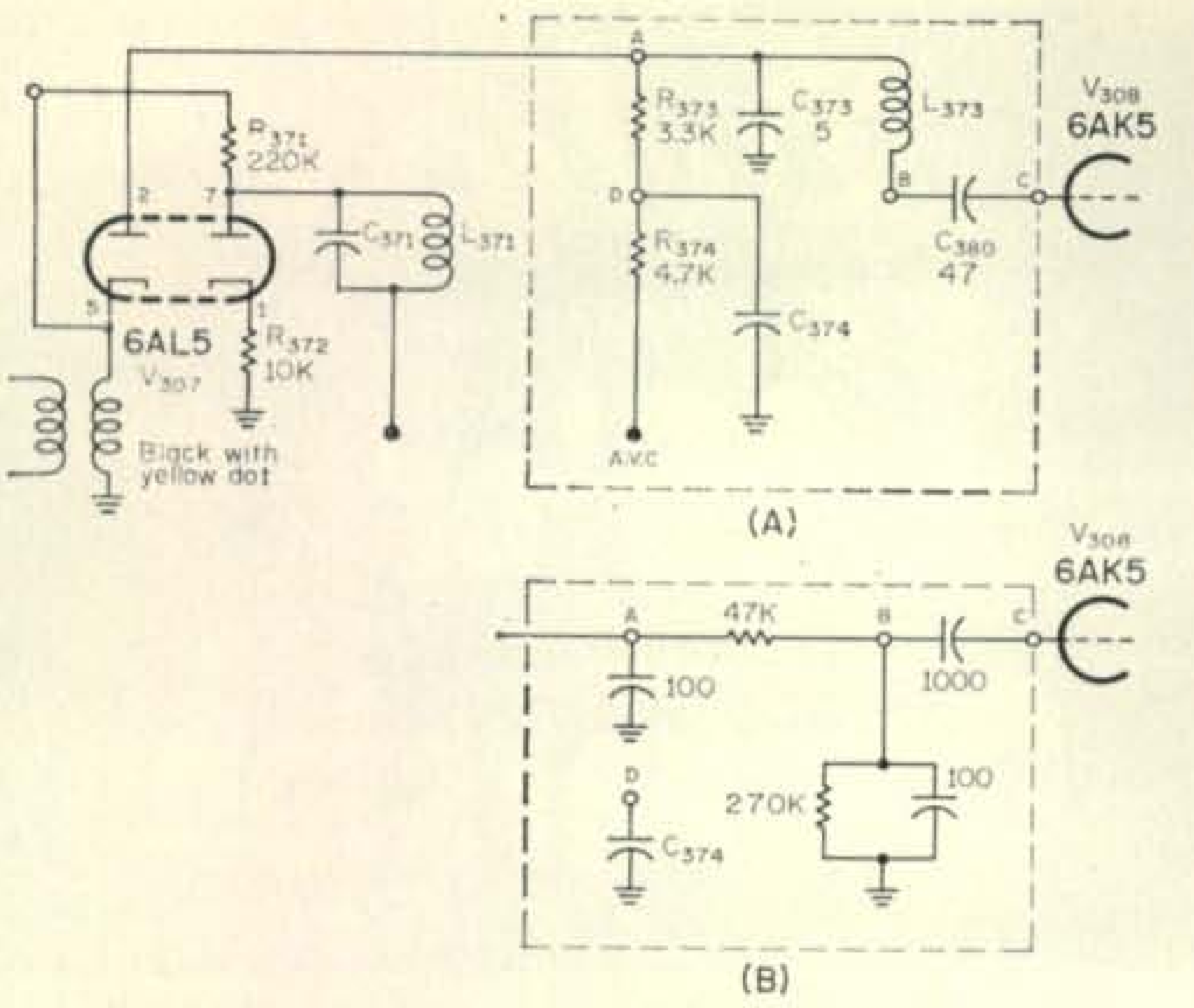
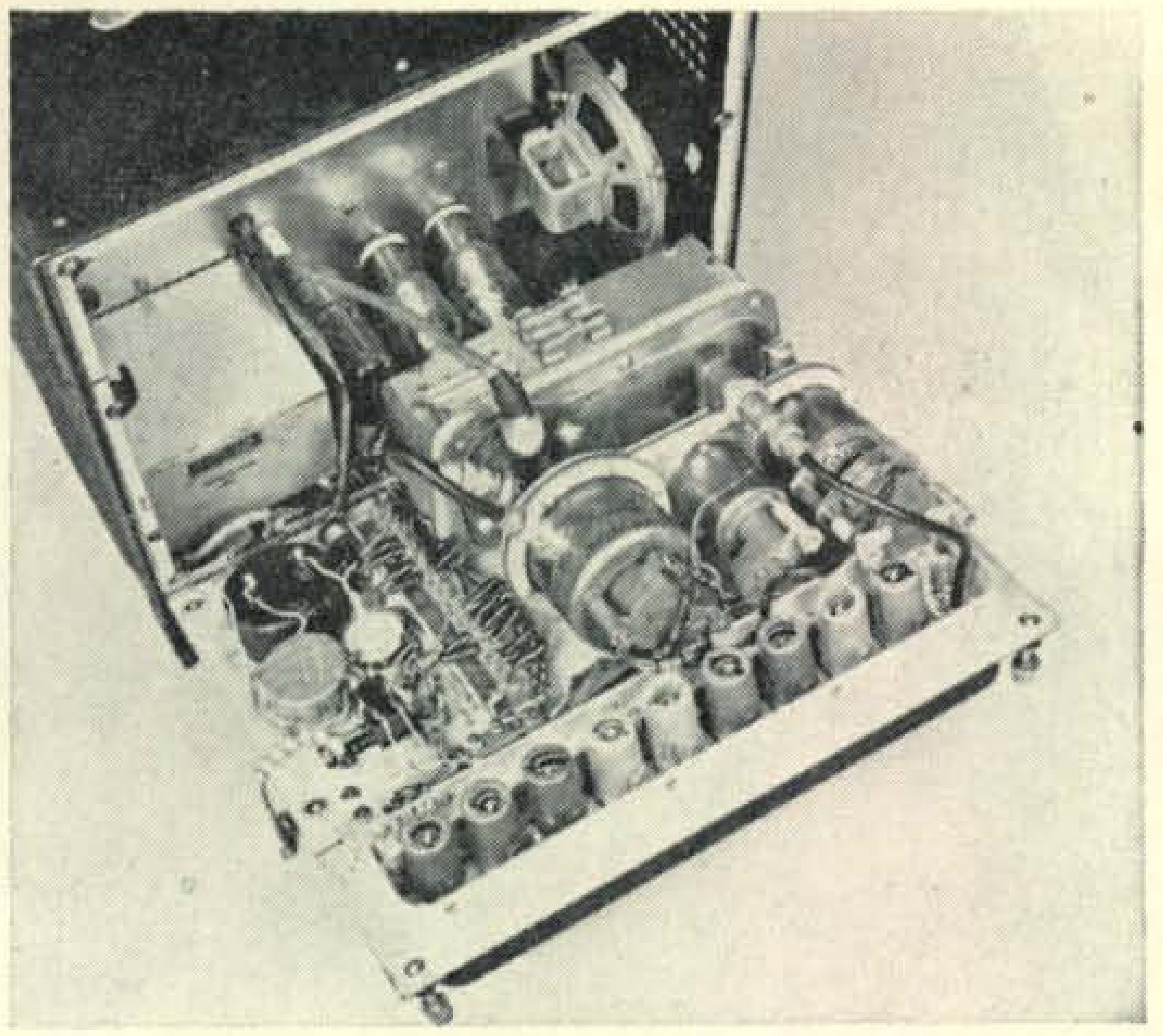


Fig. 4—(A) Unmodified portion of the i.f. strip in the APX-6. (B)—Modified portion of circuit (A).



View of the rear of the front panel of the modified APX-6. In the rear (cabinet interior) the modulator/power supply chassis can be seen with the power supply on the bottom. On the top of the front panel we have the i.f. strip fed from the mixer located just above the three cavities. The transmitter cavity (left) has the feedback loop on the left and the B+ connector to the right of it. The TR cavity is in the center and the L.O. cavity is on the right.

in place of capacitor C_{373}, a 100 mmf job. Lastly, from the tie-point of capacitor C_{380} and the 47K resistor, connect a 270K resistor and another 100 mmf capacitor in parallel to ground. Figure 4 shows a schematic representation of this part of the i.f. conversion.

Unsolder the lead from the top of the vertical coil (L_{381}) in parallel with the 10 mmf capacitor (C_{381}) from pin #2 of V_{308}. This lead will be soldered to ground at the center of the tube socket later.

Substitute a 470K resistor for the 8.2K resistor coming from pin 1 of V_{308}. From pin 2 of V_{308} connect a 6.8K resistor and a 10 mf capacitor (a small electrolytic will fit under the chassis) to ground. Disconnect the mica (C_{390}) from pin 1 of V_{309} and the 33K resistor (R_{390}) from pin 1 of V_{309} the last 6AK5. Take the 33K resistor completely out of the circuit by unsoldering its other end from the terminal to which the blue/yellow wire is attached. To this terminal post attach the free end of the mica (C_{390}). This makes the blue/yellow wire the audio feed. It was found that the audio amplifier was not affected by not having this lead shielded while in the cable from the i.f. stage to the main terminal strip.

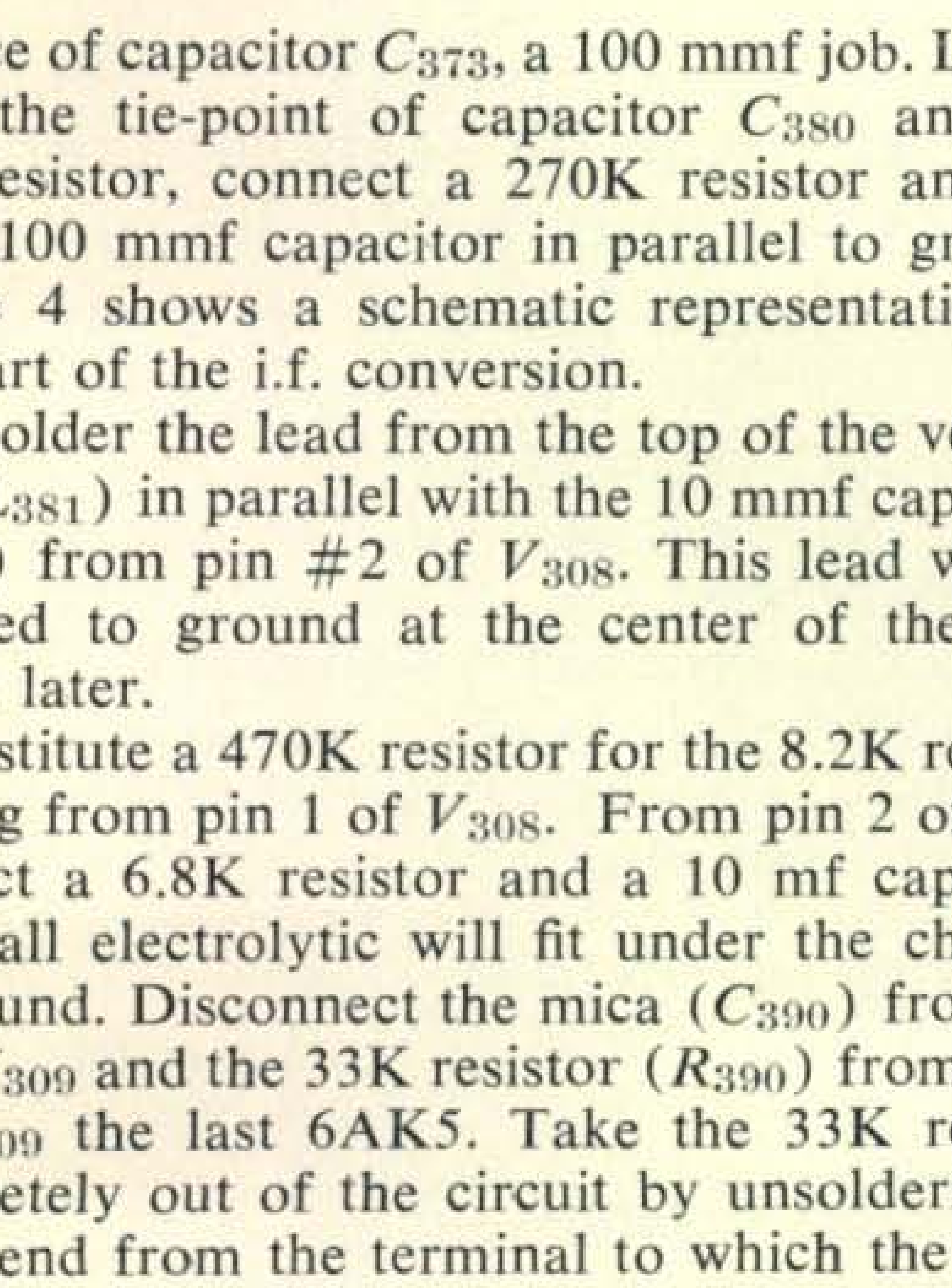


Fig. 5—(A) Unmodified portion of the i.f. strip in the APX-6. (B) Modified portion of (A) converted to an audio amplifier stage.

Next, cut the lead from pin 4 of V_{309}. This stops V_{309} from drawing current, since the tube performs no function in the converted i.f. section.

Cut the lead from the 18K resistor (R_{384}) and pin 6 of V_{308}. This will take R_{384} and C_{384} electrically out of the circuit.

Now solder pin 5 and 6 of V_{308} together and ground the lead from the top of the vertical coil (L_{381}) as mentioned earlier, and your i.f. conversion is complete. The schematic representation of this part of the i.f. conversion is shown in fig. 5.

Part II of the conversion, next month, will cover the conversion of the cavities, testing and tuneup procedures.

[*To be continued*]

Where You Can Obtain APX-6's

New: $25.00, f.o.b. NYC. Technical Systems Corp., 42 West 15th Street, New York, New York 10036. Phone: (212) CH 2-1949.

Used w/all tubes: $17.00. No shipping data available. BC Electronics, 2333 South Michigan Ave., Chicago, Illinois 60616. Phone: (312) CA 5-2235.

Used less tubes: $7.95, f.o.b. Chicago. Arrow Sales, Chicago, Inc., 2534 South Michigan Ave., Chicago, Illinois 60616. Phone: (312) CA 5-4750.

Used less tubes: $10.00. No shipping data available. BC Electronics, 2333 South Michigan Ave., Chicago, Illinois 60616. Phone: (312) CA 5-2235.

Deluxe Q5'er Conversion

BY RONALD L. IVES*

This luxury conversion of the BC-453 permits the receiver to be utilized as a second i.f. system to accomplish double conversion. As a bonus it also provides improved performance in the 190-550 kc range for reliable reception of air, weather and marine traffic. Also included is an additional gearing system that provides a tuning ratio of two hundred and thirty to one.

The beautifully-built and highly dependable long-wave aircraft receivers designated R-23/ARC-5 and BC-453, have long been popular as receiver adjuncts. By virtue of their 85 kc i.f. and their ability to tune the more common receiver i.f.s., these receivers, by a quick conversion, become an ultra-sharp second i.f. system.

Attempts to use the R-23/ARC-5 and BC-453 receivers for air weather and marine warning reception is usually somewhat less than satisfactory because of rapid tuning rate, "blasting through" of powerful b.c. stations, no tuning indicator, unsatisfactory b.f.o., and power supply problems, particularly poor filtering. The block diagram of the conversion is shown in fig. 1.

Preliminary Steps

Before doing any work on the receiver, make sure that it is operable in its original form. To do this, connect 24 volts between the filament line and chassis and 125 to 250 volts, d.c. between the h.v. terminal and chassis. Ground the GAIN control and c.w. oscillator shut-off lines. Connect a headset between the TEL terminal and chassis, and attach antenna and ground. Terminal connections are shown in fig. 2, which is the original BC-453 diagram. Connections to the R-23/ARC-5 are identical, but there are minor internal differences.

Check the receiver performance, condition, and alignment thoroughly, and correct any deficiences before making changes. Do not worry about an inoperative b.f.o., as this circuit will be altered.

Stages in the receiver conversion are:—

1. Remove components not needed; rewire filament circuit, and change tubes.
2. Rewire a.v.c., a.n.l., b.f.o., and 1st audio circuits.
3. Mechanical changes.
4. Install and wire power supply, band pass stage, and second audio stage.
5. Test, alignment, and final touches.

Component Removal

To begin conversion, remove the front adapter plug-in, exposing plug J_1. Remove the bottom

*2075 Harvard Street, Palo Alto, California.

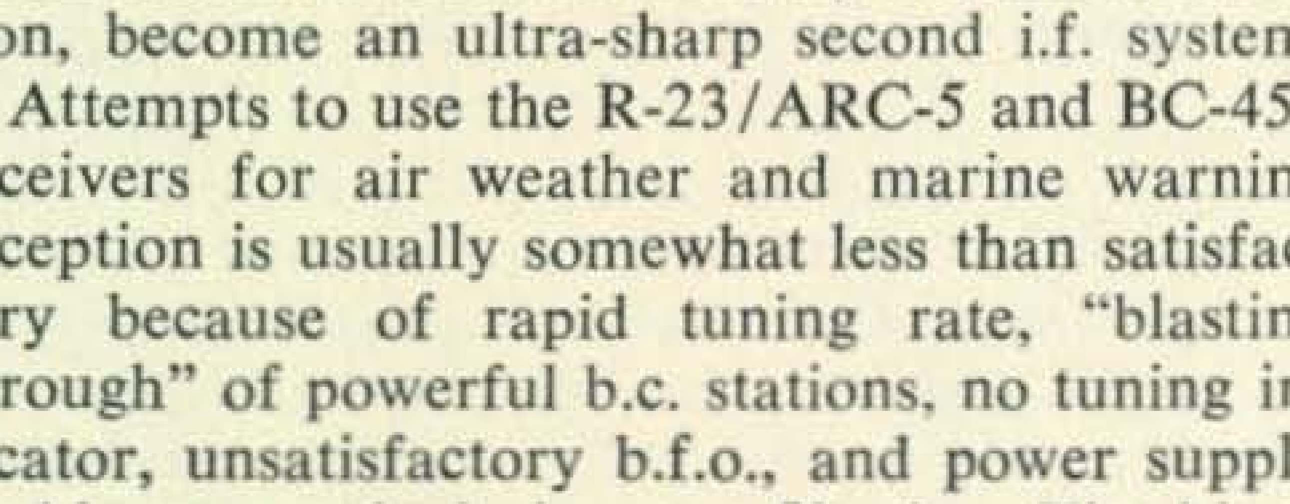
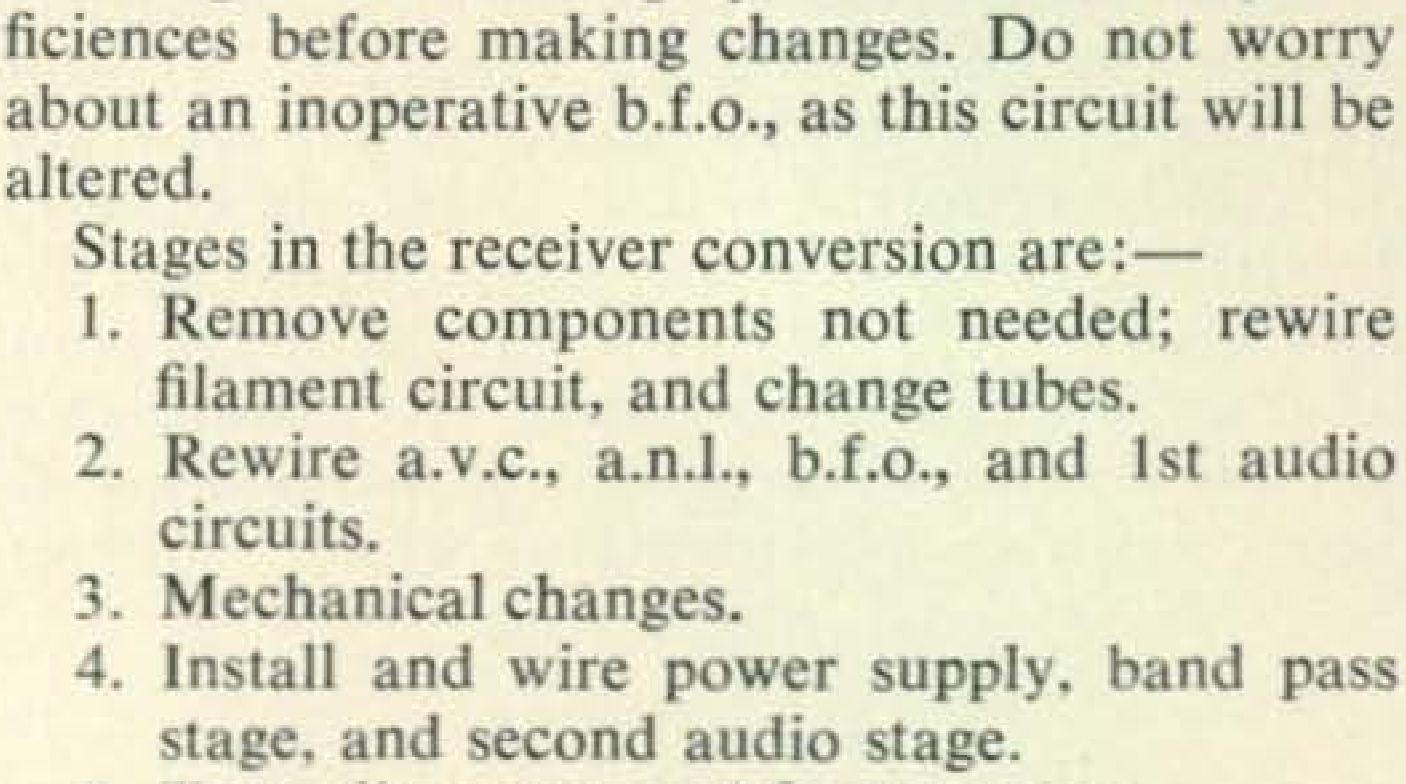


Fig. 1—Block diagram of the complete R23/ARC-5 conversion.



Panel view of the completed ARC-5 receiver conversion. All controls are symmetrical and labeled.

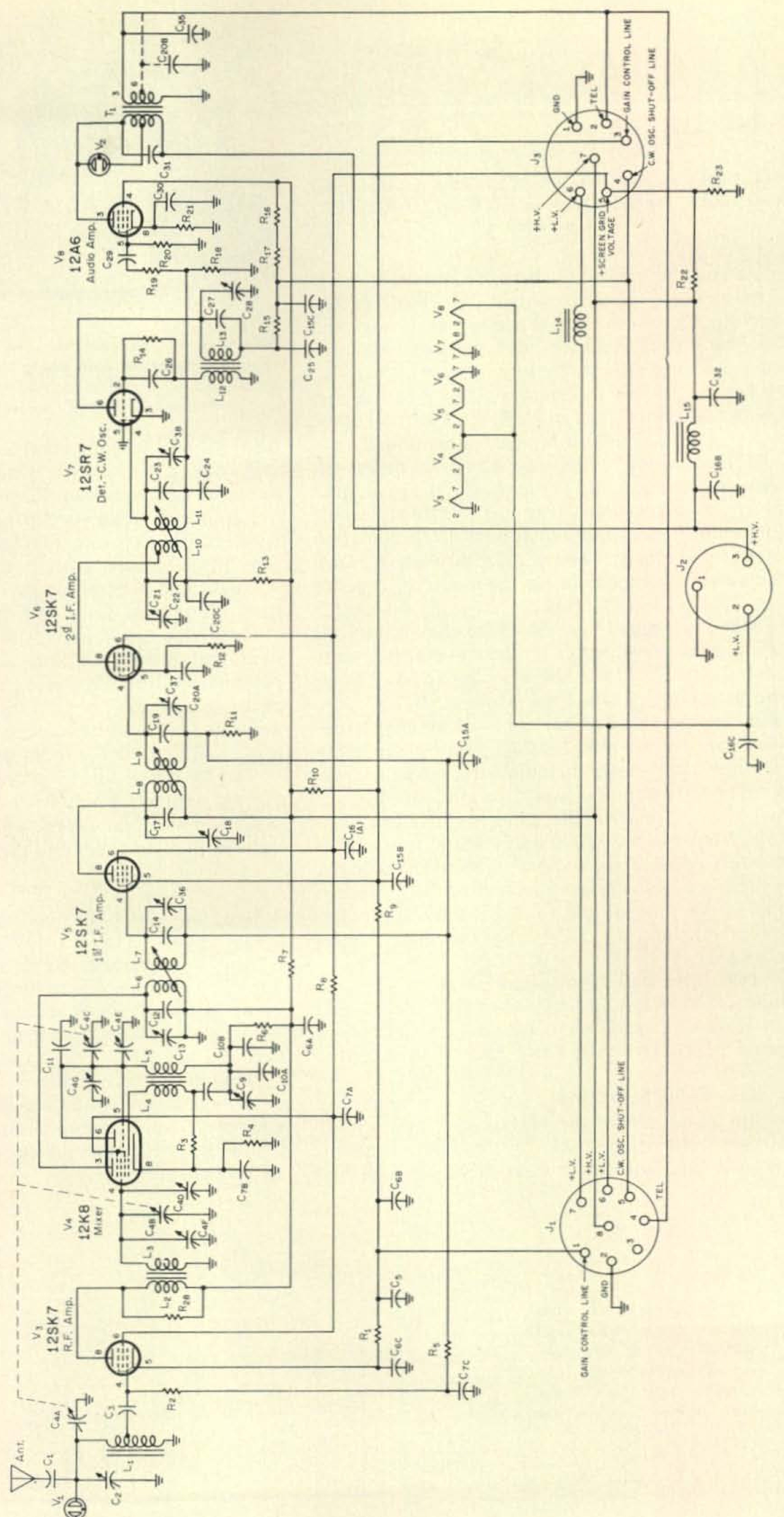


Fig. 2—Circuit diagram of the BC-453 receiver.

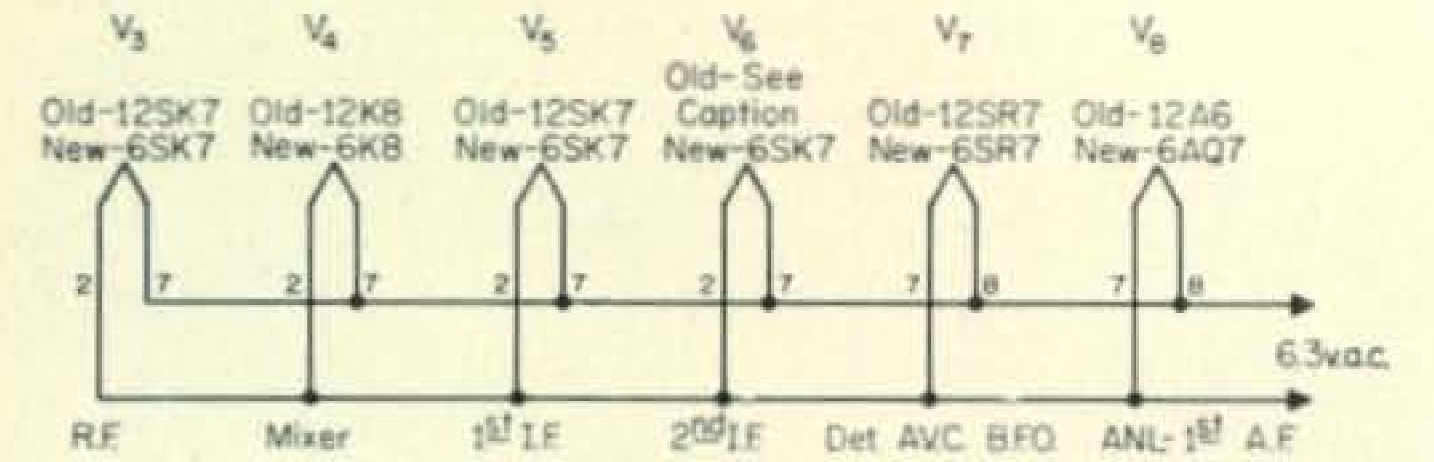
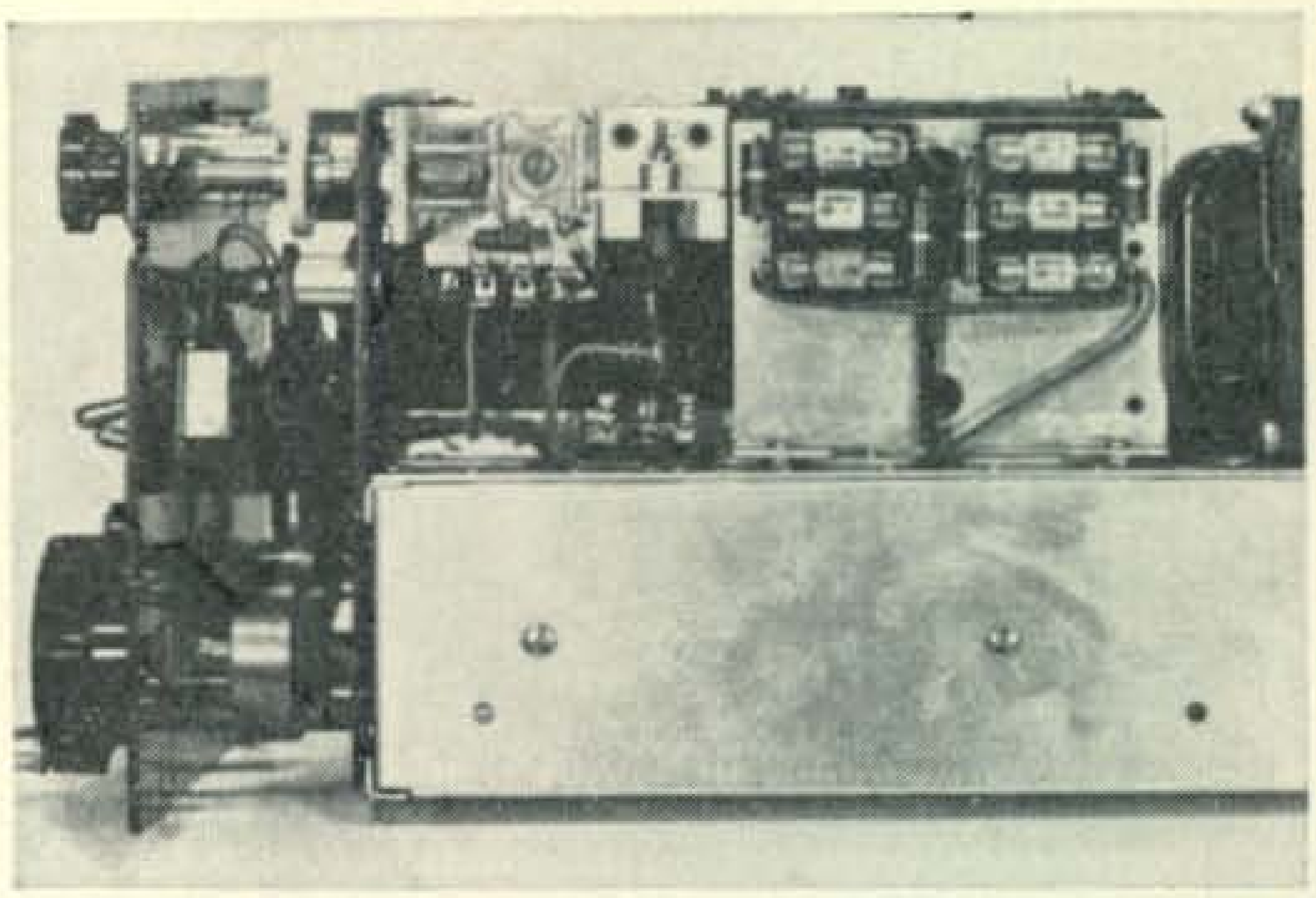


Fig. 3—The second i.f. in the R23/ARC-5 (most models) is a 12SF7. The second i.f. in the BC-453 (all models) is a 12SK7.



Side view of the converted ARC-5 shows panel and sub-panel location. Built along the ledge of the chassis is the b.f.o. circuit and the rectifiers are mounted forward of the power transformer.

plate and the triple coil shield assembly. Save all screws. Trace the gain control line (pin 1 of J_1) back to C_5, remove the capacitor, then trace the line back to C_{6B}. Disconnect the line from this capacitor and ground the line.

Trace all other leads from J_1 back to the first connection point, and clip off the leads. Remove and discard the aluminum can containing J_1.

Remove the antenna terminal from the panel, as well as the antenna capacitor C_1, the neon tube (V_1) and the antenna trimmer C_2. Fasten an 8" extension to the lead which went to the junction of C_1, C_2, and V_1, and pass it through a grommeted chassis hole between the mounting lugs for V_1. This is the r.f. input.

Now, starting at the rear of the chassis, remove the output transformer T_1 and everything connected to it, including the plate lead of V_8. Trace the gain control line (pin 3 of J_3) back to R_{10}, and remove this resistor, as well as any "free" wire. Starting at pin 4 of J_3, remove the b.f.o. circuits completely, including the b.f.o. coil assembly R_{14}, R_{16}, R_{17} and C_{26}. Disconnect C_{15C}, but do not remove the capacitor. Remove the lead from pin 5 of J_3, trace it to the junction of the two power resistors, and then to the receiver screen line. Attach an extension to this, which is the screen line of the finished conversion. Remove R_{22} and R_{23}, C_{32} and the plate circuit choke L_{15}.

Trace the lead from pin 6 of J_3 back to the filament choke, L_{14}, and remove the choke and all leads connected to it. Remove the lead from pin 8 of J_3. This is the B+ lead of the finished conversion.

Remove all leads from J_2, the power input plug at top rear center of the chassis, and remove C_{16}, clipping the leads back to the first tie point. Transfer the lead from C_{20A} to C_{6B}, which was freed when the gain control line was grounded and from C_{20C} to C_{15C}, which was freed when the b.f.o. was removed. Remove C_{20}.

Remove all filament wiring, including ground connections to some filament pins. Reconnect any other grounds that have been "carried through" filament grounds. Remove the ground from the unused diode (pin 5) of V_7.

Now, the "back porch" of the chassis, which held the dynamotor, has been freed of components, and should be removed. Cut this off cleanly, about ⅛" behind the "doghouse" which holds the r.f. and i.f. components. Chamfer the lower corners, and smooth all edges.

The new tube lineup is shown in fig. 3. When the filament circuit is rewired, bring the leads out from the rear of the chassis for later connection to other tubes and the power supply.

A.V.C. and I.F.

Next construction step is installation of the a.v.c. circuit, and revision of the second i.f. circuit if necessary. Regardless of the circuit already in the receiver, the final circuit should be as in fig. 4, which was added to many later BC-453s, probably at repair depots, and functions excellently.

When the a.v.c. circuits are completed, connect a 0.02 mf disk ceramic capacitor from the plate end of R_{13} to ground: reinstall C_{32} (5 mf.) below the socket for V_6; connect it from B+ of L_8 to ground.

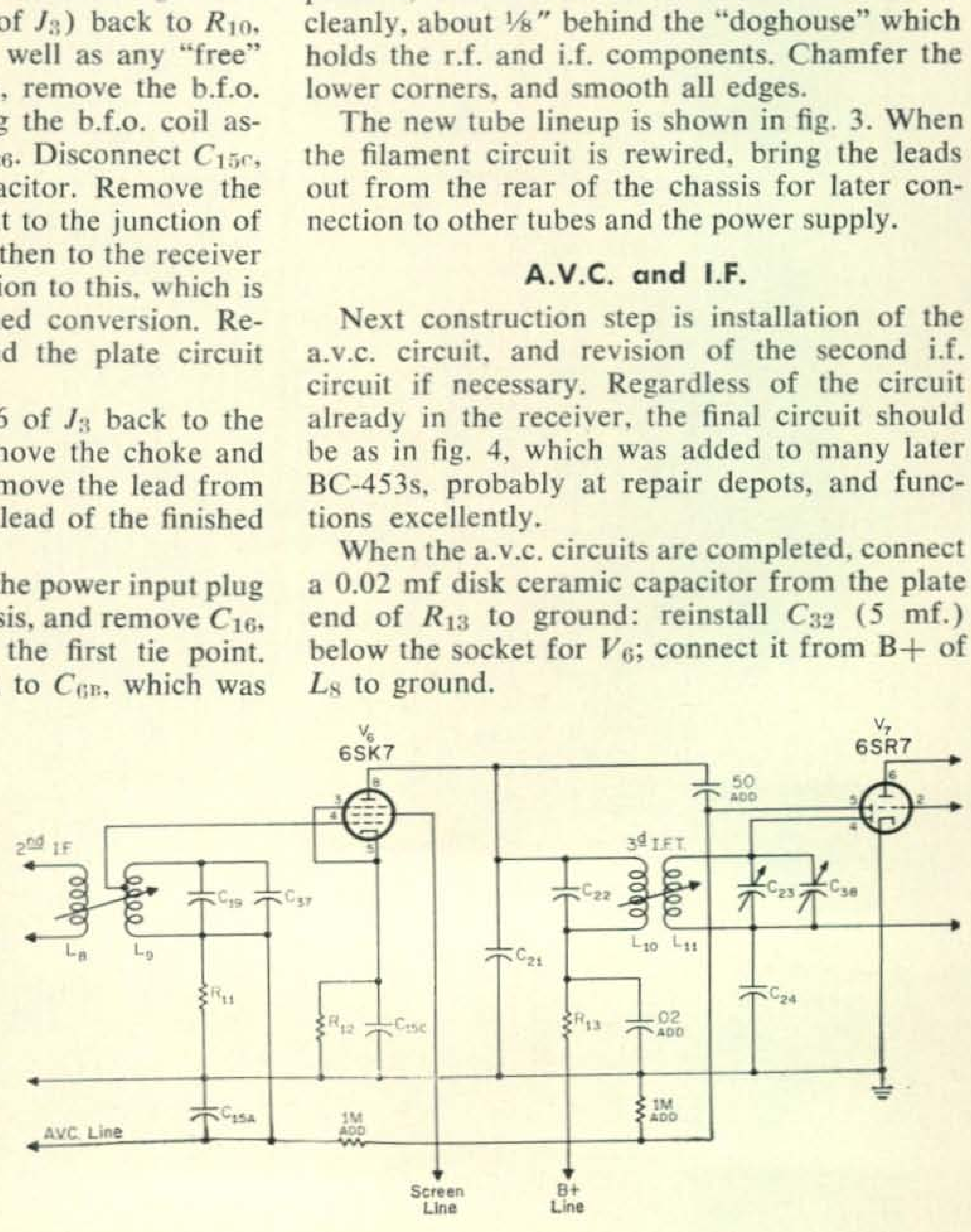
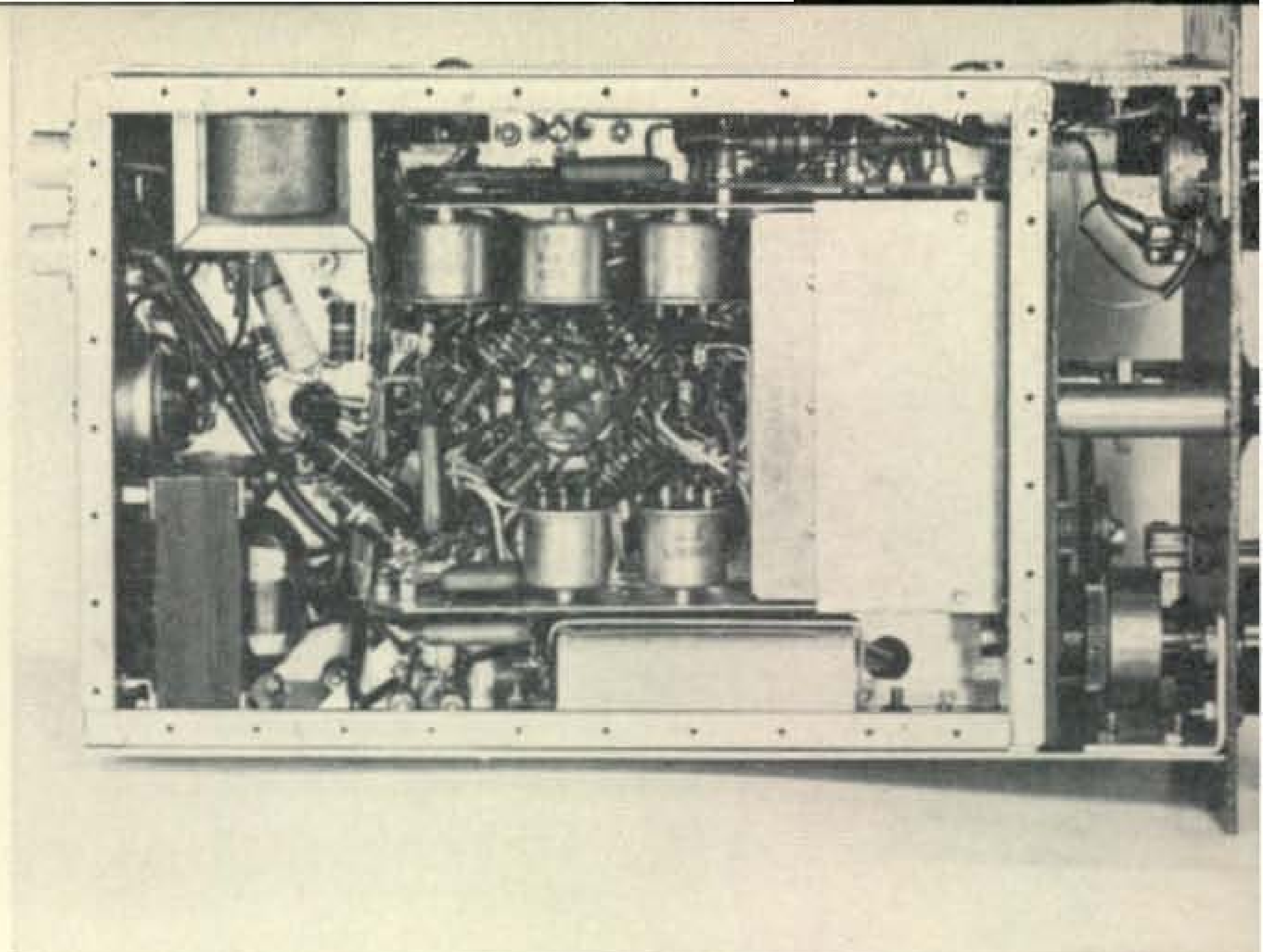


Fig. 4—Second i.f. and a.v.c. circuit of the revised ARC-5 receiver. The numbered components are original parts and those with marked values are added.

Bottom view of the converted ARC-5. Mounted along the right edge is the 2 mf input filter capacitor and the screen divider resistors. The modified filter choke is in the lower corner. The below chassis components for the bandpass section are on the left. Note the angle irons used to secure the panel to the side brackets for increased rigidity.



Wiring of the detector, b.f.o., a.n.l. and 1st a.f. circuits is done in two steps, part now, and part when the mechanical changes are completed. The circuit, shown in fig. 5, has been tested extensively in receiver conversions for weather signal reception[1]. Make only the connections in the "wire now" part of fig. 5, leaving identified leads for later connections.

Mechanical Changes

Mechanical changes, to provide a larger chassis, mount the drive mechanism, and support additional components, are next. Make a subpanel, about 6" × 6½" × ⅛", and drill it to clear the dial and drive shafts of the receiver. This is best laid out by removing the dial (unscrew the holding nut) and the front screws, and making a cardboard template. The subpanel should be flush with the top and left of the receiver, as seen from the front, and should extend to the right and downward.

Mount a 1¾" stud directly above the dial shaft hole, using a flathead screw countersunk from the rear, as a panel support. After the panel is painted to suit, retap the receiver front holes 4-40 (this includes tuning capacitor frame holes) and mount the subpanel with binding head screws.

Now, along each side of the receiver, mount lengths of ½" × ½" × 1/16" angle, using the screws that hold the top of the "doghouse" in place. It may be desirable to retap the chassis holes to 4-40. If so, hold the threaded inserts firmly with pliers while retapping, so that they will not tear out of the thin housing metal.

Fabricate a chassis 3" deep, 11" long, and 7½" wide. In the top front of this, make a cutout into which the receiver will fit snugly, and fasten it in place with screws through the side angles already affixed. Near the bottom, directly below the dial shaft, mount another 1¾" panel support stud, bolting it through both the subpanel and the front chassis skirt.

Just above this, and about 1" below the top of the chassis, mount a 3 to 25 mmf. antenna trimmer. Connect stator to the r.f. input line already installed, and be sure that the rotor is grounded. Now the coil bank, previously removed, may be reinstalled. The front compartment, containing the trimmer and coils, can now be covered with a plate cut from the original bottom plate.

Mechanical connection to the receiver drive shaft consists of a splined fitting mounted on a ¼" shaft. To prevent slop in the joint, clean and thoroughly tin the interior of the splined socket, then shove it over the splined drive shaft while it is still hot. When this cools and contracts, the fit will be very firm, devoid of both side and end shake. Starting with this shaft, construct a gear train and drive to suit your needs. The one used is made from a set of Hallicrafters split gears, and has an overall ratio of 230 to 1, including the integral capacitor worm drive. Take considerable pains with this drive mechanism, so that it will operate smoothly and dependably.

Install the power and signal connectors in the rear chassis skirt, making sure that there will be no intercomponent interference. Mount the power transformer (Stancor PC-8404) at the

[1] Ives, R. L., "Audio Systems for Radio Range Station Weather Receivers," *Bull. Amer. Meteorological Society*, Vol. 43, No. 6, June, 1960, p. 313-317.

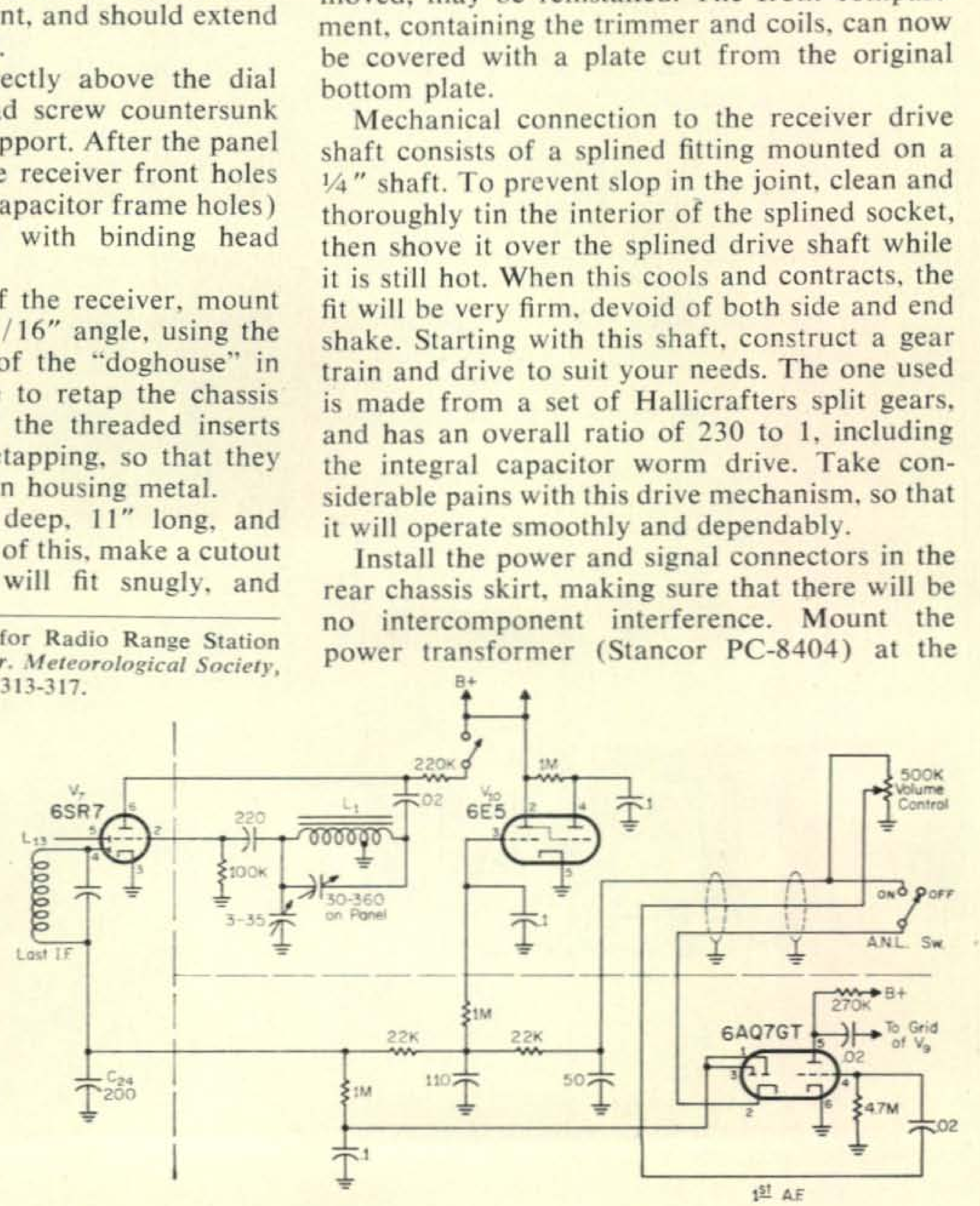


Fig. 5—Circuit of the detector, b.f.o., a.n.l. and first audio circuits to be added to the ARC-5. The circuit to the left of the dotted line is already wired as shown in fig. 4. Inductor L_1 is a Miller #6324.

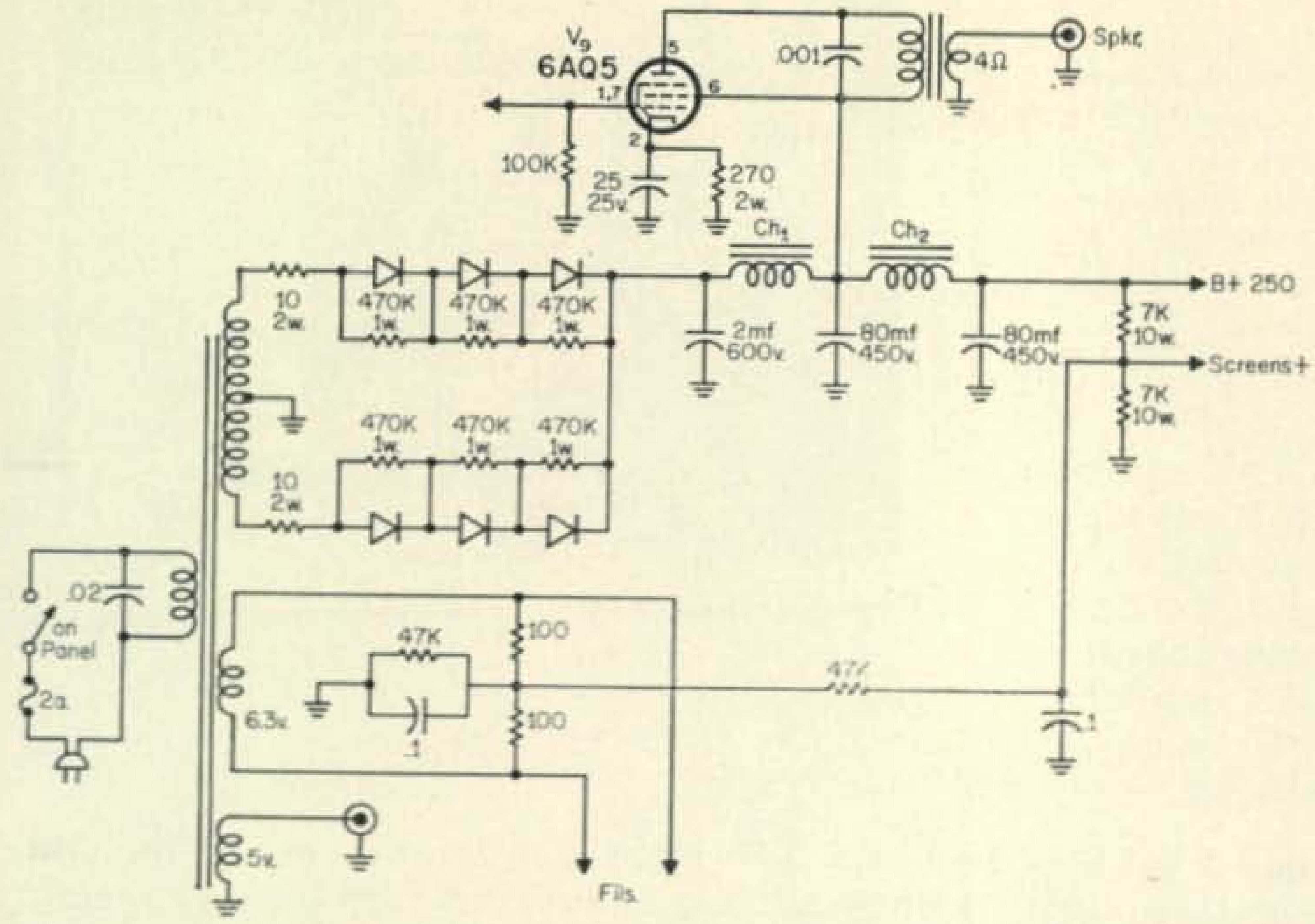


Fig. 6—Power supply and audio power amplifier circuit are built on the outboard skirts of the new chassis. The silicon diodes are Sarkes Tarzian M-500's. The power transformer is a Stancor PC-8404 and the output transformer Stancor A-3877. Choke Ch_1 is a Stancor C-1001 and Ch_2 is a C-1003.

right rear corner of the chassis, passing the leads through grommeted holes.

Wire the a.c. circuit completely, in accord with fig. 6. Make sure the switch leads are long enough for convenient mounting on the panel.

Bandpass Amplifier

The band pass stage circuit is shown in fig. 7. This consists of a low-pass input, with attenuation above 570 kc; a coupling tube (V_2-6BA6); and a band-pass filter having lower cutoff at 180 kc and upper cutoff at 580 kc. Throughout the pass band (190-550 kc), gain approximates 3 db. At 150 kc, attentuation is about 20 db and at 900 kc it exceeds 30 db. This stage eliminates blasting through of high-powered transmitters and reduces cross-modulation due to first-grid overload.

To wire the band-pass stage, mount the above-chassis bandpass components on an insulated bracket under V_{10}, and connect the auxiliary input jack between the bandpass output capacitor and the r.f. input lead.

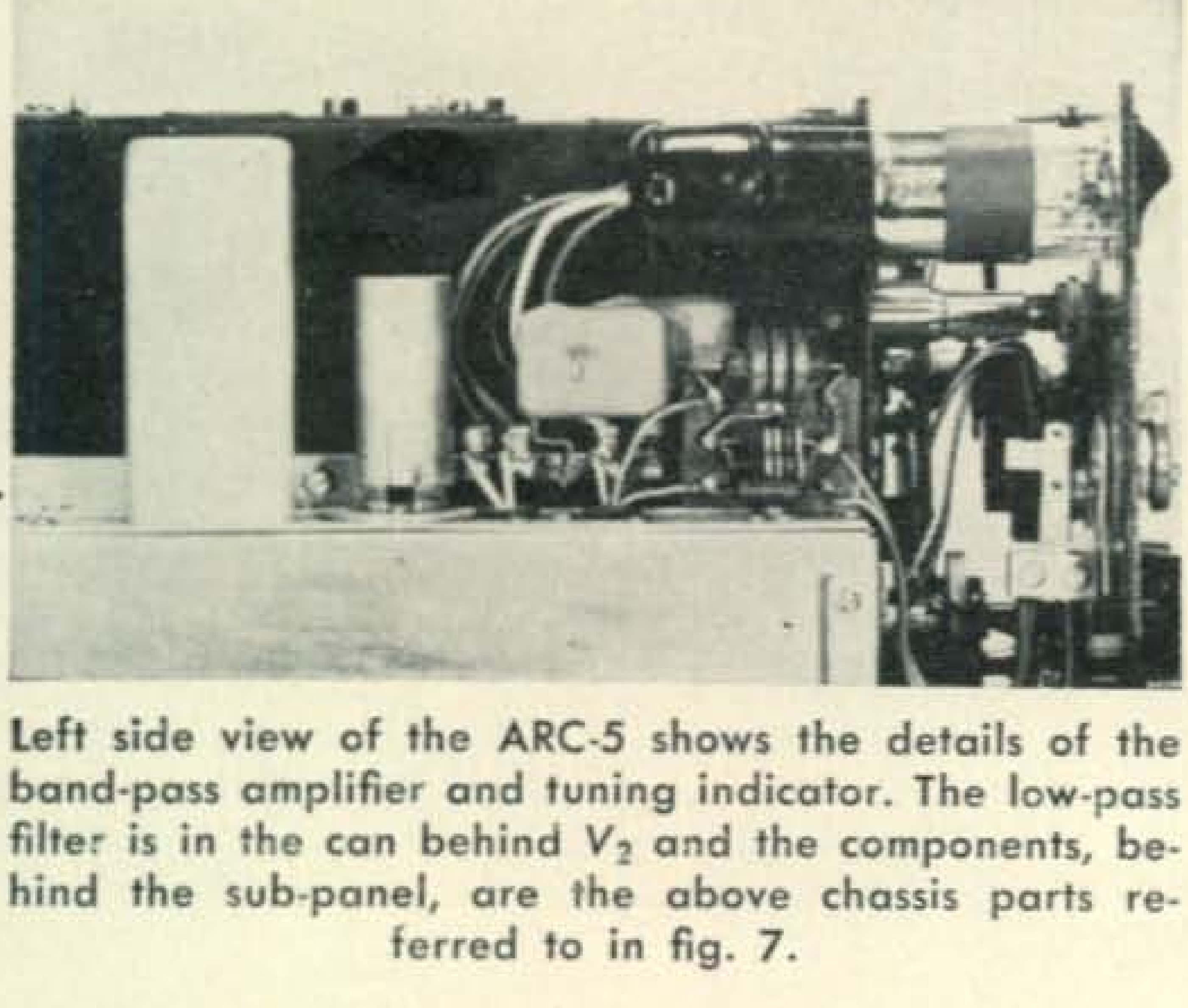
Mount the low-pass components on an insulating strip, with long leads, and enclose this in a shield can about 1¼" square. Center the inductance, so that its Q will not be lowered by proximity to the shield. Mount this can at the left side of the "doghouse", behind V_2, passing the leads through the chassis, using either a grommeted hole or feedthroughs. Complete all remaining wiring as per photos and diagrams.

Check

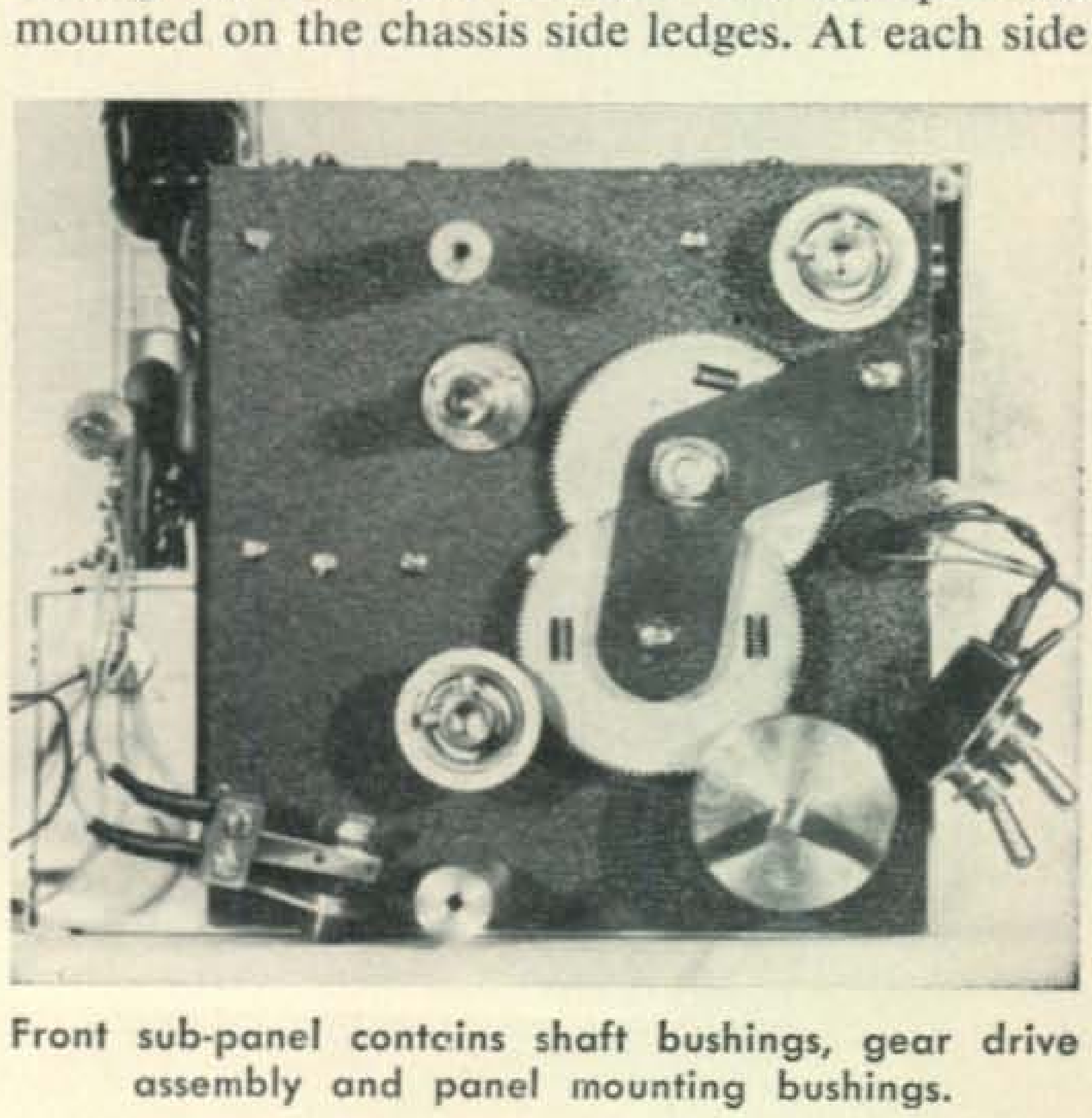
To make the electrical check, be sure that all tubes, capacitors, rectifiers and the fuse are in their sockets; connect speaker, antenna, and power, and turn the receiver on. Check tuning, operation of the tuning eye, b.f.o. and noise limiter (an a.c.-d.c. electric drill is a good impulse noise generator). When electrical operation is satisfactory, only final mechanical assembly and alignment remain to be done.

Install flexible couplings (Millen 39016) on the trimmer and b.f.o. capacitor shafts. Make a coupling to hold a ¼" shaft to the original dial fitting. Concentricity of the internal thread (½"-28) with the shaft hole is important here. Attach this firmly to the dial shaft, using a small setscrew.

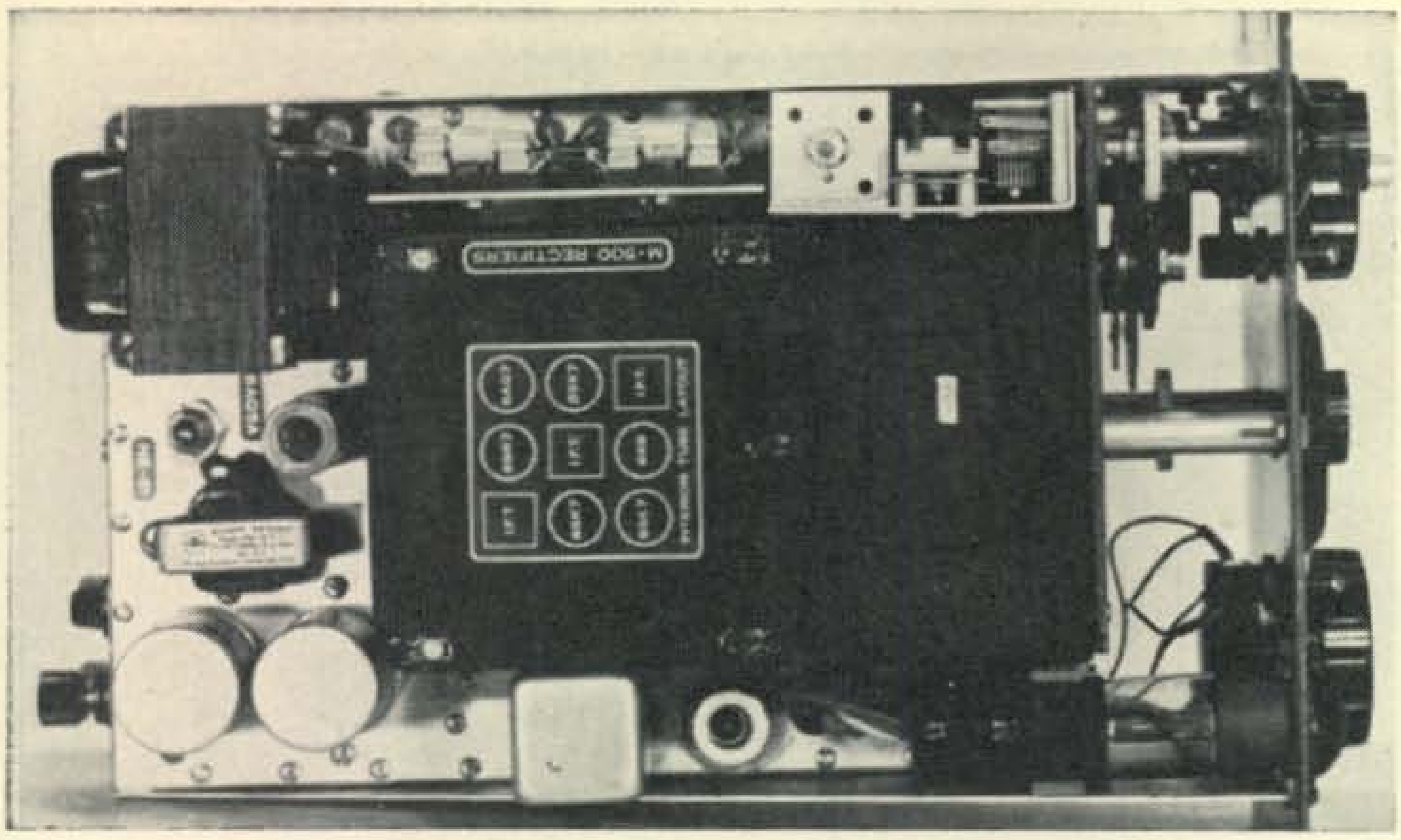
Mount the panel on the front of the receiver, using the two studs on the subpanel as supports. Fit a chassis bracket to each side of the receiver. This supports the ends of the panel, prevents flexing in use and shields the components mounted on the chassis side ledges. At each side



Left side view of the ARC-5 shows the details of the band-pass amplifier and tuning indicator. The low-pass filter is in the can behind V_2 and the components, behind the sub-panel, are the above chassis parts referred to in fig. 7.



Front sub-panel contains shaft bushings, gear drive assembly and panel mounting bushings.



Top view of the converted ARC-5 receiver showing component locations. The antenna binding post is in the corner of the rear flange.

of the bottom of the panel, attach the chassis brackets with angles to further prevent play and flexing.

Now, carefully locate, on the front panel, the positions of the control and dial shafts. Drill holes for the extensions, and install panel bushings (Johnson 115-255). Install the drive, b.f.o., and trimmer shafts, making sure that operation is smooth, without either bind or shake. Affix the tuning dial to a ¼" shaft, and engage this with the adapter already mounted. Mount the AUXILIARY INPUT jack, covering it with a standard jack cover; and mount the POWER B.F.O., and NOISE LIMITER switches.

Installation of control knobs completes the conversion. For operating convenience and component identification, labels are desirable. Those illustrated are Metalphoto labels, made by the Kohler techniques[2].

Alignment

Electrical alignment is simple and straightforward. Connect power, antenna, and speaker, and warm the receiver up for a few minutes. Tune in station of known frequency, set the tuning dial to this frequency, and clamp it there. This puts the dial in phase with the tuning circuits. Set the index of the trimmer knob so that it is vertical at mid-range. Next, while receiving a stable carrier, adjust the tuning slug and large shunt capacitor of the b.f.o. so that it zero beats when the trimmer is in the center of its range. Set the trimmer knob so that zero beat occurs when the index is vertical.

Now, after using the receiver for several hours, so that you are familiar with its potentialities, adjust the pull rods, under the i.f. transformer covers, for maximum intelligibility of a good phone signal. This position is usually found when the pull rods are about ⅔ of the way out. When intelligibility is maximum, replace the covers and the top of the "doghouse" tube compartment.

Uses

Performance is excellent for reception of weather broadcasts from radio range stations. Here, range is limited by atmospheric noise, and the limiter is very useful during summer thunderstorms. Dependable range here is about 100 miles in summer, and more than 200 in winter.

When used as a tunable sharp i.f. system, with input to the AUXILIARY INPUT jack, this conversion is a very smooth working Q5er, capable of pulling a wanted signal out of almost any phone "bedlam". Audio output, approximating 3 watts maximum, is more than adequate.

Frequencies around 272 and 455 kc. are occupied by a pandemonium of broadcast signals, radiated by myriad kitchen and car radios in any populated area. This QRM is at a minimum in the early morning hours.

Almost any reasonable antenna will work with this converted receiver, a straight wire, 50 feet long and 20 feet high, seems to be optimum.

Maintenance requirements are slight. The receiver described has needed no repairs during 3500 hours of operation, and all tubes tested good during a routine test after 2500 hours.

Although this type of conversion is not a "one evening project", and requires careful and workmanlike construction, performance to date indicates that it is about ideal for service either as a Q5er, or as a "weather receiver". ■

[2]Kohler, George M. "Prototype Labels", *Electronics*, Vol. 33, No. 1, Jan. 1, 1960, p. 100.

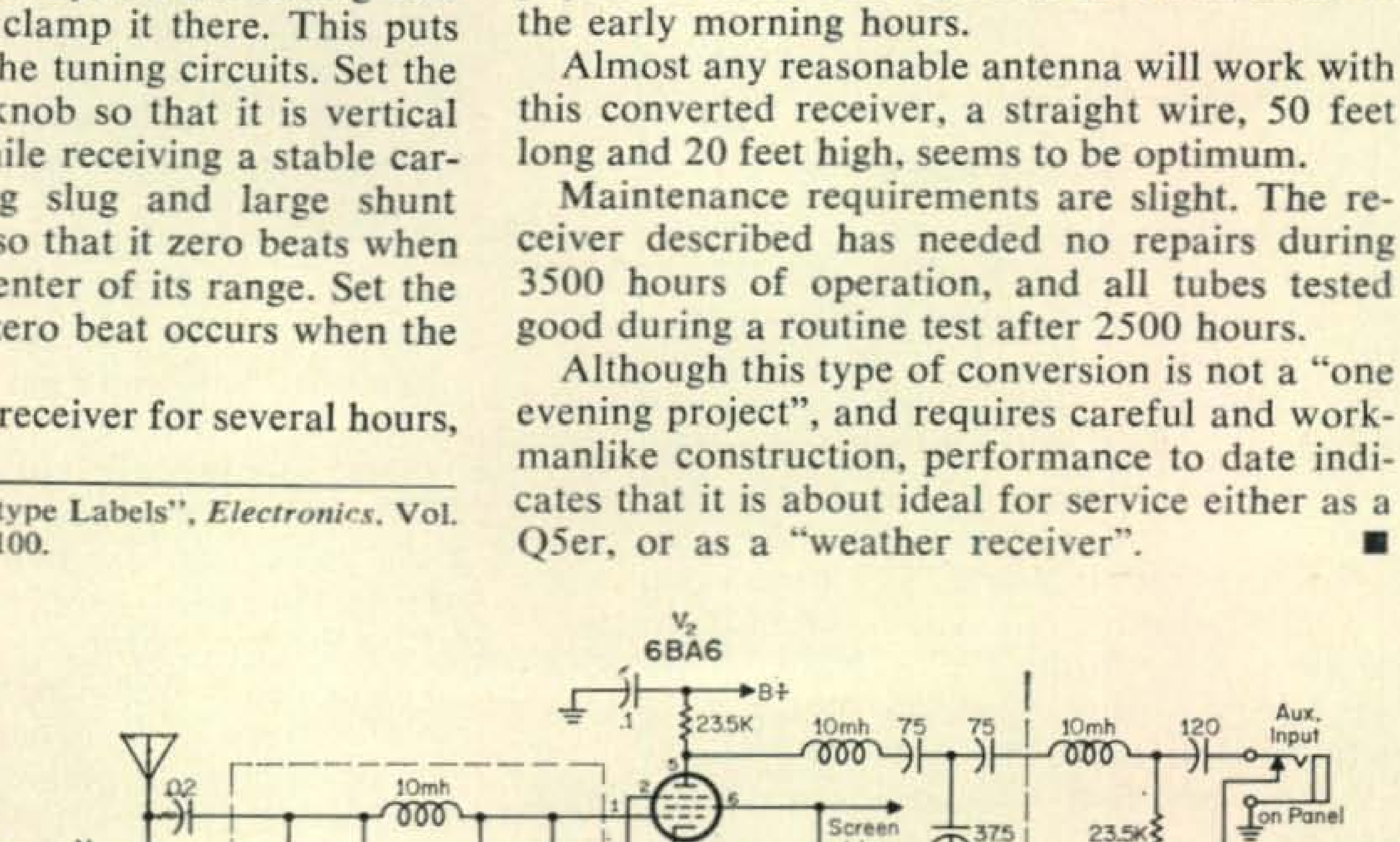


Fig. 7—Circuit of the band-pass input stage for the ARC-5. Its function is to reduce interference from strong broadcast band signals and prevent cross modulation.

ARC-3 on A.F.S.K. for 2 and 6

BY ROBERT HATFIELD,* K8JQX

If you operate, or are interested in operating, two or six meter a.f.s.k. utilizing the T-67/ARC-3 transmitter, this article should be of value to you. There are various means presently employed to generate and couple the audio frequency tones of a.f.s.k. to the transmitter audio modulator section. However, considerable complexity is usually added to the station wiring and the operation sometimes is not too satisfactory.

Those of you who have perused the schematic of the ARC-3 more than slightly are aware that V_{109} (sidetone amplifier) performs no useful function for the normal amateur operation of the ARC-3. In the military application, in conjunction with the tone oscillator, the function was to tell the pilot that the equipment was cycling after turn-on or during channellizing. In some installations it was wired to give voice side-tone as well (except this didn't really prove the signal was on the air or at the right frequency). The main subject is not V_{109} but is discussed only to illustrate some otherwise useless hardware which might be of value to the amateur and, we will come back to this circuit later to mention a possible use.

Audio Section

Now to the main theme, V_{106} (6J5), as normally employed, is the audio speech amplifier and is transformer coupled by T_{102} to drive the 6L6 modulators, V_{107} and V_{108}. The carbon mike input to V_{106} is coupled through transformer T_{103} and allied circuitry, including a set of relay contacts of K_{106}, to the 6J5 grid. Relay K_{106} is not energized in voice operation of the transmitter. There is a tone button on the remote control box which, when depressed, energizes K_{106} through pins 2 and 3 of plug P_{103} (the only use of P_{103}). Relay K_{106} also energizes during the channelizing cycle.

When energized, K_{106} effects the following: Disconnects audio input from mike transformer T_{103}; connects audio oscillator circuitry (consisting of T_{101}, C_{139} and R_{136}) to V_{106} and keys the transmitter through one set of contacts (as in the case of grounding the push to talk line in normal operation). This keying feature is particularly useful in employment of the transmitter for a.f.s.k. operation. The built-in tone frequency is 1000 c.p.s.

*11542 Fremantle Drive, Forest Park, Ohio, 45240.

Modification

Now we turn to the very few 'easy to make' changes which will permit your ARC-3 to do a self contained job of transmitting the two tones (2125 and 2975 c.p.s.) of a.f.s.k. Very conveniently, the only parts to be changed (R_{136}, C_{139} and C_{140}) are located on a fiber mounting board easily accessible on the right-lower-underneath side of the chassis. Remove the bottom cover and lay the transmitter on its right side bottom facing you. At the bottom edge of the chassis right side and approximately one third the distance from the rear, you will locate the reference parts mounting board. Just to its right is the audio-oscillator transformer, T_{101}. Parts designators are plainly visible except, possibly, R_{136}. It is the resistor on the right edge (nearest T_{101}), and may be any of about three different values depending on what model transmitter you possess. The capacitor nearest the bottom edge is C_{139} (0.01 mf) and is the tone-frequency tuning capacitor. The other capacitor adjacent or above is C_{140} and is the V_{106} grid coupling capacitor for tone operation (0.02 mf).

Remove these three parts, taking care not to damage C_{139} (0.01 mf). Remount C_{139} where C_{140} was mounted. Install a 12K half watt 20% carbon resistor in place of R_{136}. The lowering of the values of these two parts is necessary to improve the audio waveform and to avoid overdriving the modulator.

Values of the following capacitors to be used in replacement of C_{139} may require slight trimming or padding to obtain the exact a.f.s.k. frequencies for your particular transmitter. Mount a mica 2000 mmf (500 v.) in place of C_{139}. Then, to each terminal of C_{139}, add a mica 6000 mmf (500 v.) capacitor, leaving the other end of each capacitor unconnected.

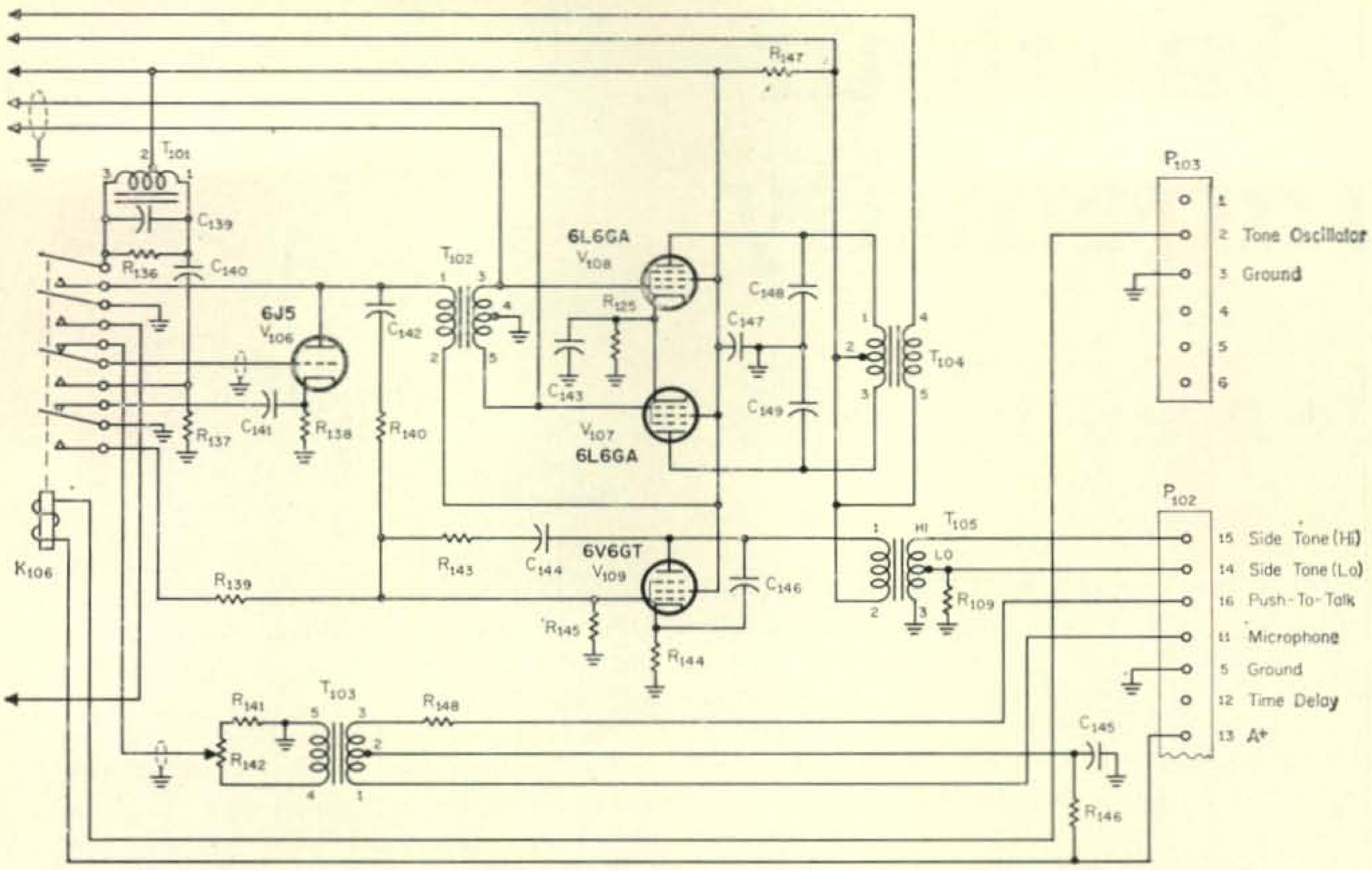


Fig. 1—A circuit of the audio section involved in the conversion of the ARC-3 to a.f.s.k.

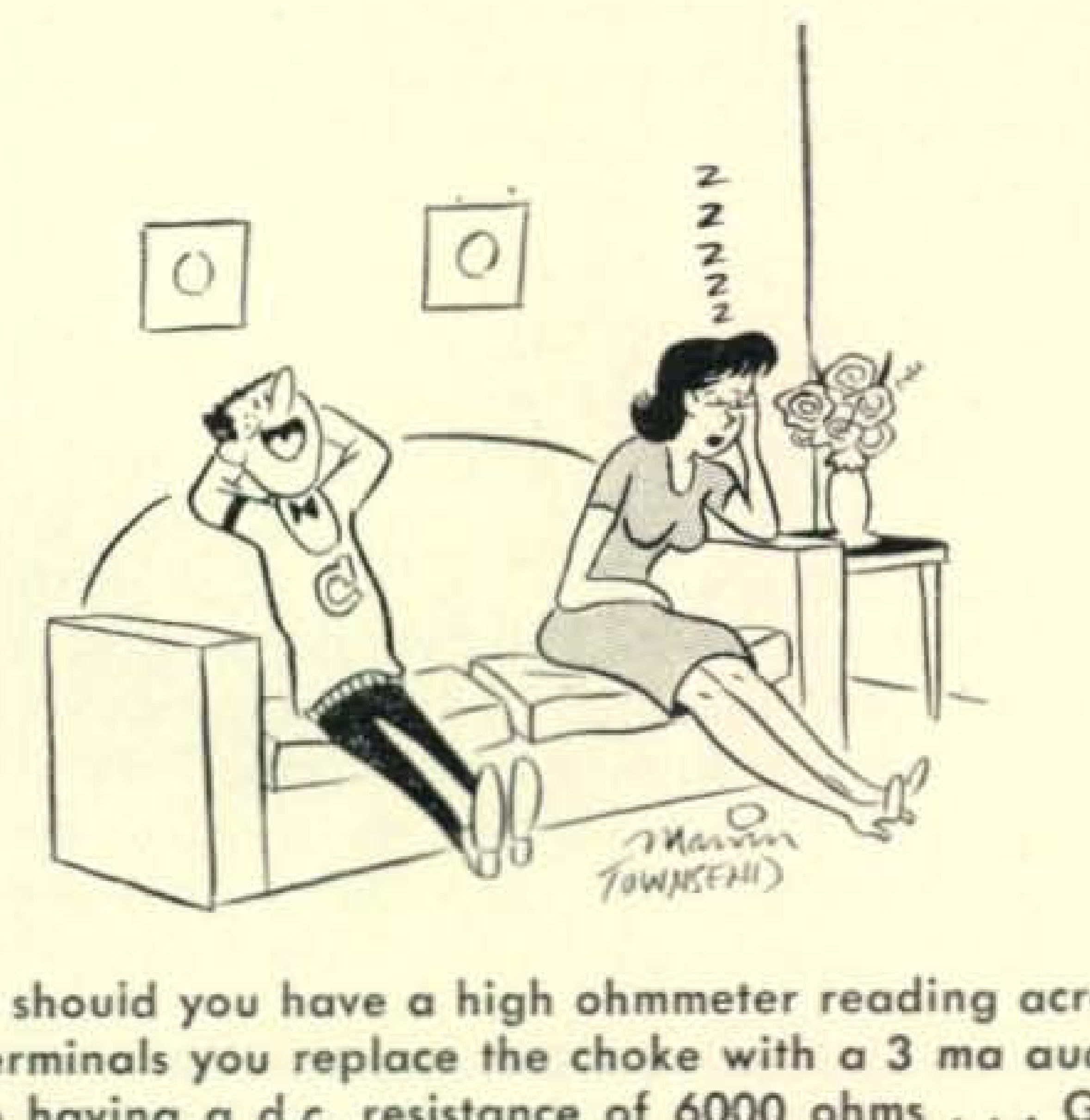
Tone Check

You should now perform a preliminary test to ascertain the accuracy of the tone frequencies. To accomplish this most easily, connect the output from the sidetone amplifier, pin 14 (low impedance) or pin 15 (high impedance) of plug P_{102} to your tu/converter, or whatever means you may have for audio frequency measurement. It may be wise to reduce the amplitude of the sidetone by connecting a volume control or other pad to avoid overdriving your tu/converter. With a dummy load connected to the r.f. output of the ARC-3 (for final protection), key transmitter by grounding pin 2 of P_{103} (to pin 3) and observe the tone for frequency. With the two 6000 mmf capacitors unconnected the frequency should be 2975 c.p.s. Close the open ends and the frequency observed should be 2125 c.p.s. If the frequencies are not within tolerance, make whatever changes are appropriate, remembering that changing the value of the '2000' mmf capacitor will effect the lower as well as the higher of the two frequencies.

Only one chore remains . . . that of providing the means of switching the capacitors for the two tone a.f.s.k. The author is using a miniature 7 pin Potter and Brumfield 12 v.d.c. relay which works very satisfactorily. The lead length from the relay switching contacts should be kept short as possible by mounting of the relay as near as possible to the parts terminal board. Relay and lead stray capacitance will lower both mark and space frequencies. The capacitor open ends are connected to a set of relay contacts which are closed with current on (*mark*) and open when current is off (*space*). The manner of connecting the relay coil to your keyboard and/or to the circuit is, of course, up to you.

In summary, aside from the treatment of the audio oscillator circuit for production of the a.f.s.k. tones, I am sure the bonus features of the sidetone amp output and the a.f.s.k. transmitter keying through P_{103} did not escape your notice. It is also possible to key the oscillator at V_{106} through semiconductor techniques and thereby eliminate the relay but the means described here, I feel, are more technically feasible for the majority with deeper involvement unnecessary.

One final word about two principles to which I adhere to for the use and adaptation of surplus gear in general. First, power it and use it as nearly as possible to original design and, second, to adapt to a purpose not intended, do so with greatest possible simplicity. ■



"And should you have a high ohmmeter reading across the terminals you replace the choke with a 3 ma audio choke having a d.c. resistance of 6000 ohms . . . Gee Marcia, it's nice to have a girl interested in my hobby."

Amateur Ingenuity

BY E. H. MARRINER,* W6BLZ

HAVE we lost our ingenuity or is it still there? One thing about Old Time Radio Amateurs was that they had ingenuity. The O.T. was noted for his fame in doing things in an inventive manner. For instance, he sawed a slot across the base of a 210 tube to keep the r.f. from arcing between the pins, ran a tube inverted in a jar of oil to get more power out of it, or used a piece of paper rubbed with carbon for a grid leak resistor.

If the O.T. wanted a crystal, he got out the hack saw and cut off a piece of Brazilian quartz and ground it down into a usable crystal. Crystal holders might take any form; one popular idea was to polish off the back of an earphone case, screw it to a board, lay the crystal on the surface, and put a polished penny on top of it with a wire attached. Tank coils for the transmitter were made out of a length of copper tubing obtained from the gas line of a car in the junk yard. When he demanded a panel it was a piece of hard masonite sprayed with a form of crackle paint. If a metal panel was needed it meant another trip to the junk yard for a piece of automobile hood that had to be pounded out flat with a mallet because sheets of aluminum were not available.

Construction of radio equipment was generally done on a board, sometimes waxed and polished or it might be just any old board. There were no chassis in those days until some bright lad took a cardboard candy box and covered it with tin foil. Out of this invention came the metal chassis, first of steel then of aluminum.

From this invention he found body capacity could be eliminated by sitting on a piece of metal and attaching it to the radio receiver; this reduced body capacity and he would not lose the signal when he let go of the dial. Grid coils for the TNT transmitter were made from a piece of broken broom stick for the coil form and fitted into an old fuse holder; it was now a plug in coil. I am sure many old operators can think of more illustrations. I can remember myself watching K6BAZ[1] putting up a Zepp antenna using chop sticks for the spacers. The point of all this discussion is, has the new generation of hams with their abundance of material manufactured from earlier inventions lost some of the old inventiveness? Have we reached a level of amateur development?

As recently as WWII some of this ingenuity came forth and produced some interesting results. Some illustrations I can recall were the clever receivers made from almost nothing in the prisoner-of-war camps; some were made from razor blades used as detectors, some from diodes smuggled into the camp in seams of clothing, one was made in a bottle with the tuning capacitor under the label. Here is the story I like:

Lt. Herb Dixon, ZL2BO, while a prisoner at Shampshupo, Argyle Street, prison camp, Hong Kong, started the most impossible task of collecting parts to build a receiver so that he could hear the BBC. The first parts for the collection took many months. An old Austin car provided wire, bolts and nuts and other miscellaneous metal parts.

As the months passed by the receiver began to take shape, and was kept hidden in the false bottom of a kerosene can buried in a mint garden. As parts became available it was dug up and more was added to it. The filter capacitors were made from tin foil taken from cigarette packages, cut into shape and impregnated with candle grease and sealed into small cans. The supply of cigarettes being limited, it took months of the camp's combined effort to fill the requirements.

Headphones were one of the most difficult things to make, and they took shape from cheese and sugar cans. The power transformer and filter choke took four months to finish because each lamination had to be hammered out flat from scrap metal. The chassis was the easiest part to make; it was a nice copper sterilizing tank just made for the project. All of the resistors were made from pencil leads of various lengths. The tuning capacitor was made from sheet metal slipped on a four inch nail fastened to a dial made from an auto horn part.

After most of the major components had been manufactured the vacuum tubes could not be obtained and were holding up the completion of the receiver. At this point the anticipation be-

[Continued on page 93]

*528 Colima Street, La Jolla, California.

[1] Not to be confused with K6BAZ today. This is the old Hawiian prefix of the thirties.

Johnston Island, four hundred and fifty acres of coral in the South Pacific, is fairly well represented in the amateur radio community. The above men are members of the Johnston Island Amateur Radio Club. The occasion for the gathering was the Charter Membership Picnic held Sunday, June 27, 1965. The accompanying letter with the photo had the following calls: W6PXP, K4MVA/6, K5UXF/6, W6LVX, W6HST, W5CXU, and KH6CRV. We don't know who is who, or who the other two are either.

A Group of Boy Scouts and Explorer Scouts of Atlantic City, N.J. watch John Gronlund work k2BFW, the Boy Scouts of America amateur radio station at the Johnston Historical Museum, New Brunswick, N.J. On Oct. 16-17, about 50,000 Scouts and leaders around the world will participate in the eighth Jamboree-on-the-air.

PEOPLE AND PLACES

Col. Ruben A. Osio Navas presenting the Radio Club Venezolano plaque to Ricardo Sierra Jr., CX2CO, for his outstanding success in World Wide DX competition. Looking on is Eduardo Cabrera, YV5AXU, in charge of public relations. Similar plaques were presented to Stuart Meyer, W2GHK, and Frank Anzalone, W1WY, CQ CONTEST CALENDER Editor for their respective contribution to the promotion of DX-peditions and contest competition. Col. Navas is president of the Circulo de Las Fuerzas Armadas where these awards and the CQ World Wide DX Contest Trophies were presented to YV9AA, YV5AKU, YV5BIG and CX2CO.
This was part of a 3 day program organized by the Radio Club Venezolano in celebration of the success of the YV boys in the CQ World Wide DX Contest in 1964.

Parents of a young singing group called the Scotia-Glenville Choralaires gather around Harold A. Hornbeck, K2DLD, as he relays messages from the group on a two week singing tour in Venezuela to their waiting parents. Harold is Director of the Schenectady Amateur Radio Association.

Guest operators and regular Navy personnel gather for a group picture at the close of Armed Forces Day Communications Tests last May. The tests included military to amateur cross-band operation on c.w. and RTTY.

DX

BY URB LE JEUNE,* W2DEC

SSB Honor Roll News

CEØXA pushed W2BXA to 303, WØQVZ to 303, K4TJL to 303 and G3AWZ to 301. CR5SP and CEØXA placed W2TP at 302 . . . Dorothy, K2MGE, added YA1A, PY7SC, CR8BH, CEØ-XA, and AC3H for a score of 296/301 and 300 certificate #11 . . . Mary, K8ONV to 269 with CEØAG, CR4, IS1, KG6S, MP4M, MP4Q, SVØWF, UG6, UH8, VK9TL, VQ1, VQ8AMR, VQ8, VS5, VU2NRA, XU, ZS2MI, 3W8, 7G1, 8Z4, 8Z5, 9M4 and ZL3VB. Doc, W4HUE, added CEØAG, CEØXA, CR4AJ, GC3MLR, SVØWGG, VP2LS, YA3TNC, YU3LB, ZL3VB, ZS8H, 5B4CZ and 5X5IU, for 231. 9X5, YO2, UP2, VU2NRA, KW6, 9M8, 9M4, TJ1, VS5, UH8, ZL3, KG6IJ, KS6, CR8BH and CEØXA pushed W3DJZ to 231. WØQLX enters the Honor Roll with some choice goodies which include CEØAG, MP4QBF, UG6, UL7, ZS3 and 4W1.

Here and There

AP Pakistan: Unable to get confirmation or logs from AP5HQ anymore. Cards on hand being returned with suggestion to AP5HQ direct. The above from W4LRN needs no explanation.

KA Japan: KA7DR is now QRT. Anyone still needing a card may reach Dick at 206 Gregory St., Fairfield, Calif.

OY Faeroes: Martin, OY7ML, passes along the following: "This is to inform you that for the coming DX season, we all will be very active and will also activate a club station with the call OY9FRA. That station will operate all 48 hours in the CQ-WW contest. Also in some other test. Many OY stations will be active in the CQ DX contest.

*Box 35, Hazlet, New Jersey 07730.

SSB DX HONOR ROLL

TI2HP	303	W1LLF	281	W4SSU	263	W6YMV	235
W2BXA	303	W6UOU	281	G2BVN	263	OZ7FG	233
K4TJL	303	W3KT	281	G3DO	260	W4HUE	231
WØQVZ	303	WA2IZS	281	W4RLS	259	W3DJZ	231
W2TP	302	G8KS	279	W6WNE	259	W2PTM	230
W2ZX	301	K4HYL	276	PJ2AA	258	WA2EOQ	229
G3AWZ	301	DL1IN	275	KP4CL	256	W6ZJY	227
5Z4ERR	300	HB9TL	275	K6LGF	250	W3FWD	226
W8PQQ	299	I1AMU	275	W1AOL	250	K1SHN	224
W3NKM	296	PZ1AX	274	W4OM	249	K2JFV	223
K2MGE	296	W6RKP	273	W4PAA	249	K4JEY	221
W2FXN	293	K9EAB	273	W4NJF	248	K1JMV	213
W4OPM	290	W2RGV	272	GM3JDR	246	SM5UF	208
W2VCZ	290	W2LV	271	XE1AE	246	WØQLX	205
K1IXG	288	G3NUG	269	YV5AFF	239	K6CYG	203
K8RTW	286	K8ONV	269	W7DLR	238	W6USG	203
W3MAC	281	G2PL	265	W3VSU	235	KØUKN	202

Since my last letter the following are licensed: OY2AD, OY2W, OY4R, OY5Q, and OY9FRA (club station) Foroyskir Radio Amatorar. Tnx very much for all and 73 from all OY stations."

SVØ Rhodes: SVØWF, John, is active daily on 14115 or 14240 at 0500 GMT and 2100 GMT. *(Tnx WGDXC)*

VKØ Macquarie Island: VKØTO has been active around 0500 GMT on 14173 a.m. He listens for s.s.b. in the American phone band. *(Tnx NEDXA)*

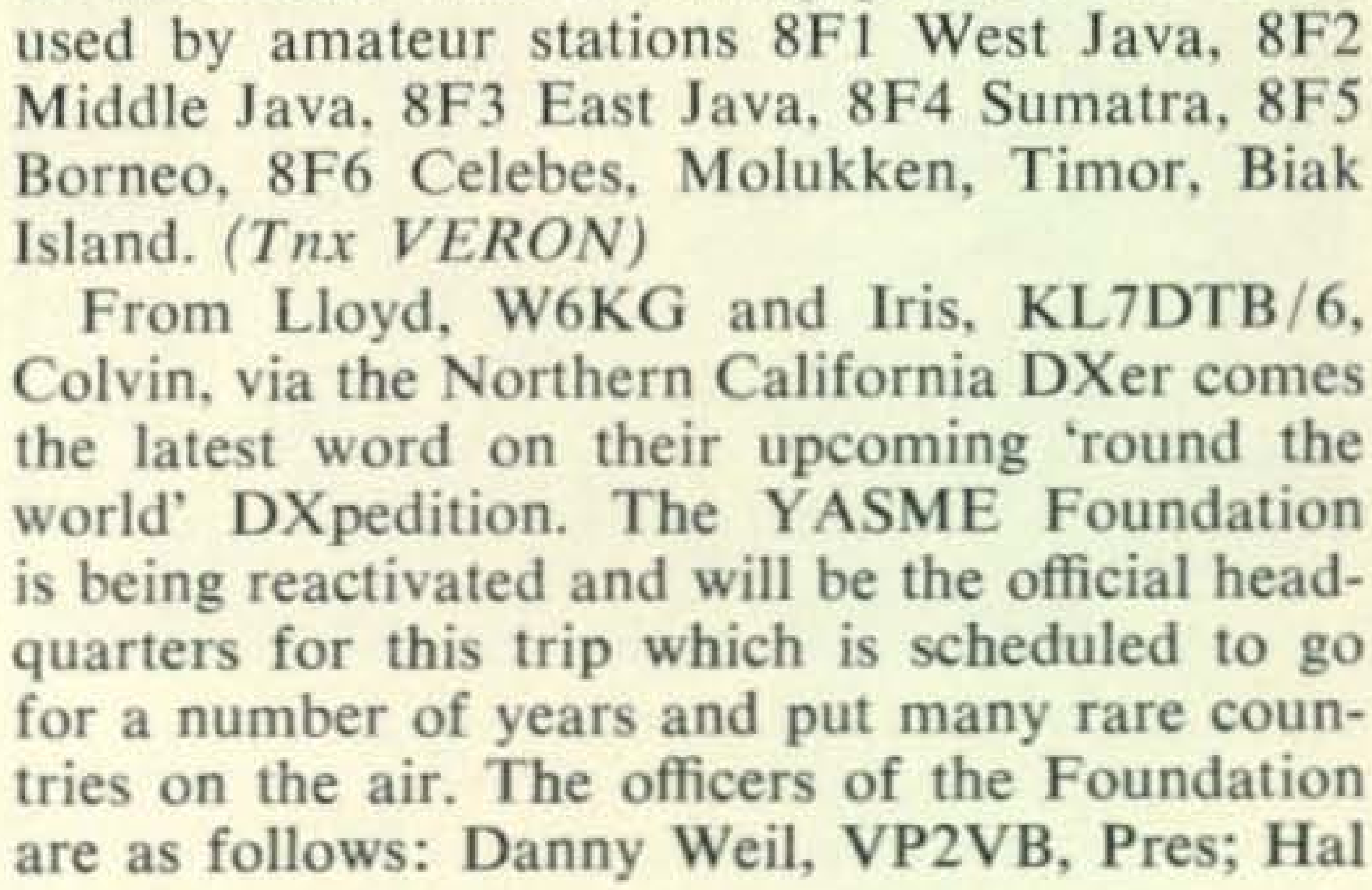
ZD9 Gough Island: ZD9BC has been active on 14240 both c.w. and a.m. phone. He prefers weekends and will be active for at least one year. *(Tnx LIDXA)*

ZS9 Bechuanaland: Mal, ZE3JO, passes along the following: "Please note that Ivan (ZS3JJ) and I hope to operate over the CQ contest weekend in November this year under the callsign of ZE3JJ/ZS9 and ZE3JO/ZS9. The QTH will be Francistown, Bechuanaland. Ivan's TX/Rx Viking Ranger and Drake 2B. Mine is a Viking Ranger II and Eddystone 888. All bands CW/Phone—no SSB. No gear for that mode, hi. All contacts to be QSLed via Buro but direct if sent direct."

4X4 Israel: WAØITX, Kal, left for a year's stay in Israel. He will operate both s.s.b. and c.w. on 80, 40, 20. He will be looking for contacts in the U.S., especially in the midwest. His QSL manager is Bob, WAØDXZ. Please send a s.a.s.e. with all QSL requests. Kal is age 17 and will go to college there while his father does research under a Guggenheim grant. *(Tnx WAØDXZ)*

8J Indonesia: The following prefixes are to be used by amateur stations 8F1 West Java, 8F2 Middle Java, 8F3 East Java, 8F4 Sumatra, 8F5 Borneo, 8F6 Celebes, Molukken, Timor, Biak Island. *(Tnx VERON)*

From Lloyd, W6KG and Iris, KL7DTB/6, Colvin, via the Northern California DXer comes the latest word on their upcoming 'round the world' DXpedition. The YASME Foundation is being reactivated and will be the official headquarters for this trip which is scheduled to go for a number of years and put many rare countries on the air. The officers of the Foundation are as follows: Danny Weil, VP2VB, Pres; Hal



This very neat station belongs to Mike, YV5BQF. Mike, operating 20 meters only has worked 280 countries WAZ and several other awards in only two years.

The following certificates were issued during the period from July 6th, 1965 to and including August 5th, 1965:

CW-PHONE WAZ

2186	KH6CUP	Harris F. Taurmoto
2187	SM7CAB	Nils Modeus
2188	K9JJR	Myron E. McCone
2189	DL3YQ	Heinz Schwaderlapp
2190	K9TZH	James E. Fenstermaker
2191	SM3AF	Sten Backlund
2192	SM6CCB	Bertil Ahlquist
2193	ZL1ARY	Ray W. Chandler
2194	W7AIB	Herman F. Helgesen

ALL-PHONE WAZ

306	LA5YE	Hallvard Heggtveit
307	SP8CK	Edward Kawczynski
308	ZL2UW	Noel Souper
309	WØLBB	Harris A. Fromhold
310	VE2WY	Ross Way
311	W1PST	Justin L. Wyner

TWO-WAY SSB WAZ

332	WØLBB	Harris A. Fromhold
333	VE2WY	Ross Way
334	W2WMG	George W. Rosch, Jr.
335	WA8AJI	Walter E. Miller
336	F2FO	Claude Paillard

CW WPX

663	OK3HM	Jozo Horsky
664	DJ9HA	Gunther Bruhl
665	HK4JC	Juan Caballero Amaris
666	OK2KOS	Radio Club of Poruba
667	LU7AU	Elisa S. De Margenat
668	DJ1RZ	Gerhard Polenz
669	WA6OET	Jessie Billon

PHONE WPX

119	DJ2YL	Susi Liebig
120	I1LCF	Fanti Dott Franco

MIXED WPX

113	WA6MWG	John P. Billon

200 TWO-WAY SSB

129	WØQLX	Even J. Maloney

300 TWO-WAY SSB

11	K2MGE	Dorothy Strauber

Sears, W5JLQ, Vice Pres; Ed Peck, W6LDD, Treas; Bob Vallio, W6RGG, Sec'y and QSL Manager. The directors are Frank Campbell W5IGJ, Bramblett Miller W6GNU; Golden Fuller W8EWS; Dick Spenceley KV4AA and J. M. Drudge-Coates G2DC. With the assistance of W5IGJ, the official news outlet for the DX-pedition will be the West Gulf DX Bulletin.

Lloyd and Iris plan to get underway the latter part of August and to the Pacific area first. At that time there will be a 'one time only' news bulletin giving all the particulars which will be sent to all the previous contributors of the Yasme Foundation. This will contain their itinerary, operating frequencies, and any other pertinent data. Future correspondence should be addressed to the Yasme Foundation, P. O. Box 2025, Castro Valley, Calif, USA. Incidentally, Lloyd and Iris are trying to sell their beautiful home in the Berkeley Hills area, complete with the 100′ rotating pole and welcome any inquiries.

This smiling couple is Yathe, 9M4JY and jr. op., Sheila. For 15 years Yathe has been a civilian wireless operator for the British Navy Station in Singapore. A quad helps Yathe put a big signal into the States.

LIDXA DXCC Contest

Here's a reminder to participants in the Long Island DX association's "First Annual DXCC Contest" that the contest ends at 0000 GMT on December 31, 1965. The LIDXA thanks one and all for their interest and participation and hopes that this effort to work all the DX in one year proved both interesting and instructive.

The Contest Committee is currently preparing unique trophies and certificates to award to the world's top scorers and encourages all contestants to submit their lists of confirmed conutries (at least 100 necessary) so that they may be considered in the judging. Don't forget that ARRL DXCC rules apply to this contest.

Send your list of confirmed countries to LIDXA Contest, POB 599, Lynbrook, N.Y. 11563 with postmarks no later than March 15, 1966. If yours is among the top qualifying scores in your country or in each of the USA, Canadian, or Australian Districts, you will be requested to submit proof of confirmations. A complete list of winners will be published as soon as the LIDXA Committee, comprised of Joe Hellmann, W2MES; Dorothy Strauber, K2MGE; Win

This chap who looks like he has just arrived from the golf course is Bing, G3NMQ. Bing may be a little more familiar as ZC4BC, 5A3BC, MP4MAQ/HZ, MP4QBG, MP4DAH, or EI2AT.

This is ZB2AE, Peter Holmes, who made the first 160 meter W/ZB2 QSO when he worked W1BB. 160 meters should start perking up about the time you read this.

Tames, WA2QNW and Marv Fricklas, W2FGD, tabulates the results.

The W-CR7-A

The League of Radio Amateurs of Mocambique (LREM) have made available a new award to be known as W-CR7-A for any foreign amateur station submitting proof of having worked 15 licensed CR7 stations, either in phone, or c.w. in any amateur bands, except ZS, ZE, VQ2, VQ3, VQ4, VQ5, OQ, FB8 and CR6, which have to prove 25 QSOs instead of 15.

Contacts must have been made after January 12, 1949. QSL cards must be accompanied by a list but if any QSO has not been confirmed, this may also be mentioned in the list and the LREM Secretary will do his best to obtain the missing confirmation(s). The cards, list and 5 IRC's must be sent to: Liga Dos Radio Emissores De Mocambique, POB 812, Lourenco Marques, Mocambique.

The Herzlia Diploma to commemorate the celebration of 40 years Herzlia will be issued to all licensed amateurs for contacting any amateur located in or around the town of Herzlia. The QSOs are to be from 1/9/65 until 1/10/65. In order to facilitate identification of an amateur located in the Herzlia area, the suffice/H will be added to the call sign. Ex: 4X4AA/H.

The number of points necessary in order to qualify for the diploma is 4.

A QSO with any station located in or around Herzlia will count for 1 point except for a QSO with the Herzlia Club Station 4X4 QG/H which will count toward 2 points.

It is allowed to contact the same station on different bands in which case each QSO will count as an extra point.

The bands to be used: 3.5—7.0—14—21—28 mcs on all modes.

A medal will be given to the foreign amateur for having collected the largest amount of points.

For s.w.l. the same rules apply. They can qualify for a Herzlia Diploma when they have accumulated the required number of points. An extract of the log and 4 IRC are to be sent in order to apply for the diploma. Last date for sending in logs Nov. 15, 1965. Address to which the logs should be sent POB 65, Herzlia, Israel.

Amateur stations located in or around Herzlia are: 4X4HI/H, 4X4IX/H, 4X4MC/H, 4X4-NNG/H, 4X4NVG/H, 4X4NY/H, 4X4ON/H, 4X4OZ/H, 4X4QG/H, 4X4RW/H, 4X4TD/H, 4X4TV/H.

QTH's and QSL Managers

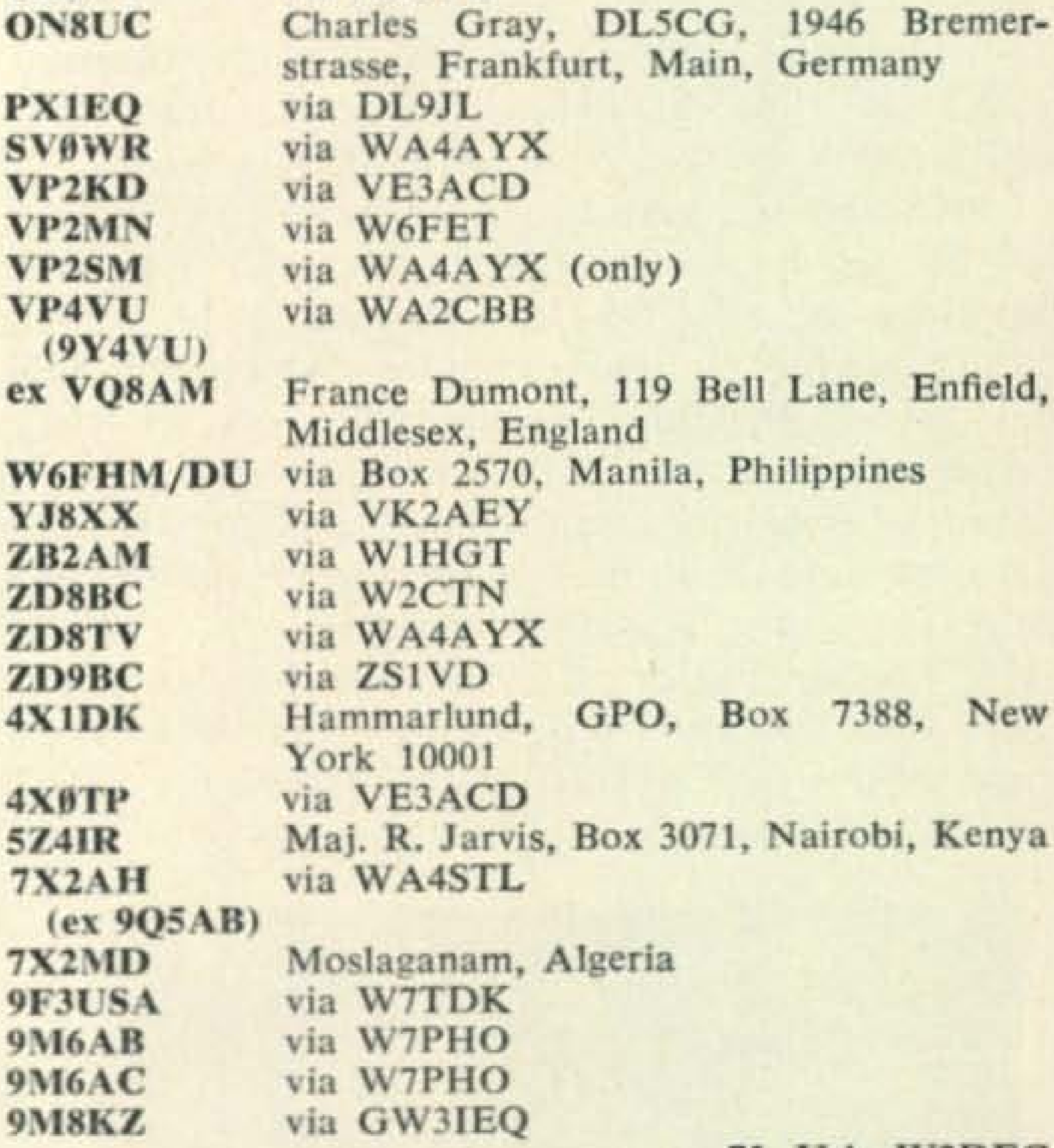
The Florida DX Report has a six page list of QSL managers in its August report. They have this issue available for non-members at $.50. It's well worth it.

Drop W4LVV $.50 for your copy. His QTH is 2210. S.W. 27th Lane, Miami, Florida.

Doty Tullos, WA5ENK, wishes to offer her services as a QSL manager. Her address is 5795 North Circuit Drive, Beaumont, Texas 77706.

CP0DJ	via K0WGY
DL0ITU	via DJ7SW
DU1MR	via VE4OX
F7CP	via W2ZRX
F0BB	via ON4FU
F0BC	via ON4QJ
FP8CV	via W2GKZ
HK3AFB	via K8VDV
HM1AX	via WB6GVV
JY1AU	via W8HMI
KH6EDX/M1	Box 400, Verona, Italy
KH6FJL/6	John Fail., 6170 Downey Ave., Long Beach, Calif.
KP4BPG	via K6UTU
KZ5AY	via K6CYG
LA5CI/P	via LA1NG
OD5AI	Box 4846, Beirut, Lebanon
OH0FZ	via DJ4SO
OH0VF	via OH5VD
ON8UC	Charles Gray, DL5CG, 1946 Bremerstrasse, Frankfurt, Main, Germany
PX1EQ	via DL9JL
SV0WR	via WA4AYX
VP2KD	via VE3ACD
VP2MN	via W6FET
VP2SM	via WA4AYX (only)
VP4VU (9Y4VU)	via WA2CBB
ex VQ8AM	France Dumont, 119 Bell Lane, Enfield, Middlesex, England
W6FHM/DU	via Box 2570, Manila, Philippines
YJ8XX	via VK2AEY
ZB2AM	via W1HGT
ZD8BC	via W2CTN
ZD8TV	via WA4AYX
ZD9BC	via ZS1VD
4X1DK	Hammarlund, GPO, Box 7388, New York 10001
4X0TP	via VE3ACD
5Z4IR	Maj. R. Jarvis, Box 3071, Nairobi, Kenya
7X2AH (ex 9Q5AB)	via WA4STL
7X2MD	Moslaganam, Algeria
9F3USA	via W7TDK
9M6AB	via W7PHO
9M6AC	via W7PHO
9M8KZ	via GW3IEQ

73, Urb, W2DEC



This happy looking chap is John, KH6FJL. John is now stationed in California but managed to make WAZ just prior to leaving KH6 land.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

September	**25-26**	**S A C Phone**
September	25-26	RSGB 21/28 mc Phone
September	25-26	MARC VE/W
October	2-4	Massachusetts QSO Party
October	2-3	WADM C.W.
October	2-3	Oceania DX Phone
October	9-10	Oceania DX C.W.
October	16-17	RSGB 7 mc Phone
October	16-17	ARRL CD Phone
October	23-24	ARRL CD C.W.
October	20-21	YLAP C.W.
October	**23-24**	**CQ WW DX Phone**
October	30-31	New Hampshire QSO Party
October	30-31	VU2/4S7 DX C.W.
November	3-4	YLAP Phone
November	6-7	VU2/4S7 DX Phone
November	6-7	RSGB 7 mc C.W.
November	13-14	ARRL SS Phone
November	20-21	ARRL SS C.W.
November	**27-28**	**CQ WW DX C.W.**

S A C Phone

Starts: 1500 GMT Saturday, September 25.
Ends: 1800 GMT Sunday, September 26.

The c.w. section of the Scandinavian Activity Contest has already taken place. Full coverage of rules was given in the August CALENDAR.

Mailing deadline for your logs is October 15th and this year they go to: The NRRL Traffic Department, P.O. Box 6594, Rodelokka, Oslo 5, Norway.

RSGB 21/28 mc Phone

Starts: 0700 GMT Saturday, September 25.
Ends: 1900 GMT Sunday, September 26.

With the sun spots now on the rise and conditions slowly improving, this one should increase in popularity. Check last month's CALENDAR for details.

Mailing deadline is October 15th and your logs go to: R.S.G.B. Contest Committee, 28 Little Russell Street, London, W.C.1, England.

MARC VE/W

Starts: 2300 GMT Saturday, September 25.
Ends: 0200 GMT Monday, September 27.

There were a few modifications made in the rules from previous years so it might be well to check them in last month's CALENDAR. Canadian geographical areas (13) will now be used as the multiplier instead of call areas (9) and the power multiplier is now 1.5 for 200 watts or less.

This year your logs go to: Contest Chairman, R. A. Eberts, VE2AE, 1535 St. Croix Blvd., St. Laurent 9, Quebec, Canada. Mailing deadline is November 8th.

*14 Sherwood Road, Stamford, Conn. 06905.

Massachusetts QSO Party

Starts: 2300 GMT Saturday, October 2
Ends: 0500 GMT Monday, October 4

The annual Massachusetts QSO Party is once again sponsored by the M.I.T. Radio Society to promote friendship and operating ability.

Exchange: QSO number, RS/RST report and county, (for Mass. stations) state or province for others.

Scoring: Two points for each completed exchange. Mass. stations multiply the number of QSO points by the different states and Canadian provinces worked to determine their final score. Outside stations will multiply their QSO points by the number of different Mass. counties contacted. (A maximum of 14)

Log Data: Date/time in GMT, QSO number sent and received, station worked, signal report sent and received, and county, state or province. Also indicate band and mode used.

Frequencies: C.W.–3560, 7060, 14060, 21060, 28060. a.m.—3990, 7260, 14230, 21310. s.s.b.—3960, 7220, 14290, 21410. Novices—3735, 7175, 21110. A station may be contacted once on each band, phone and c.w. segments will be considered as separate bands. Crossband contacts are not permitted.

Awards: Certificates to the highest scoring station in each state, province and Mass. county. Additional awards if returns warrant them.

Include a summary sheet with your name and address and include a signed declaration that the rules of the contest and the regulations of your country have been observed.

Mail your log no later than October 25th to: M.I.T. Radio Society, W1MX, Box 558, 3 Ames Street, Cambridge, Mass. 02139.

WADM C.W.

Starts: 2000 GMT Saturday, October 2.
Ends: 2000 GMT Sunday, October 3.

This is a new activity sponsored by the Radioclub of the German Democratic Republic and will be held the first full weekend in October each year. It's the world working the DMs on c.w. and all bands.

Complete rules of the contest and a list of the 15 DM districts that will be used as the multiplier appeared in last month's CALENDAR.

Mailing deadline for your logs is October 30th and they go to: The Radioclub of the GDR, DM Contest Bureau, P.O. Box 30, 1055 Berlin, German Democratic Republic.

VK/ZL/Oceania DX

Phone—Oct. 2-3. C.W.—Oct. 9-10.
Starts: 1000 GMT Saturday Ends: 1000 GMT, Sunday in each instance.

This year's contest is being run by the Wireless Institute of Australia and by a new committee. A few modifications have been made in the rules but they are minor and covered in last month's CALENDAR. Awards are now based on all band operation only and at least 3 entries must be received from a country or the contestant must score at least 500 points to be eligible.

Your logs must be in the hands of the committee no later than January 15, 1966. Mail them to: W.I.A. Contest Committee, Box N1002, G.P.O. Perth, Western Australia.

YLRL Party

C.W.—Oct. 20-21. Phone—Nov. 3-4.
Starts: 1700 GMT Wed. Ends: 2300 GMT, Thursday in each instance.

The party is open to all YLs and XYLs throughout the world. There will be certificates for all winners and Gold Cups for the top scoring members of the Young Ladies' Radio League.

See Louisa Sando, W5RZJ's YL Column on page 94, September for details. Mailing deadline is November 24 and reports go to: Kayla Bloom, WØHJL, 175 So. Jasmine St., Denver, Colorado.

RSGB 7 mc DX

Phone—Oct. 16-17. C.W.—Nov. 6-7.
Starts: 1800 GMT Saturday. Ends: 1800 GMT, Sunday in each instance.

It's the world working the British Isles on 40 meters in the 4th RSGB 7 mc DX contest. The following prefixes constitute the British Isles: G, GB, GC, GD, GI, GM and GW.

1. Contacts must be made in that portion of the 7 mc band for which the entrant is licensed. Only one contact with the same station is permitted, of course, and duplicate contacts must be shown but no credit taken.

2. Entries may be Single operator or Multi-operator.

3. Serial numbers will consist of the usual five and six figures; RS/RST report plus a progressive three figure contact number starting with 001 for the first contact.

4. Contact point value varies according to the continental location of the station working a British Isle station.

Europe 5 points, North America 15 points, South America, Africa and Asia 25 points, and Oceania 50 points for each contact.

An additional bonus of 50 points may be claimed by overseas stations for the first contact with each British Isles country-numeral prefix. i.e. G2, G3, GB2, GC2, GI3 and *etc.*, a possible 37 in all.

5. Your final score, therefore, will be the sum of QSO points and bonus points; no multiplier.

6. Log sheets should be columned and show in this order: Date/time in GMT, station worked, serial number sent, received, bonus points and total points claimed.

7. Each entry should also include a summary sheet with your call, name and address in BLOCK LETTERS, claimed score and other pertinent information about your equipment. And don't forget the usual signed declaration that all rules and regulations have been observed.

8. Certificates will be awarded to the leading station in each country and each call area in the following countries: VE, VK, W/K, ZL and ZS; provided that the log contains 20 or more valid contacts.

There is also a listeners' section with rules, scoring and logging the same as indicated for the transmitting section. Overseas stations should log British Isles stations only.

Log should show in this order: Date/time in GMT, station heard, number sent, station being worked, bonus points and points claimed.

Mailing deadline is November 22nd and they go to: R.S.G.B. Contest Committee, 28 Little Russell Street, London, W.C.1, England.

VU2/4S7 DX

C.W.—Oct. 30-31. Phone—Nov. 6-7.
Starts: 0600 GMT Saturday, Ends: 0600 TMT, Sunday in each instance.

This is the second DX contest organized by the joint Radio Societies of India and Ceylon.

Phone and c.w. are separate contests, all bands

[*Continued on page 103*]

1965 CQ World Wide DX Contest

Phone

Starts: 0000 GMT Saturday, October 23.
7:00 P.M. EST Friday, October 22.
4:00 P.M. PST Friday, October 22.
Ends: 2400 GMT Sunday, October 24.
7:00 P.M. EST Sunday, October 24.
4:00 P.M. PST Sunday, October 24.

C.W.

Starts: 0000 GMT Saturday, November 27.
7:00 P.M. EST Friday, November 26.
4:00 P.M. PST Friday, November 26.
Ends: 2400 GMT Sunday, November 28.
7:00 P.M. EST Sunday, November 28.
4:00 P.M. PST Sunday, November 28.

Part of the crew at YV5AKU, the 1964 Phone Champions in the Multi Transmitter division. L. to r.—Pete, YV5-AFH; Ed, YV5AKP; Ralph, YV5AHG and sitting is John, YV5AKU himself. Missing are YV5AQS and YV5BED. Who will be this year's Champs?

Propagation

BY GEORGE JACOBS,* W3ASK

THE 1965 *CQ* World Wide DX Contest will be held on the following dates: Phone Section: October 23-24. C.W. Section: November 27-28.

Continuing the practice of the past fourteen years, this month's PROPAGATION column is devoted to a special forecast for use during the 1965 contest. For those readers interested in the accuracy of the forecasts made during previous contests, last year's forecast ranged between "fairly accurate" to "you hit it right on the nose." The score for the phone and c.w. section forecasts for the past fourteen years stands at: highly accurate predictions 21 times, fairly accurate 5 times, and missed the mark completely 2 times.

Sunspot Cycle

The new sunspot cycle continues to rise, but at a very slow pace. The Swiss Federal Solar Observatory at Zurich reports a monthly mean sunspot number of 12 for July, 1965. This results in a smoothed sunspot number of 11.9 centered on January, 1965. A smoothed sunspot number of 25 is forecast for October and 27 for November, 1965. This is approximately the same level of solar activity that last occurred during the 1963, and before that, during the 1952 contest periods.

General Forecast

10 Meters—As a result of the seasonal increase in daytime maximum useable frequencies, and because of the increase in solar activity, a considerable improvement in DX conditions is forecast for October and November on the 10 meter band. Good openings are expected during the daylight hours from all areas of the United States to all areas of South America. Other openings are likely to occur to Africa, the Pacific Islands, Australia and New Zealand. On days when propagation conditions are above normal, openings may also be possible from Eastern and Central USA to Europe, and from Western USA to the Far East ad Southeast Asia. The band will peak on circuits from the east shortly before noon, on circuits from the south during the early afternoon hours, and on circuits from the west during the late afternoon hours. If propagation conditions are normal or better during the 1965 contest, conditions on 10 meters are expected to be better than they have been since 1962.

15 Meters—An improvement in DX conditions is also forecast on this band for October and November. Good openings are forecast to almost all corners of the world from shortly after sunrise, until shortly after sunset. The band is expected to peak to Europe before noon; to Africa at noontime; South America during the afternoon hours, the Pacific, New Zealand, Australia, Far East and Asia during the late afternoon and early evening hours. During many openings, signals are expected to be exceptionally strong. During the contest, 15 meters is likely to be the best DX band during the early afternoon hours.

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for October

Days	(4)	(3)	(2)	(1)
	Forecast Rating & Quality			
Above Normal: **7, 15, 21, 26**	A	A-B	B-C	C
Normal: **1, 4, 6, 8-12, 14, 16-17, 20, 24-25, 27-28, 31.**	A-B	B-C	C-D	D-E
Below Normal: **2-3, 5, 13, 18, 22-23, 29-30.**	C	C-D	D	E
Disturbed: **19.**	D	D-E	E	E

HOW TO USE THESE CHARTS

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

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

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

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

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

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

6—The Eastern USA chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through Nov. 30, 1965, and are prepared from basic propaganda data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

20 Meters—Twenty meters is expected to close earlier in the day than it did during the summer months, but fair to excellent world wide DX conditions are forecast from sunrise through the early evening hours. Many circuits to southern and tropical areas may remain open during the hours of darkness as well. Conditions are expected to peak on this band shortly after sunrise and again during the late afternoon and early evening hours, often with exceptionally strong signal levels. During these peak periods, 20 meters will be the best band for DX openings.

40 Meters—A seasonal improvement is expected for DX conditions on 40 meters as absorption and static levels decrease from summertime peaks. The band is expected to open for DX during the late afternoon hours, and remain open to one area of the world or another until shortly after sunrise. During most of the hours of darkness, 40 meters is expected to be the optimum band for DX openings, with signal levels often exceptionally

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

strong.

80 Meters—Night time propagation conditions are expected to improve to many areas of the world during October and November as static levels decrease. While generally not as good a night time DX band as 40 meters, some fairly good DX openings are forecast to some areas of the world during the hours of darkness and the sunrise period.

160 Meters—While a much poorer DX band than 40 or 80 meters, some DX openings are forecast for 160 meters during the night time hours and the sunrise period. Because of low power limitations imposed in this band in many areas of the world, signals are likely to be very weak and noisy, especially on phone.

For a more detailed circuit-by-circuit forecast please refer to the special contest *DX Propagation Charts* appearing on the following pages. Instructions for the proper use of these Charts are given in the box following the "Last Minute Forecast" at the beginning of this column.

Contest Work Plans

The *DX Propagation Charts* on the following pages show the times that each amateur band from 10 through 160 meters is expected to open from the United States to all other areas of the world. The information contained in the charts can be easily re-organized into operational work plans, or schedules, which can serve as a guide during the contest periods for piling up as many points as possible. For example, from data appearing in the charts, the following 20 meter operational schedule has been devised which shows the optimum time for working various areas of the world on this band. A Western USA QTH has been chosen for this example, but similar schedules can be devised for other QTHs and other bands.

Sample 20 Meter Operating Schedule for Western USA QTH

Time PST	*Areas to which openings should be possible*
00-03	No good openings predicted (good time for sleeping).
00-06	No good openings predicted (good time for sleeping).
06-09	Europe, North & East Africa, Eastern Mediterranean, Central & Southeast Asia, Pacific Islands, New Zealand and Australia, South America, Antarctica.
09-12	Europe, North, West & Central Africa, Southeast Asia, Pacific Islands, Australia and New Zealand, South America.
12-15	West, Central & South Africa, Far East, South America.
15-18	West, Central & South Africa, Pacific Islands, Australia and New Zealand, South America, Far East.
18-21	Central & Southeast Asia, Far East, Pacific Islands, Australia and New Zealand, South America, Antarctica.

The following is a typical *multi-band* operational schedule based on an Eastern USA QTH. The schedule shows the times and bands when propagation conditions are expected to be optimum to various parts of the world.

Sample Multi-Band Work Plan for Eastern USA QTH

Time EST	*Optimum Band*	*Areas Open*
00-03	40 M.	Europe, Pacific Islands, Australia and New Zealand, South America, Antarctica.
03-06	40 M.	Europe, Pacific Islands, Australia and New Zealand, South America, Central & Southeast Asia, Far East.
06-09	20 M.	Europe, West & Central Africa, Central & Southeast Asia, Far East, South America, Pacific Islands, Australia and New Zealand, Antarctica.
09-12	15 M.	Europe, Africa, Eastern Mediterranean, South America, Antarctica.
12-15	15 or	Europe, Africa, South America, Antarctica.
	20 M.	Europe, Eastern Mediterranean, Africa, South America.
15-18	20 M.	Europe, Africa, South America, Antarctica.
18-21	20 M.	Central & Southeast Asia, Far East, South America, Pacific Islands, Australia and New Zealand.
21-00	40 M.	Europe, Eastern Mediterranean, Africa, South America.

Similar type operating schedules can be devised from the charts for other operating conditions and QTHs.

Up-To-The-Minute Forecasts

Check WWV for the latest information on propagation conditions during the contest periods. WWV broadcasts propagation information on 2.5, 5, 10, 15, 20 and 25 mc twelve times every hour. The data is transmitted at 4½ minutes past the hour, and repeated every five minutes thereafter. Given in Morse Code, the transmissions consist of the letter N, W, or U followed by a number ranging between 1 and 9. The letter designations apply to propagation conditions as of the time of broadcast, and have the following meanings:

W—Ionospheric disturbance in progress or expected.
U—Unstable conditions, signals subject to fading and noise.
N—Conditions normal, no warning necessary.

The number designations apply to propagation conditions forecast for the subsequent 6 hours, and have the following meanings:

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

If, for example, propagation conditions are normal at the time the forecast is issued but are expected to become "poor-to-fair" during the next six hours, the forecast announcement would be broadcast as N4 in Morse Code.

Up-to-the-minute propagation data can also be obtained by telephone from the CRPL Radio Warning Centers at Fort Belvoir, Virginia for the North Atlantic area, and Anchorage, Alaska for the North Pacific area. The telephone number for this service at Fort Belvoir is Area Code 703, 780-1444, and at Anchorage it is Area Code 907, 753-2211 or 753-7210. Information on current radio propagation conditions can be obtained from Fort Belvoir 24-hours a day, and from Anchorage between 0800 and 1700 Alaskan Standard Time.

C.W. Contest Forecast

The *Propagation Charts* appearing in this month's column are valid for *both* the phone and c.w. periods of the contest. *Be sure to retain the charts for use during next month's c.w. period.* The charts appearing in next month's column will contain Short-Skip forecasts for November and December, 1965. Short-Skip information for October appeared in last month's column. Good luck in the contest. 73, George, W3ASK

[*Charts Begin On Page 97*]

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

WE have been receiving a great number of letters from CB enthusiasts who are thinking about becoming hams in view of the measures taken by the FCC against hobby-type CB operations. We of course welcome these letters.

The most frequently asked questions from CB'ers are these: is it easy to convert an 11 meter CB set for 10 meter operation or other ham bands? Is the code really hard to learn and what is the best way to learn it? How long does it take an average person to learn enough theory to be able to pass the general type class ham examination? Why not (through *CQ*) encourage the establishment of ham operators' schools throughout the country for CB'ers and anyone else interested in communications as a hobby? What do *you* think about devoting some ham radio frequency space for CB hobby operations?

Before answering these questions (to which I cannot devote too much space), I would like to point out that I *too* have a CB license, as well as an extra class and commercial licenses. Many hams are also CB'ers and there should be no conflict between the two at all.

CB Set Conversion

Converting the average 11 meter CB set for 10 meter operation is no problem at all. In many cases the tuned circuits in the CB sets will operate at 28.5 mc and up very well without extensive modifications. Perhaps a turn or two of wire must be removed from some coils (including the coil in the final stage) but this is not difficult.

Usually, an oscillator that will operate with an 11 meter crystal will operate nicely with a 10 meter crystal. An advantage to ham operation is of course the fact that one need only stay within the ham-bands—there are no assigned channels. If you have the proper class of license, you can use any frequency in any of the ham-bands.

About the only instrument one needs to modify a CB set to a ham set is a grid-dip meter. However, if the CB'er ham wants to use his set on the lower bands (15,20,40,&80 meters), then for this the CB set must be really redesigned, *new* coils installed, etc.

Remember, a set certified for CB operation when it is once modified (unless just the crystals are changed) *cannot* be used for CB operation. Any modifications that might affect modulation, frequency stability and tolerance etc., of a CB set *must* be performed by a properly licensed commercial operator if the set is again to be used for CB operation.

Learning the Code

A number of methods have been (and are) advocated for learning the code and all have their merits. Like learning a new word, each letter of the alphabet must be repeated often enough to recognize it among others *by sound* and not by sight. This takes a lot of consistent practice.

I believe the code is not difficult to master if one is interested. On the other hand, if the code is thought of as a chore and an "evil," the psychological block is established and the task is indeed made difficult.

Learning the code takes time, patience, interest and *help*. Although I learned the code by myself and can copy over 50 words per minute, I realize that had I had some help, my task would have been much easier—but what was I to do in a town of 10,000 people in 1932 where there were no hams? I learned the code by sending to myself, listening to an old regenerative receiver and coyping what I could.

Those who first learn the code by sight (by memorizing dots and dashes visually) have the hardest time. Memorize the code by sound.

Passing the General Class Exam

A high school graduate who has had some study in math and physics can, if he is interested, learn enough theory *through* books available, in 8-9 weeks to pass the general class examination. This means a study period every day of at least 1½ hours.

If a local radio club sponsors a school (as many do), one can, with help, pass the examination in even less time if he diligently attends *all* classes. I recommend the school as a means for getting the ham license.

Donating Ham Frequencies to CB'ers

I have been a ham longer than I have been a CB'er. I do *not* like or advocate the idea of "donating" any ham frequencies to CB'ers for hobby purposes. I do believe though (and strongly suggest) that certain frequencies in the present CB 11 meter band be set aside by the FCC for CB hobby communications. Why? Because sooner or later if this is done, there will be a number of ham "converts."

The FCC would save itself many future headaches if it designated say 5 channels in the present 11 meter CB band for CB hobby communications *and* permit the CB'er to work hams cross band (from 11 to 10 meters).

Five watts of r.f. on 10 and 11 meters (when these bands are open) can go a long way. I remember talking to Hawaii on 10 meters from California with ½ watt when 10 was open—quite a thrill.

The moment *anyone* attempts to take fre-

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

quencies away from the hams for any other service, you can bet the hams will be more forceful the next time.

Questions

SB-400 l.s.b. Operation—"My Heath SB-400 transmitter has given me real fine service and I am happy with it. The other day, however, it refused to work on lower sideband. What should I check?"

Suggest you check V_{2A} (6AV11). If this is okeh, then check the 3393.4 kc crystal. If the crystal checks out then check the components in the circuits of V_{2C} and V_{2A}.

Silicon Diode Replacements—"Why are silicon diodes placed in series? Why do circuits containing them show resistors (and sometimes capacitors) in parallel with them?"

Silicon diodes are connected in series to permit higher peak inverse voltage (p.i.v.) operation. To figure the number of diodes needed for a specific p.i.v., multiply the voltage (r.m.s.) delivered by the power transformer by 1.4 (both legs of a full wave circuit), then divide the p.i.v. rating of the diodes into this. Then as a safety factor boost this by 40 to 50 per cent.

Resistors across diodes are voltage equalizing components. They are used because diodes are seldom uniform in back resistance characteristics. When used together, diodes (even of the same type) do not have equal voltage division. The parallel resistor (across each diode) should have a resistance lower than the back resistance of the diode—this will often be between 75K and 400K ohms.

The capacitor (usually ceramic) across the diode and resistance is used for suppressing transient voltage spikes. Its value will vary from .01 mfd to .03 mf and should be of the proper voltage rating, *i.e.*, always between 1kv and 4kv, depending on the voltages involved.

U.h.f. p.a. Tube—"I'm experimenting with u.h.f. and want to build a c.w. 420 mc transmitter with an output of around 75 to 80 watts. I do not wish to force air cool the final tube. Any recommendations?"

Yes. Try RCA's 8072. It is cooled by conduction (heat sink). It has a plate dissipation of 100 watts; can be used at 420 mc with ease and because of its design is a high-perveance tube which naturally requires lower plate voltage to obtain higher output.

Zener Diode Noise—"I understand that zeners can often create noise in receiver circuits when used as voltage regulators. True or false? If they do, what's the cure?"

True. A zener when used for v.r. purposes may create noise as will any diode under the right circumstances. If zener noise is encountered, paralleling the zener with a .01 mf ceramic capacitor will sometimes help. Also an r.f. choke in series with the zener and if by-passed will often take out the noise. Before altering any circuitry, however, try another zener. Often, one zener wil be noisy when another will not. I suppressed the noise generated by one zener by merely paralleling the zener with a 22 megohm resistor.

Transceiver Hum—"I have a transceiver that hums when I first turn it on and this lasts about 15 minutes, then disappears. What do I look for?"

What make and model of transceiver? Mechanical or electrical (a.f.) hum? Could be a bad rectifier tube or silicon diodes, bad filter capacitor or a tube with a filament to cathode short (when cold) if the hum is electrical. If mechanical, then it could be caused by a maladjusted relay or loose transformer laminations which can cause this condition when cold. Heat and expansion stop the noise. Please readers, *be specific* when writing to us!

Barefoot and High Power—"I'm one of the hams who believes in only using the power he needs to communicate with. I have been using a variac to reduce transmitter power, but isn't there a way to switch in a transceiver or driver to an antenna and cut out the power amplifier inexpensively? This is what I would like to do. Any help?"

I presume you wish me to come up with a recommendation for a good coaxial relay that will do the job. Well, I highly recommend the Dow-Key relay modenl DK2-60B. This is a d.p.d.t. switch, has a 1kw rating, a v.s.w.r. of less than 1.15:1 from 0 to 500 mc; the transfer loss is *less* than 0.03 db at 30 mc, has been tested out at over 1,000,000 operations without "bugging out"; has a 50 ohm impedance and costs only $19.00—a bargain in my estimation. Write: Dow-Key Co. Thief River Falls, Minn. for more info. Good luck.

HRO-500—"I recently tried out a National HRO-500 receiver and found it to be a terrific set.

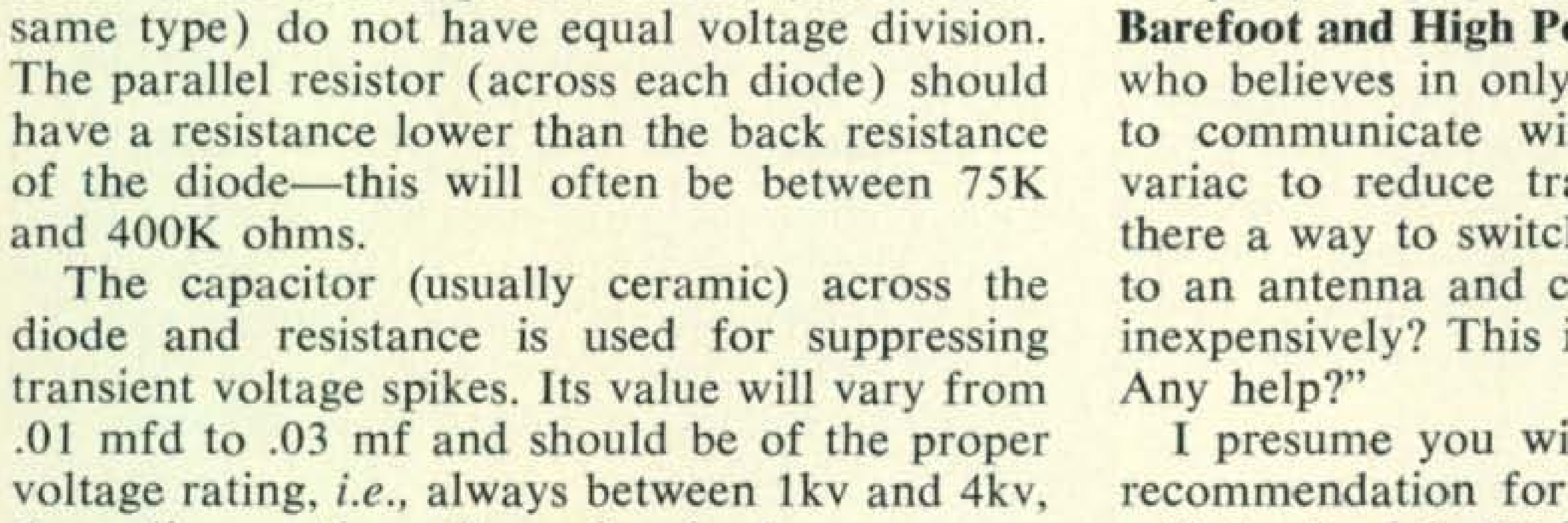


Fig. 1—A simple transistorized pre-selector/signal-booster for 80 through 10 meters. If necessary, tap down on L_2 and L_3 for best signal-to-noise ratio. All resistors are ¼ watt and decimal value capacitors are in mf.

L_1, L_4—2 turn link, #18 cotton covered at cold end of L_2 and L_3. Vary turns for best operation.

L_2, L_3—Airdux 832T or B&W 3016 coil stock (32 t.p.i., 1" dia., #24 tinned wire). 80 m.—36 t. 40 m.—23 t. 20 m. and 15 m.—14 t. 10 m. 4 t.

Sooner or later, I'll add one to my station, but tell me, would it not be wise to use a number of special antennas for optimum reception? I say this because when I tried out the set using a 72 ohm dipole, some bands were received better than others.".

The HRO-500 is indeed an excellent set and has more or less now established itself as a "standard" for others to "shoot at." But when it comes to optimum operational results it is no different than any other high quality set—they both need the properly matched antennas. With the HRO-500, 50 ohm antennas are suggested. On the low and v.l.f. bands a good antenna is important. I would like to see National come out with the same set minus the low frequency bands; although it is nice for a ham to have full coverage. All of the hams I talked to who own the HRO-500 use only the ham bands.

All-band Selectro-booster—"How about publishing an experimental circuit for an all band signal booster-selector? It should be transistorized, fairly low noise and work. Can you do this for a broken-down old-timer?"

You may be an old-timer but I do not consider you broken down—at least not if you are interested in ham radio. There are older hams than you still tapping a key—I don't consider 69 as old.

See fig. 1. This is a good booster-selector and I call it the "selectro-booster" (SB).

The important point in construction is to keep the output and input circuits isolated. I used 2N384 transistors but you can also use 2N2494, 2N2495, PADT-30, 2G401 or a 2N1516.

The tuned circuits are not critical and the unit will work down to 6 meters if the proper transistor is used for the frequency.

I suggest making yours in a Minibox so that shielding of output and input circuits can be accomplished with aluminum partitions.

The input impedance can be 50 or 72 ohms and the output Z can be adjusted to suit your particular receiver by varying the number of link turns on the output coil.

For low-loss I recommend using ceramic coil forms or no forms at all.

I hope yours works as well as the one I constructed. I do *not* suggest that the SB be used with anything but an unbalanced transmision line (coaxial cable). Good luck.

A.f. Signal Generator—"I would appreciate it very much if you would publish the circuit of a good single frequency a.f. generator that puts out a good sine wave. It can be one that uses either tubes or transistors. Any frequency from 500 to 3000 cycles will do fine. Help me, please?"

Sure. See fig. 2. This little a.f. generator using

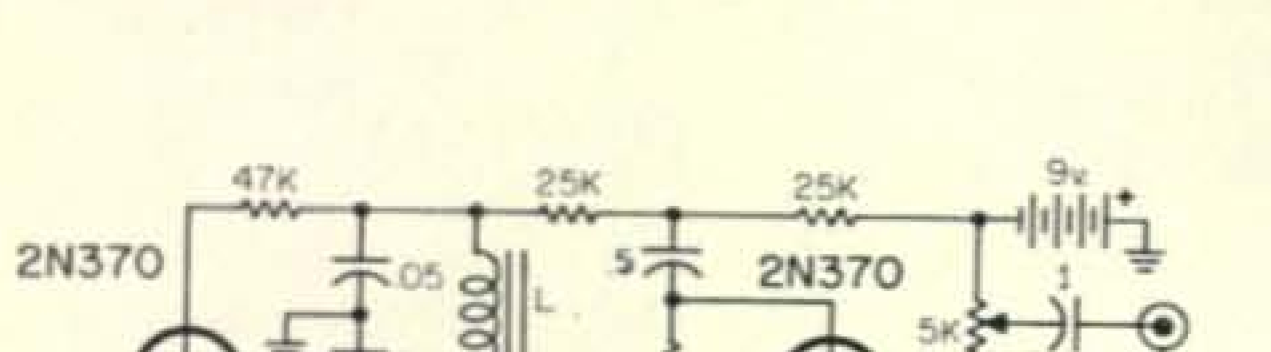


Fig. 2—A.F. signal generator

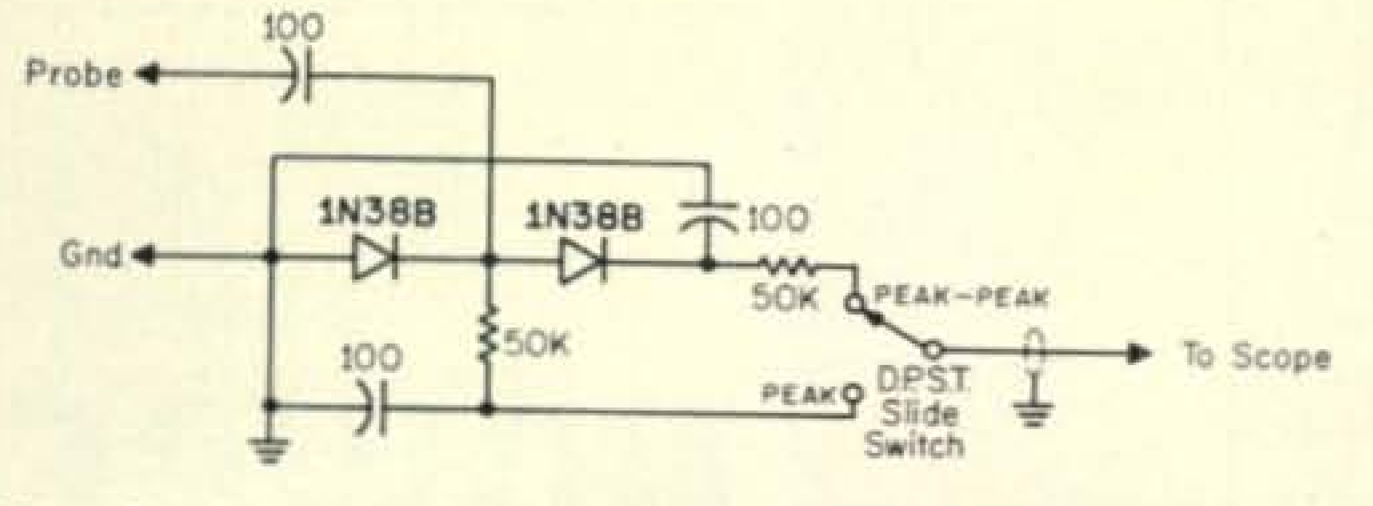


Fig. 3—Circuit of a simple peak and peak-to-peak demodulator scope probe.

transistors works like a charm. Its output waveform is excellent.

The inductance L in the emitter of the first transistor can be a good iron core choke or the primary of nearly any output transformer (2000 to 6500 ohms or so). The capacitors across the inductance may be varied in value (along with the latter) to give you the frequency you want. I suggest that you keep the ratios of capacitance of the two condensers as is and vary the size of L.

Transistors other than 2N370 (as shown) that can be used are: 2N105, 2N283, 2N371, 2N372, 2N373, 2N374 and CK-722.

Peak and Peak-to-Peak Probe—"Can you please give me a diagram of a peak and peak-to-peak reading demodulator probe that I can use with my oscilloscope? I would like to switch from peak to peak-to-peak readings too."

Be glad to. See fig. 3. This probe is simple to make and can be contained in the body of an old ball point or marking pen. Coax cable is used, of course, for connection to the scope. The probe point can be the pen point (if the pen body is not metal). When the switch is in the peak position, you will note that one diode is used, in the peak-to-peak position both diodes are used. It is a good idea to use matched diodes, *i.e.*, both having the same back and forward resistance.

Thirty

The DX season is approaching and with it a lot of fun. Our ham hobby has many sides to it and this is what makes it interesting. You can rag-chew if you want to, hunt DX, work c.w. or phone, s.s.b. or experiment. But in order to keep our frequencies *we must occupy the bands*. If 10 meters sounds dead, give 'er a try anyway, maybe someone will come back to you. "Opening up" a band is fun too.

To those of you who are reading HAM CLINIC for the *first* time and who may have a question or two, please send in two IRC's (with your letter) or 25¢ in coin to cover postage. Be brief but specific. You can send your letters to *CQ* Headquarters or to me at 4 Lutzelmatt St. Luzern, Switzerland where I presently reside.

Thank you (our regular readers) for supporting us. To you who are stamp collectors, we want to say that we always try to use the latest Swiss stamps on our correspondence. We receive letters from all over the world and so we have a lot of stamps to give away. Let us know if you are a serious philatelist. If you are, we'll enclose a few stamps you may not have.

73 and 75 Chuck.

NOVICE

WALTER G. BURDINE,* W8ZCV

We who have been in the radio game since the early twenties often fail to realize how complicated the art of communications has become since we only had to worry about three or four types of tubes and the A, B, and C battery supply. We also fail to think about the complexity of the circuitry for even the simplest receiver and transmitter. When I built my first ten meter outfit, it was about as small as any transmitter. Yet today I have a better transmitter with three times the power output in about one twentieth the space, and this one is both v.f.o. and crystal controlled. This has come about by every one contributing a little toward the development of better circuitry and better parts, along with parts placement and smaller components. The amateur has had a lot to do with development of the smaller, more complex and more dependable amateur station. Almost anything the progressive amateur wants, he is able to build.

Today the three or four types of tubes have been replaced with about three thousand types; each more durable and sensitive than the best we had when we started. There is a tube for every purpose that we can think of now. If a tube won't work because we have space problems, we can use a transistor, diode or some other means to do the job. We have every known method of doing complex chores in the amateur radio hobby at our finger tips. Even the small transistor, with its very low-power consumption will out perform our best tubes that we had to use in the beginning. We can now operate a complete radio receiver using transistors on less power than we could operate the filament of one of our tubes that we used in the beginning. We don't even use power consuming pilot lamps any more. For such is progress, have you ever seen a transistor radio with pilot lamps?

Questions and their answers

Many of the amateurs do not use the information they have at home. They just do not know how to use the information they have in their handbooks. This is because they do not understand the theory behind those diagrams, tables and graphs. Don't forget that to many of the hams, radio is *only* a hobby and they are using it for just that purpose. They do not intend to try to make a living at radio or its allied occupations in the electronic trade. It is just a hobby and the necessity for knowing the theory behind each diagram will likely never be needed by our hobbyist. But he could use this information if trouble develops and he decides to try his hand at equipment repair. This can usually cause more trouble than you had in the first place. If you built your equipment at first, then you are on your way to being able to repair the equipment in case of trouble. The handbooks have all of the information that will be needed but it is usually so covered with technical verbalism that the technical substance of the sentence is usually clouded in its meaning. Careful reading and an analytical mind will usually clear this problem. Let's see if we can clear up some of this information to our benefit.

One of my hardest jobs in repairing a radio set was caused by someone trying to repair his set by himself and failing to use all the information he had at his fingertips. He had taken the tubes to the drugstore to check them and they all checked "GOOD", so he proceeded to replace them. All were octals, and he found they would all go in the same socket. He was lucky and got most of the tubes in the right socket except he exchanged a 6K7 and a 6A8. Stations were received from the high powered locals but no sensitivity. Three other repairmen plus the local outlet of the manufacturer tried unsuccessfully to find the trouble, then *I* got it. I did just what the rest of them did, checked tubes, continuity of all coils, for shorted capacitors and resistors, etc. Nothing *apparently* wrong. It was a costly set, so I just couldn't give up. I started at the antenna and worked toward the end. I checked all of the circuitry as it would be in any superhetrodyne and found the two tubes in the wrong sockets. You just never look for the obvious trouble, all trouble *must* be complicated and rare. By the way, this was at the beginning of my radio repair.

The foregoing little story wasn't told to show you how stupid I was, but to tell you that re-

Robert Van Hook, WA8QFI, 3643 Woodland Terrace, Dayton, Ohio operates the 6 and 2 meter bands on amateur radio. He is Commander of C.A.P. Squadron 703 in the Ohio Wing. On CAP frequencies he operates the Bands near the 160, 80,11 and 2 meter bands and has 7 years of C.A.P. operation. Nice set-up, Bob.

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

A Navy TCS converted for amateur use and an NC-183-D used with a vertical antenna has snagged 42 states, Canada, Puerto Rico, Brazil, France, Columbia and Argentina for Doug Seyler, WN8OKL, 14, of 3286 Rinda Lane, Cincinnati, Ohio. Doug's favorite bands are 15 meter c.w. and 2 meter phone.

placing parts in a radio set must be done with care. Luckily no other parts were damaged by having these tubes in the wrong socket, but it could have caused some expensive parts replacements.

Letters

Doug Seyler, WN8OKL, 3286 Rinda Lane, Cincinnati, Ohio writes a newsy letter. "Dear Walt: Hi there. I don't have a subscription to *CQ* but my dad gets it all of the time so I thought I would write and tell you how much I enjoy your column. I have heard you on two meters and hope to talk to you sometime.

"I got my license last November and operated strictly 40 meters until January. Then my dad, W8JRB, and I threw together a two meter rig. About three months ago I got on 15 meters and worked my first DX. We have two rigs, a converted surplus Navy TCS running 75 watts on 40 and 15 meters to a vertical and an NC-183-D receiver. This makes up the main rig. We also have a two meter station consisting of a homebrew rig running 20 watts to a 5 element beam 25 feet high with a converted ARC-3 receiver. I've worked about 42 states, Canada, Puerto Rico, Brazil, Argentina, Columbia and France. I hope to get my General in August or November.

"I am enclosing a school picture. I am sorry I don't have any of me at my rig. I am 14 years old and in the 9th grade. My main bands are 15 meter c.w. and two meter fone.

"I think we should have more novice contests, otherwise I think the radio magazines are a great booster to ham radio. I hope it continues to be a very fascinating hobby and that more people becomes aware of its existance. By the way, I'm already helping a couple of prospective hams and my theory is that you have to get people interested in radio as a more than pastime hobby to make really good amateurs.

"Well, so long for now and I hope to see you on the air. Thanks and 73. Doug."

"Dear Walt: I have read your column with great interest since I obtained my novice license and find it very educational. I plan to obtain my general class license before the first of the year.

"I am 15 years old and have been on the air for about 4 months. I have worked 34 states with 31 confirmed. I haven't had much DX out of the United States and only one good DX contact with Parana, Brazil. The signal was 579 in Brazil. What I need is any station out of the U.S. on 15 meters. I usually work 15 meters between 2300 and 0300 GMT just about every night. My frequencies are 21,111, 21,162 and 21,180. I could use some sheds in 7 land, I have only worked into Washington State.

"My rig is a DX-40 running 75 watts to a dipole antenna. The receiver is a surplus Air Force SP-600 Hammarlund receiver. I will sked with anyone anytime and for any reason.

"I would appreciate your mentioning me in your column. I will also exchange letters with any foreign amateur station or s.w.l. 73 es best DX. Ray."

Ray may be contacted at: Ray Keyes, WN9OOE, 1126 Barksdale Avenue, Bunker Hill A.F. Base, Peru, Indiana 46971.

Your Chance To Do Your Boy Scout Deed For The Day

"Dear Walt: After some hesitation I am writing this letter to run a "Help Wanted" ad, so to speak in your column in response to your invitation in *CQ*.

"As you see from the signature I have obtained my novice ticket (last April).

"Now comes the problem: I am disabled to the extent that I am unable to handle any tools or wire my equipment or copy c.w. by pen or pencil. I use an electric typewriter for this purpose. I am teaching myself the code for my general or conditional license thru the use of the Instructograph.

"I have my receiver, A National NC-270 and transmitter a Knight T-150A hooked up but after much CQ-ing on 40 meters I don't seem to be getting out.

"Walt, would it be possible to get someone to check my equipment over, could some local check the connections and find if I have every thing hooked up and working correctly by using a field strength meter of some other method? I would like very much to be able to use my equipment.

"I hope that this will be possible but at the same time I don't want to be putting any one out.

"I will appreciate anything that can be done in this regard. Kindest regards. Wes Harris, WN9OVD, 1755 North Sawyer Avenue, Chicago, Illinois 60647. Telephone 235 6078."

Thanks for the letter Wes. I'll bet a plug nickel that you will get help to solve your problems and soon if I know my hams. I know of no better hobby for a person that has your problem than ham radio. I sure hope you pass your general license test and get on the air, this is the best therapy that I can think of: to be able to converse with other hams over the world. Most of the hams I know would be glad for the chance to help some one who is trying to help himself in such position as you find yourself. I hope that your condition improves to the point where you will be able to wire up your own equipment, we need more hams with that kind of spunk. Good luck.

Fellow hams, here is your chance to show ham radio up for its best. Thanks.

Help Wanted

If you need help with any of your radio studies or any other radio problems that you think some of our readers might be able to solve for you just put all of the information that you have down on paper and send to the help wanted part of our column. Someone will help if they can. I have received many letters from people who have been helped to ham radio operators by someone who has read about them in this column. Address mail to Walter G. Burdine, W8ZCV, R.F.D. #3, Waynesville, Ohio. 45068. DO NOT send mail to the New York office, it just slows down the mail and puts a heavy load on the already loaded [Hic! *Ed.*] office staff. I have had a few letters addressed to the office that have been remailed and arrived too late to make the column that I had just mailed. I know you can read better than that.

73, Walt, W8ZCV

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

Now that the September 1st comment file deadline has past, all that anyone can do is bite his finger nails, wait, and hope for the best. But if past v.h.f. decisions of the FCC are any indication of the future, that 'best' may be poor indeed. Was the 147.9 mc 2 meter c.w. subband a joke as some suggest? And the present incentive licensing proposal, as it concerns six and two meters—is it helpful or as far away from such as the man in the moon?

One thing is for sure: segregation has never helped anyone. It lowers the standards of one group and thins the membership of another. There are still many state-of-the-art accomplishments to be made on two and six meters—accomplishments which can benefit from the efforts of every technically inclined v.h.f. enthusiast.

As an example, let's consider the present situation on the 144 mc band. Here the technician, who by definition is licensed as an experimenter, is denied operation on that part of the band where 98% of such experimental operation is conducted. Oscar III, which should have been of prime interest to the "true Technician," was barred from his use. By the way, we suggest that qualified Technicians try requesting special permission from the FCC to operate below 145 mc on an "experimental" basis for the express purpose of communication via Oscar IV.

To make matters worse, the Tech in particular and v.h.f. in general is a victim of the problem of the "few rotten apples." These incompetents, many of whom do not know what Ohm's Law is and have difficulty recognizing . — as "A," are the fellows who stand out. No wonder the present image of the Technician is *anything* but technical! These are the type of problems the "incentive licensing" proposal not only ignores, but aggravates . . .

Although we have been rather naive, it has become clear to us (by utter repetition) that something is wrong with the mail-order Technician license; and that something is not only a Technician but a General or an Extra also. This type of "licensing" should be abolished—that would be incentive!

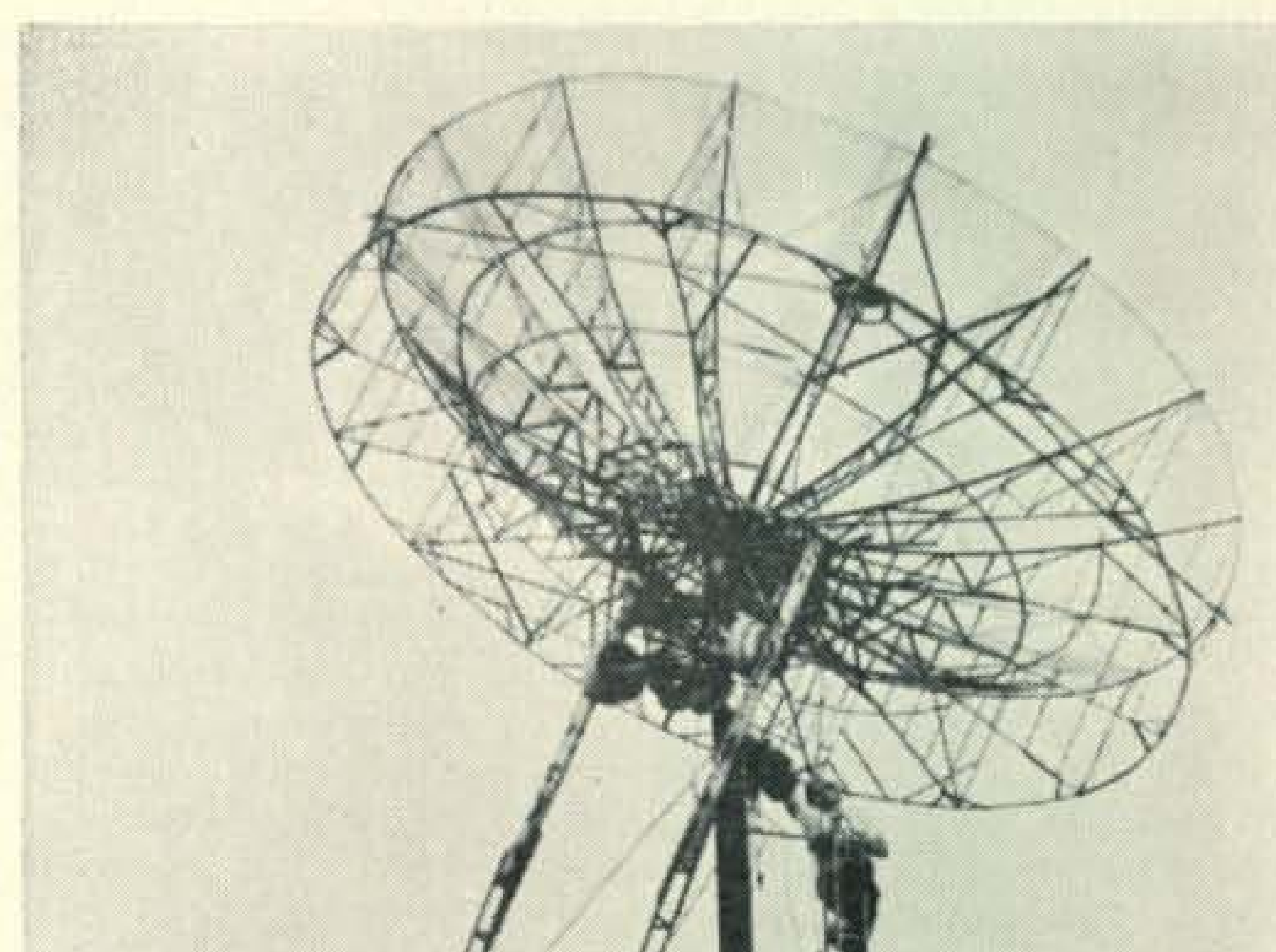
Furthermore, it has been suggested by many Technicians that they would like to see a tougher theory test, one superior to that of the General and concentrating on v.h.f. techniques. After all why should a Technician be required to know the length of an 80 meter dipole when he can't even operate on this band.

You may have noticed that we have said nothing about incentives for getting an Extra class license. But, as pointed out in previous columns, neither does the technician who is seriously interested in v.h.f. operation have any incentive to obtain a higher license. Oh well, there are always the bands 220 mc and above.

Oscar IV Delayed

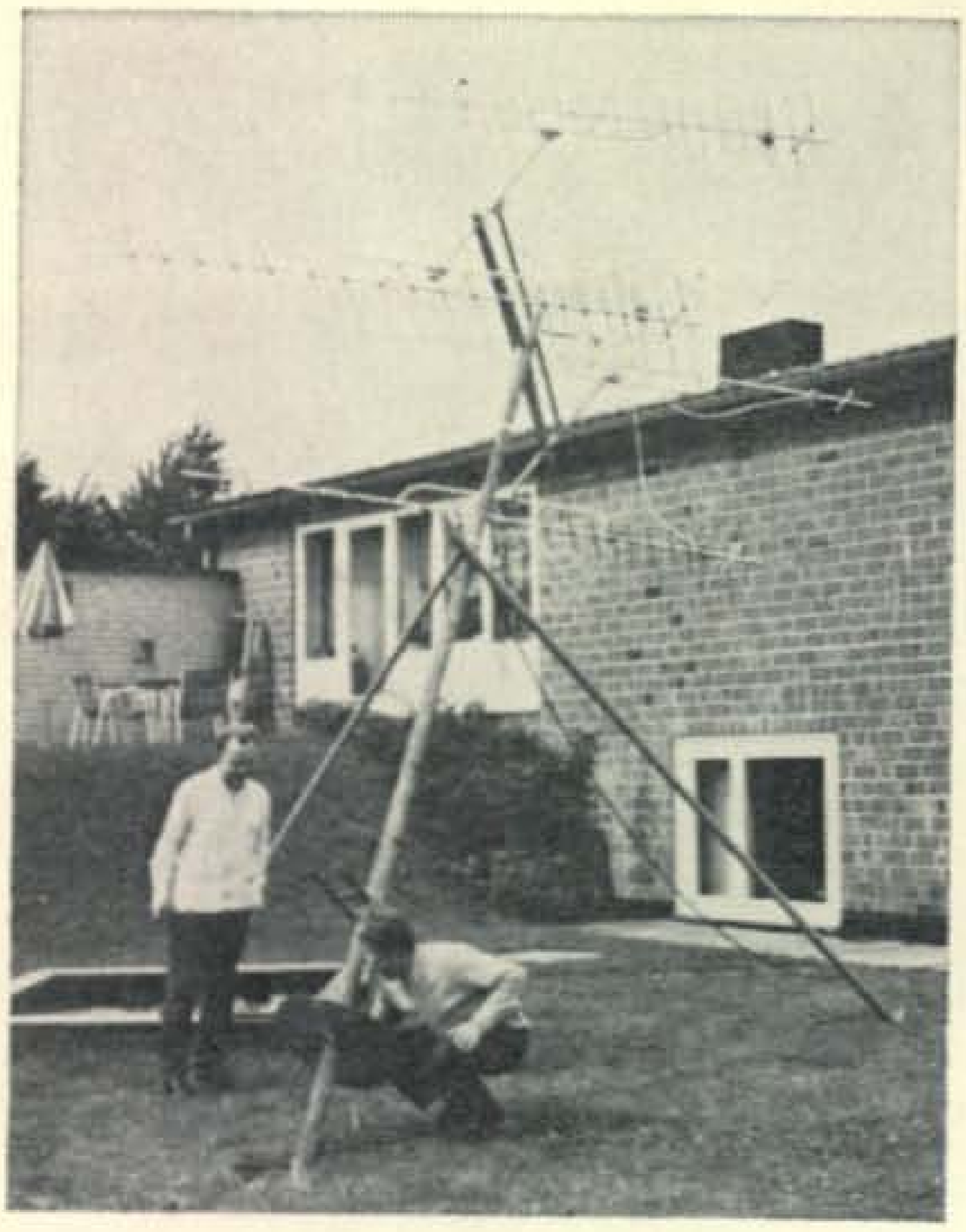
News from California indicates that 2 meter space communications aspirants will have to wait an extra 3 months before Oscar IV goes into orbit. Launch date is now sometime in January or February. The reason for the delay appears to be a desire on the part of the Oscar group to learn exactly what amateur sentiments are on future communications satellites. One suggestion was to create a satellite that would repeat between 10 and 6 meters. For more details of this proposal see last month's W3ASK's SPACE COMMUNICATIONS column.

We are not particularly happy about the above proposition. Considering the preparations already made by amateurs on 144 mc, it seems kind of ridiculous to switch horses in mid-stream. Once a permanently-operating satellite has been established on the 2 meter band, there is only



Here's a shot of W3SDZ's 20′ parabolic dish used to make contact with KP4BPZ on July 3rd from Vic's Milton, Pa., QTH. He spent August & September running tests with W4HHK & HB9RG on 432, and will be attempting a conversion to 1296 mc during October & November. Test info is available to anyone "really equipped": W3SDZ, Box 345, Milton, Pa. Phone: (717) 437-2769.

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



Another station to work KP4BPZ on 432 mc was DJ4ZC, pictured above with DL6IQ putting the finishing touches on their ¾ meter yagi configuration. In what is undoubtedly a "first," the DL-KP4 QSO was not only accomplished on u.h.f., but on s.s.b. yet!

one logical direction for future Oscars to take—and that is *up!* The suggested 1296 and 432 mc beacons would at least be a step in the right direction.

Possibly one reason for the Oscar poll is to determine just how much v.h.f. amateur interest there is in satellite communications. There was certainly no question during the 2-week-plus period that Oscar III's repeater was in operation. Everybody and his brother was listening. Rigs were dug out of the attic or basement and put on two which had not been on for years. And we doubt whether the effect of being able to work Europe on 144 mc will wear off in a long time—if ever. However, reporting could have been better. Lists of orbit numbers and calls of stations heard or worked are just not as useful as descriptive letters. Reports of preparations for Oscar IV might also help. We have already started setting up a system to monitor Oscar IV's 1296 mc beacon.

432 Mc Moonbounce via KP4BPZ

Just a little over one year after KP4BPZ first aimed the 1,000 foot dish at Arecibo, Puerto Rico moonward and broke the 432 mc DX record, they have done it again. And this time due to earlier news of their plans many more stations were able to participate. At least 20 contacts on c.w. and s.s.b. were made. The Arecibo project must go down in history as a major u.h.f. gain. It gave incentive to stations all over the world to get their 432 mc systems working. In New Jersey there were at least six stations copying KP4BPZ—two made the grade with a contact. Our only disappointment was that contact was not established between stations other than KP4BPZ. The only reports we have of reception of a station other than KP4BPZ is that of K2MWA/2, a group of amateurs using one of the 60 foot dishes at Bell Telephone labs in Homedell. K2MWA/2's echoes were copied by K2TKN and WA2FSQ, who coincidentally are also located in N.J. At MWA, the signals of W1BU and W3SDZ were received. However, judging by the schedules mentioned in the letters which follow, this situation should not last long.

Karl Meinzes, DJ4ZC, Germany: "After an unsuccessful attempt to work KP4BPZ on July 3rd, we finally worked him on July 24 with s.s.b. The first attempt was primarily unsuccesful because we were unable to get an 8122 amplifier working. This is the 432 mc amplifier described recently in RCA "Ham Tips." Efficiencies were around 20% and the tube has an extremely delicate screen grid No. 2 (which resulted in two killed tubes). So we made up our minds to build a cavity using four 4X150's, which produced about 1 kw p.e.p. output with 1.5 kv on the plates (about 50% efficiency). This amplifier put out its first r.f. during the QSO with KP4BPZ." *(That's cutting it close!)*

"Because here in Germany antennas with 20 db gain are readily available, and the distances are not as great as in the U.S.A., there is much 70 cm s.s.b. troposcatter activity. We thought you might be interested in how u.h.f. looks on this side of the Atlantic, so we thought we would let you know." *(We are—Thanks!)*

Paul Wilson, W4HHK, Collierville, Tennessee: "This letter is to give you a few more details on our end of the KP4BPZ moonbounce tests. We used a barefoot home-built converter with a noise figure of 8 db. There was no r.f. amplifier at the input, just a hot 1N21F mixer. The first i.f. is a pair of 6AM4's at 49.5 mc in a cascode circuit. Second i.f. is 7.0 mc and is fed into a 75A3 receiver. The antenna was the 18 foot dish pictured on the cover of the March 65 issue of QST. A two element yagi is used to illuminate the dish. The transmitter started out at the usual 8 mc and ended up with a surplus T-271/ART-28 with a pair of Eimac 4CX250's in parallel. Power output was 200 watts."

"During the contact, Sam, W1BU, was on the s.s.b. rig at KP4BPZ. His report to me was 559X, and I gave him R3 to 4 and S3 for the s.s.b. signal. This was a very conservative report . . . but in the excitement of making the contact . . . it was the first thing that came to mind. We were reading him solid with little difficulty. The blower on the surplus ART-28 made so much noise it was like operating alongside a jet plane warming up . . . hi, which didn't help. The QSL has since arrived from Gordon, and is quite attractive, being a color photograph of the big dish." *(Paul also mentioned his appreciation for the support MARS gave his project; he is very active in this organization. Included also was a newspaper clipping describing the contact—an excellent example of the good publicity this kind of endeavor can bring to ham radio.*

From the Mailbag

Howard Zeh, W8JLQ, on 1296 activity in Ohio: "We have been maintaining frequent communications between here in Toledo and Detroit and Sandusky, Ohio on 1296 mc; usually on phone. The distances are 50 and 47 mile airline respectively. We are not solid all the time, but hope to be by winter. Typical equipment is either a 2C39 tripler or tripler amp. Most of the converters are patterned after the K6AXN one from March 1961 *QST*.

[*Continued on page 92*]

In case you're curious what it takes to hop the pond on 432: DJ4ZC sits at the left of the cavity, power supply for 1.5 kv hidden in shoe box, next comes the driver, driver p.s., and finally a mere solid-state 4 meter transceiver. No it wasn't a "birdie"—he's looking at a treasured KP4BPZ QSL!

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

THE big story for the month is that any minute a very famous County Hunter will have (or already has) the QSOs and confirmations to qualify for the USA-3079-CA for *ALL* counties and special Honors Plaque. There are rumors that another famous County Hunter claims to have the necessary confirmations; time will tell. I feel sure that when the USA-CA Program was conceived a few years ago, few dreamed that anyone would corral them all, much less two possible claims in one month. I am happy that I am so closely associated with the program when THREE hunters make USA-CA-3000. And now for these 3079, Hemi please get me the smelling salts.

All the above, unfortunately, tends to steal the spotlight from "Otts", K8CIR, who qualified for the USA-CA-3000 Award #3. "Otts" also received endorsements of ALL 40 Meters and ALL 40 Meter SSB for his USA-CA-2000 Award #2 and his USA-CA-1500 Award #5. He also got all the above plus ALL CW for his USA-CA-1000 Award #19 and ALL 20 Meters for his USA-CA-500 Award. Harry, K8KOM, received USA-CA-2500 Award endorsed Mixed and ALL 40 Meter SSB endorsement for his USA-CA-1500 Award. Orville, KØIIK, received USA-CA-1000 Award endorsed Mixed. USA-CA-500 Awards, all endorsed Mixed, went to K3SVI, WA4GAY, WA4PFQ, WA5HDA, WA8HSB, KØIIK and KØSPH. Again, congratulations to *all*.

New Honor List

The New Honor List, starting this month, was supposed to show the actual *claimed confirmed* counties of the TOP 25 County Hunters. Although most letters have expressed pleasure with the New Honor List, the response for *claimed confirmed* counties has been anything but overwhelming.

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

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

3079	VE3-9301	W8UPH
K9EAB	K8IWI	WØKZZ
3020	WA9AJF	K8VSL
WØMCX	K8KOM	K8YGU
3005	WØVFE	W9CMC
K8CIR	**2050**	W5NXF
2500	K3LXN	**1780**
K4VOF	**2000**	K8BAI
K5SGJ	K9UTI	**1500**
K5SGK	W5EHY	W6KG
WØJWD	WA8EZW	KØHUU

FLASH: USA-CA-3079 FOR *ALL* COUNTIES AND SPECIAL HONORS PLAQUE!

Yes, as I am in the midst of trying hard to meet my deadline—*IT HAPPENED*—application for #1 USA-3079-CA arrived from that young man from Peoria, Illinois, Cliff Corne, K9EAB. Fortunately I had already planned to use his latest photograph in this column. This photograph also shows his equipment and prominently displayed is his #1 USA-CA-3000 Award and two other *CQ* awards—WAZ and WPX. Congratulations and continued Good Hunting Cliff! Of course I have not had time to check his application, but as anyone who has had any dealings with Cliff will verify, I know the application will check perfectly.

Awards

TCA, Twin County Award as described and pictured in June *CQ*, has a new custodian, John M. Ciganek, W4GYP, RTE 1, Leesburg, Virginia 22075.

ZONE FIVE AWARD, sponsored by the Canisteo Valley Amateur Radio Club of Hornell, N.Y. to promote both state-side and DX contacts with stations throughout all states, provinces and countries located in ZONE FIVE. It was desired to have the award within reach of everyone seriously interested in it, but not obtainable with such ease as to make it worthless. Contacts must have been made after January 1, 1947 on any or all bands, either c.w. or phone or both. Contacts with mobiles do not count, contacts may be made from any authorized location. GCR applies, send list of *confirmed* contacts (or heard for s.w.l.) showing times, dates, calls, country, state, county, province, *etc*. Send this with $1.00 to Awards Chairman, Canisteo

K9EAB, Cliff Corne holder of #1-R USA-CA-500 Award, USA-CA-1000 #6, USA-CA-1500 #1, USA-CA-2000 #1, USA-CA-2500 #1, USA-CA-3000 #1 and now apparently #1 USA-3079-CA

Istmania Certificate (Guatemala).

USA-CA HONOR ROLL

3000		1000			
K8CIR	3	KØIIK	84	WA5HDA	508
				KØSPH	509
				WA8HSB	510
2500		500		K3SVI	511
				WA4GAY	512
K8KOM	11	KØIIK	507	WA4PFQ	513

WACAN—Worked All Canada.

Valley Amateur Radio Club, Hornell, New York. Necessary contacts are (generally one third of the counties or divisions in each state or country or province of Zone Five): FP8—One contact; VP9—Two parishes; VE1-(N.B.)—3 counties; VE1-(P.E.I.)—One contact; VE2 (Que.)—3 counties; VO1/5-(N.F.)—2 counties; W1-Maine—5 counties, N.H.—3 counties, Vt.—4 counties, Mass.—5 counties, R.I.—2 counties, Conn.—3 counties; W2-N.Y.—20 counties, N.J.—7 counties; W3-Del.—One county, Pa.—21 counties, Md.—8 counties; W4-Va.—30 counties, N.C.—30 counties, S.C.—15 counties, Ga.—50 counties, Fla.—20 counties and W8-W.Va.—15 counties. This is a *new* award to be issued starting October 1, 1965.

GRANITE STATE AWARD, The Nashua Mike And Key Club, Box 94, Nashua, New Hampshire is happy to offer this award to promote contacts with New Hampshire stations. Requirements are: Stations in 1st call area need confirmations for QSOs with 35 New Hampshire stations in a minimum of 5 counties. Other USA and VE stations need 25 N.H. QSOs in a minimum of 5 counties. Send certified list and $1.00. DX (including KH6 and KL7) need 15 New Hampshire QSOs in a minimum of 3 counties; They send certified list and one I.R.C. All contacts must be after January 1, 1962, portable stations count, but mobile stations do not count.

WACAN, Worked All Canada, sponsored by the Nortown Amateur Radio Club, VE3NAR, P.O. Box 356, Adelaide Street Postal Station, Toronto, Canada. Produce QSL cards to verify QSOs with 2 different stations on two different bands in each of the following 11 sections. Prince Edward Island VE1, Nova Scotia VE1, New Brunswick VE1, Quebec VE2, Ontario VE3, Manitoba VE4, Saskatchewan VE5, Alberta VE6, British Columbia VE7, Yukon and or Northwest Territories VE8, Labrador and or Newfoundland VO. All contacts must be made from an area within a radius of 150 miles of one point and after January 1, 1939. VO contacts must be made after March 31, 1949. Submit the 22 QSL cards with $2.00 or 20 IRCs; all cards will be returned. *Note*—This will also qualify you for **WAVE AWARD** which was pictured and described in *CQ* of August. If you already have **WAVE AWARD,** produce QSL cards to verify QSOs with 2 different stations on 2 different bands in each of the following 3 sections: Labrador and or Newfoundland VO, British Columbia VE7, Yukon and or Northwest Territories VE8. Submit the 6 QSL cards, **WAVE AWARD** No. and $1.00 or 10 IRCs. All cards will be returned.

THE CLUB DE RADIO AFICIONADOS DE GUATEMALA, C.R.A.G., offers three beautiful certificates, as listed below. All applications should be sent to the Awards Manager, Cesar A. Siu, TG9SC, P. O. Box 53, Guatemala City, Guatemala, enclosing $1.00 or 10 IRCs. Seals for extra classes will be sent for 2 IRCs, but if applied for at the same time as the award, there is no extra charge. Do not send QSLs, a certified list by a radio club officer or two licensed radio amateurs will be accepted. Also available to s.w.l.'s.

ISTMANIA CERTIFICATE, of C.R.A.G.–requirements:

	Mexico, Central & South America	North America	Rest of The World
Guatemala	5 QSLs	3	2
Belice (VP1)	1	1	1
Costa Rica	5	3	2
Nicaragua	5	3	2
El Salvador	5	3	2
Honduras	5	3	2
Panama	5	3	2

TTG CERTIFICATE, of C.R.A.G.–requirements:

Issued in three classes, for confirming a specific number of TG9s and different zones in Guatemala (TG4, 5, 6, 7, 8, and TGØ)

Class	Mexico, Central & South America	North America	Rest of The World
TTG 1	3 TG9s 2 Zones	2 TG9s 1 Zone	1 TG9 1 Zone
TTG 2	7 TG9s 4 Zones	4 TG9s 2 Zones	2 TG9s 2 Zones
TTG 3	10 TG9s 5 Zones	6 TG9s 3 Zones	3 TG9s 3 Zones

QUETZAL CERTIFICATE, a new award issued by C.R.A.G. for confirmed QSOs with any two of the following: TG4AA, TG5AA, TG6AA, TG7AA, TG8AA and TGØAA. All of these are to be operated by the radio club in special expeditions to these "rare" zones in Guatemala. Cost of this award $1.00 like the other two and certified list; no QSLs to TG9SC.

METROPOLITAN NASHVILLE AWARD as photographed and described in *CQ* for June has a *new* custodian: John Ward, WA4IOL, 1004 Neely's Bend Road, Madison, Tennessee 37115.

Hope you are all having a wonderful summer and vacation as I write this, but also hope you find time to write and tell me, how was your month?

73, Ed, W2GT

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

THE big space communications news to report this month is the successful Moonbounce, or Earth-Moon-Earth (EME) communications on 432 mc between KP4BPZ at Arecibo, Puerto Rico and amateur radio stations in at least six countries.

Sam Harris (W1FZJ), v.h.f. Editor for *QST* and one of the pioneering radio amateurs in the field of EME communications, has recently joined the technical staff of the Arecibo Laboratory, home of one of the world's largest radio telescopes. Mainly through Sam's efforts, arrangements were made to operate the Laboratory's 1000 foot, 56 db gain antenna on the 432 mc amateur radio band for short periods of time on July 3 and 24. The antenna, which focuses power in a needle-point beam, was aimed at the moon. Twenty-eight stations in the United States and five European countries reported receiving signals from KP4BPZ as they were reflected from the moon's surface, and managed to establish two-way communications with the Puerto Rican station.

KP4BPZ's two hour operating period on July 3 began with c.w., went to s.s.b. for about an hour, and then finished up with c.w. During this period KP4BPZ worked 28 station in 9 USA call areas and five European countries on 432 mc! The following is the list of stations reporting two-way QSOs with KP4BPZ:

W1BU, W1HGT, W1HIV, K1IGY, W1OOP, W1OUN/1, K1SDX, K2CBA, W2CCY, K2-MWA/2, W2ROP, K3GYF/3, K3SDR/3, W3-SDZ, WA4BYR, W4HHK, K6MIO, W7ORG, W7UAB, W8TYY, W9HGE, W9GAB, DJ4AU, DL3YBA, G3LTF, HB9RG, LX1SI and OZ8EME.

This EME communication experiment was an outstanding contribution to u.h.f. amateur radio activity. The contacts made during this two hour period have broken all existing records for the 432 mc band. Never before in the history of amateur radio, or for that matter, in the history of radio communications, have stations over such a widespread area maintained successful communications in this frequency range.

The July 24 test transmissions from KP4BPZ also appear to have been very successful. Complete information is not available at this time, but Bill Orr, W6SAI, reports the following concerning activity on the San Francisco Peninsula:

"The Stanford Research Institute Radio Club (WA6LET/6) obtained the use of the 150 foot dish antenna operated by the Institute. The dish is located in the hills behind Stanford University, about 40 miles south of San Francisco. On hand were WA6MGZ, K6HCP, WA6QQI, W6GXN, K6TDR and W6CBE. Immediately at the start of the schedule, KP4BPZ was heard tuning up, and came through S9 on s.s.b. Copy was 100%, with only slight audio selective fading. No flutter was observed, and the signal sounded just like 20 meters! During the test schedule, WA6LET/6 worked KP4BPZ. This was followed by a long QSO on c.w. with K2MWA/2 who had just completed working KP4BPZ. A partial QSO was achieved with DJØLO on c.w. The DJ station heard WA6LET/6 with no difficulty, but the Stanford station was troubled with QRM from other stations working and calling KP4BPZ. This on 432 mc, believe it or not! The German signal was quite weak, riding in and out of the noise level. A final contact was made with W1BU, who put in a fine signal on s.s.b. Many other unidentified signals were heard, and it is hoped that a re-run of the 3 hour tape at WA6LET/6 will divulge some of these calls.

"A second group of San Francisco Peninsula radio amateurs, located in Sunnyvale and using the call WB6FSC/6, worked KP4BPZ and heard DJ4AU."

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

Bad News for OSCAR

During early August someone broke into Project OSCAR Headquarters at Foothill College, California and stole a Radio Receiver, Type R-391/URR, Serial No. 087.

The receiver is valued at over $3,000 and was on loan to Project OSCAR. If the receiver is not recovered, the Project *may* be responsible for its replacement.

Anyone knowing the whereabouts of the receiver is urged to notify Project OSCAR Headquarters, Foothill College, Los Altos Hills, California, immediately.

Moonbounce—It Isn't Easy

A radio signal traveling to the surface of the moon and then reflected back to earth again travels close to a *half-million* miles. Traveling at the speed of light, it takes the signal nearly 2½ seconds to traverse the EME circuit, causing a time lag of this magnitude between reception and transmission.

It's not only the great distance involved that makes EME communications so difficult. The moon's diameter is 2160 miles. Viewed from the earth, a quarter of a million miles away, this diameter subtends an angle of only *one-half* degree. Most of the energy radiated from even the finest designed antennas used by radio amateurs (having a beamwidth as narrow as 5 degrees, for example), misses the moon completely and passes by it into space. Of the small amount of energy that may strike the moon, almost 85% is absorbed by the roughness of the moon's

The 27 foot dish antenna used by W3SDZ for contacting KP4BPZ on 432 mc by means of Moonbounce, or Earth-Moon-Earth communications. The antenna has a gain of 29 db. K3GYF is seen standing beneath the antenna.

surface. The remaining 15% is scattered in all directions, with only a minute fraction reflected back to earth. In spite of this, the KP4BPZ tests have shown that radio amateurs can communicate by means of moonbounce on the 432 mc band, and 28 stations did just that on July 3.

Granted that the 1000-foot antenna at KP4-BPZ is unique. Many other stations, however, were able to communicate successfully using home-built equipment. Establishing communications via moonbounce isn't easy, and the equipment isn't simple, but more and more radio amateurs are becoming interested in this space communication activity. Most of the 28 stations making two-way QSOs on July 3 were running between 200 and 750 watts output on 432 mc. Almost all of them were using parametric amplifiers in the front ends of their receivers. The antenna required for EME communications must have a gain of at least 25 db, and must be able to beam as much energy as possible towards the moon. Several of the successful EME stations use 25 to 30 foot dish antennas or 64 element colinear arrays.

Radio amateurs with serious interests in EME communications and wishing to participate in future experiments, may receive additional information and an interesting newsletter from Victor A. Michael, W3SDZ, Box 345, Milton, Penna. 17847.

Euro-Oscar Progress

As the first positive step towards the eventual development of an European OSCAR satellite, a huge meteorological balloon was launched on August 22, containing a 2 meter transponder and c.w. beacon similar to those carried aboard the OSCAR III satellite.

The transponder and beacon were built by German radio amateurs, while the balloon was launched from Utrecht by Dutch amateurs. The equipment, which was launched at 0610 GMT on August 22, functioned perfectly for approximately 80 minutes. G6AG, near London, reports two-way QSOs through the balloon-borne transponder with PAØSOS, G3LTF, PAØIJ, DJ3SP and ON4FG. A large number of other 2-way QSOs also took place within a range of approximately 400 miles. A complete list of successful QSOs is now being compiled and will be available in the near future.

The balloon exploded as planned at approximately 80,000 feet and the radio equipment was returned to earth by parachute. The success of the balloon launched transponder brings an European OSCAR satellite that much closer to reality.

Late Oscar News

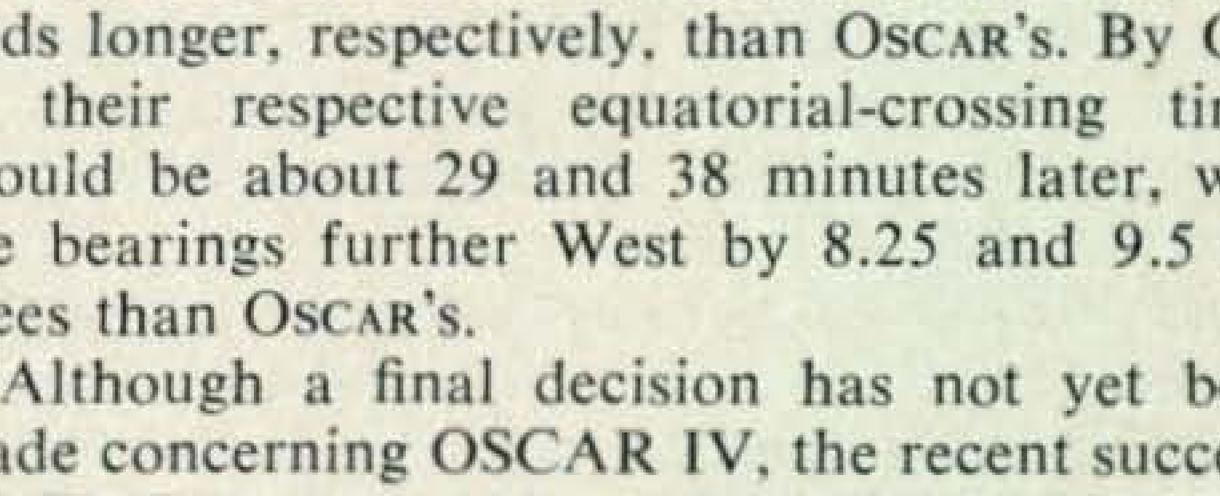
There have been no reports of reception of OSCAR III's beacon transmitters since early July, and it now appears almost certain that the radio equipment aboard the satellite is dead. Project OSCAR headquarters, however, still requests that the satellite continue to be tracked since the circuitry is such that the telemetry beacon transmitter could suddenly come to life again.

Although the radio equipment aboard OSCAR III is silent, the satellite's position can be determined by tracking three other satellites that are in approximately the same orbit as OSCAR III. These satellites are EGRES III, transmitting on 136.840 mc, and following OSCAR by 2 minutes; GRAVITY GRADIENT III transmitting on 136.766 mc, and SOLAR RAD transmitting on 136.800 mc. The periods for GRADIENT III and SOLAR RAD are about 0.6 and 0.8 seconds longer, respectively, than OSCAR's. By Oct. 1, their respective equatorial-crossing times should be about 29 and 38 minutes later, with the bearings further West by 8.25 and 9.5 degrees than OSCAR's.

Although a final decision has not yet been made concerning OSCAR IV, the recent successful EME test on 432 mc has added support to the possibility that OSCAR IV will be designed to receive signals on the 2 meter amateur band and retransmit them on 432 mc. In this way, OSCAR IV would be used to stimulate greater activity in the u.h.f. bands. There is also a possibility that OSCAR IV will be placed in a near synchronous orbit at an altitude of about 18,500 miles.

No final decision has yet been made, and there is still time to get your ideas concerning future OSCAR satellites to Project OSCAR Headquarters, Foothill College, Los Altos Hills, California, USA.

73, George, W3ASK



RAGCHEW ANYONE?

YL

LOUISA B. SANDO,* W5RZJ

BECAUSE it happened "out our way," and is such a fine example of the prime importance of ham radio in a disaster, we quote the following from the July issue of *HARC News* (Houston). Co-editor is W5ZPD, Cindy.

"Sanderson Emergency. On Friday, June 11, the West Texas town of Sanderson was the victim of a downpour, followed by a 15-foot wall of water. The damage was devastating, and all communications were lost. . . (Latest death toll, 25 persons.)

As many times in the past, it was by amateur radio that the outside world was informed of this tragedy. The Mayday call was given by K5HCQ, who it seems did not have a receiver, but he had faith someone would hear and respond. . . Someone did hear and many responded. The Texas Dept. of Public Safety was notified, starting the wheels of help to moving. It would be impossible to list the call of everyone who assisted.

It was many hours before normal communications were restored and it was during this time that communication was maintained through the efforts of Martin, W5GVQ, Ft. Stockton, who set up a station at Red Cross Headquarters in Sanderson, and by W5BCD, Frank, from San Angelo, operating mobile out of Sanderson.

The 7290 Traffic Net was alerted of the emergency at 0930 Friday and maintained operation all day Friday and Saturday. At this time a net was operating on 3900 kc with W5GVQ as NCS.

One observing this operation, could not help being proud of those participating. Procedure and conduct were outstanding. Amateur radio exists because of the ability to serve in time of need until normal communications have been resumed. The amateur fraternity can be proud of the service rendered during the Sanderson emergency."

K7GS, Girl Scout Roundup

Our tnx to W7GGV, Helen, for her report on operation of K7GS at the Girl Scout Senior Roundup at Farragut, Idaho, July 17-26, 1965. This was the first time amateur radio was incorporated in Roundup planning. Operators from Idaho and Washington kept three stations on the air from 0800 to 2400 MST. Two stations, a Swan 400 and Hallicrafters SR-160, were set up in the Rendezvous area and Scouts who stopped by to listen were invited to send a message home. All states but one were signed in by 730 girls who wanted to know more about amateur radio. In the administration building a complete Collins S-line station with a 3-element beam was installed. Between all stations 547 contacts were made with all states but 9, plus 14 DX countries. Messages for the girls consisted of 183 informal ones, 36 formal ones, several phone patches direct to parents, and 15 messages received from parents.

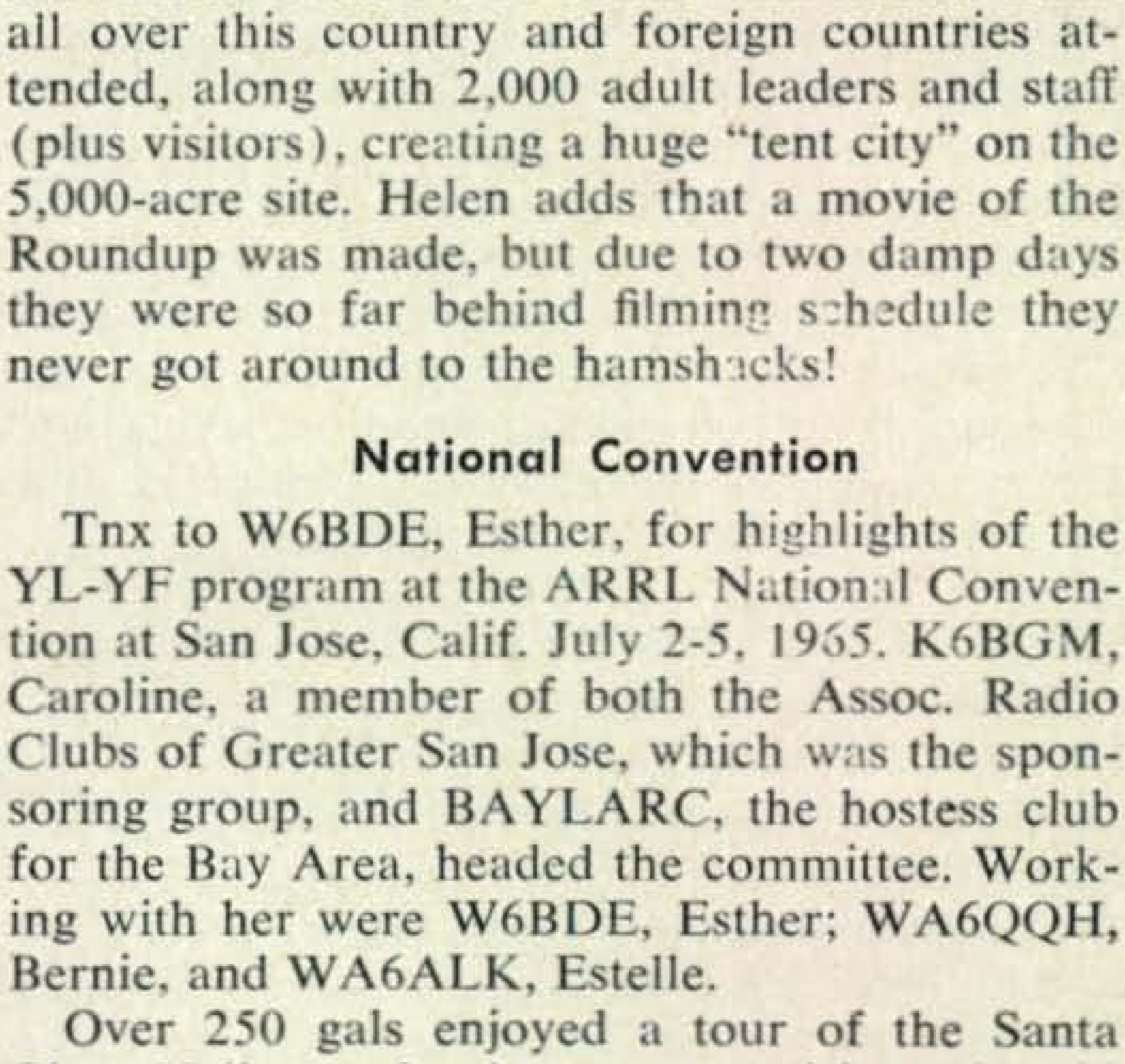
The Spokane ARC under direction of W7BFI, Irwin, Comm. Director, installed the wiring, antennas, and stations. W7GGV, Helen, of Pocatello, Asst. Director, was in charge of operators. YLs working with her were K7RAM, Bobbie; K7PVG, Frieda, and daughter, K7VSG, Vicki; W7TWQ, Jessie; W7GUQ, Bettie; W7OBH, Catherine; K7MFS, Gladys, and WA7BDD, Joan.

Roundups are held every three years; this was the fourth. Some 9,000 Senior Girl Scouts from all over this country and foreign countries attended, along with 2,000 adult leaders and staff (plus visitors), creating a huge "tent city" on the 5,000-acre site. Helen adds that a movie of the Roundup was made, but due to two damp days they were so far behind filming schedule they never got around to the hamshacks!

National Convention

Tnx to W6BDE, Esther, for highlights of the YL-YF program at the ARRL National Convention at San Jose, Calif. July 2-5, 1965. K6BGM, Caroline, a member of both the Assoc. Radio Clubs of Greater San Jose, which was the sponsoring group, and BAYLARC, the hostess club for the Bay Area, headed the committee. Working with her were W6BDE, Esther; WA6QQH, Bernie, and WA6ALK, Estelle.

Over 250 gals enjoyed a tour of the Santa Clara Valley orchard country, a visit to the old Santa Clara Mission, inspection of a winery (with a tasting period), and luncheon at Los Gatos, as



Senior Scouts get to talk to home city via K7GS from the Girl Scout Senior Roundup at Farragut, Idaho. Jessie, W7TWQ, wearing Red Cross arm-band, operates the Swan 400. Photo courtesy W7GGV.

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

guests of the convention committee. Other events included a presentation of SWOOP by the original SWOOP team, W6BDE, K6HIW and WA6GQC, and celebration of SWOOP's 9th birthday, complete with cake, candle and sparkler, surrounded by 16 charter members of SWOOP who were initiated at the National Conv. in San Francisco in 1956.

BAYLARC's sponsored a 4th of July breakfast for over 150 ladies, with many prizes. W6QYL, Martha, president of YLRL, moderated a YL forum, which was attended by three past presidents: W7NJS, Beth; K6OQD, Jean, and W6DXI, Gladys. Backdrop for the forum was the certificate bedspread, main prize of the 1964 YLRL Convention, which K6KCI, Irma, its winner, brought for all to see. A lovely display was sent by the Colorado YLs inviting all to the YLRL Convention to be held in Denver in 1968. The invitation, edged with pictures of each of the 49 SYLVER DOLL(AR)S, was presented to W6BDE by WA6PKP for safe keeping, since it was BDE who kindled the spark which resulted in formation of the Colorado YL club. Three different workshop demonstrations presented by women in handcraft and hobby arts enabled the gals to actually make a sample of the craft to take home. Also available to the YLs-YFs was a 3-room hospitality suite, complete with color TV, eye-lash QSO space, handcraft displays, and YL & YLRL posters and certificates.

Congratulations

To W6QGX, Harryette, for taking part in the 19th annual Powder Puff transcontinental women pilots derby. Leaving from El Cajon, Calif. on July 3, termination of the race was 2,400 miles away at Chattanooga, Tenn. Harryette flew as co-pilot with Virginia Wegener, also of Calif. Ironically they were forced down only 10 miles from the terminal point when their engine began sputtering from trouble in the fuel line. Fortunately neither was hurt, though their plane was damaged. Better luck next time, Harryette!

Pictured at the MINOW YLs annual picnic at Lewis & Clark Trail State Park in May are, l. to r., front: K7RAM, K7VSG, W7NJS, K7MRX; 2nd row: K7KSF, K7YDO, W7FDE, W7IXR, K7TWQ; back row: WN7CCZ, K7PVG, K7UHF, W7JRB.

K6ELO, Roxy (left), received the president's gavel from W6QYL, Martha, outgoing president of L.A. YLRC, at installation luncheon in June. This is the olive wood gavel Martha brought to the club from Lebanon. W6KW photo.

To Tillie, KØRGU, for being the first YL in the world to earn CHC-400; also to Tillie for her FB column, "YL Hunters News."

To W3CDQ, Elizabeth Zandonini, on her retirement from the Bureau of Standards after 45 years of government service. A wonderful dinner party was given to Liz by her section at BuStan with many out of town and ham friends, and lots of gifts including world atlas, typewriter, luggage, album of photos, plus a certificate from the Bureau as well as a letter from President Johnson.

Here and There

On a quick trip to W1 land to see our family we enjoyed chats with K1ICW, Mary; K1IZT, Blanche, and K1EKO, Edie, and were so glad to learn Edie's son was improving after lengthy hospitalization and several operations. . . . Learned that W1IIF, Ruth, and family were off to Europe for 6 weeks. . . . Our best wishes to W1HOY, Helen, and Sam, W1FZJ, on their move to Puerto Rico.

The Los Angeles YLRC June meeting was an installation luncheon at QTH of Fran, W6GAI, who helped guide the gals by running flags (her call letters in nautical code) to the top of her tower. New club officers are: President, K6ELO, Roxy; V.P., WA6ISY, Myrtle; Rec. secy., WA6KLP, Carlene; corr. secy., WA6OAZ, Vera; treas., WA6LWE, Madge.

KØGRU reports that at the RMD Conv. at Denver in July the Colorado YLs elected these officers: Pres., WØUTO, Ollie; V.P., WAØEXX, Betty; secy., WØHWL, Judy; treas., WAØBBR, Joyce; P/C, WØESD, Estelle; historian, KØBTV, Kay; editor *Loose Change*, KØWZN, Anne. Chairman for the '68 YLRL Conv., KØEPE, Marte, is moving to Nebr. or Kans., but expects to be back before convention time. These gals are generating so much enthusiasm and so many ideas for the convention they are having a rough time "keeping the brakes on."

New officers for Floridoras: Pres., K4UIZ,

[*Continued on page 102*]

RTTY

BYRON H. KRETZMAN,* W2JTP

RTTY Operating Frequencies

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

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

SURPLUS terminal equipment for radioteletype has never been in abundance or in any kind of variety. We briefly described the AN/URA-6A and -7A (CV-57 and CV-71) in the September '62 RTTY Column, and the AN/URA-8A (CV-89) in the June 1961 Column. Several other types, designed to work from oddball i.f.'s of military receivers, and in small quantity, are gathering dust in surplus emporiums around the country. The biggest and least expensive surplus converter is the AN/-FGC-1. This 425-pound fabulous monster naturally is not very popular, especially with the fellow with limited room for ham gear. Therefore, not too many surplus houses stock them.

Since there is quite a lot to the AN/FGC-1, both physically and electronically, we began a series in the July '56 RTTY Column describing each significant unit or panal. (The AN/FGC-1 has been in use at W2JTP for many years.) Much to our surprise we have been getting quite a few letters from other RTTYers using it, telling us about modifications made and the way *they* are using it. We will pass along this interesting info as time and space permit.

The AN/FGC-1, Part IV

The Receive Relay Panel and Monitor Circuit

The 255A polar relay on the REC RELAY panel is operated from the Detector Panels and its contacts are used to key a *polar* "local" loop. The polar loop circuit was used because in the original application the AN/FGC-1 was located at the radio receiver station, many miles from the Signal Center where the Teletype machines were located. (Use of a neutral loop over such a long wire line would have resulted in telegraph distortion.) A spare 255A relay and circuit is provided on this panel so that it may be quickly patched in if the normal relay, or its circuit, is suspect.

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

Figure 1 (1) is the simplified schematic diagram of the receive relay and loop circuit. The equivalent polar loop circuit is shown, too. Note that a ground return may or may not be used. Generally, it is not, SUB. SET is the machine (or polar relay) at the Signal Center end.

When the receive relay REC is operated to its marking contact by a signal from the marking detectors, it connects the negative terminal of the 130-volt supply through 124-ohms to one side of the receiving loop circuit. The return side of the loop is connected to the junction of two 3500-ohm resistors across the same supply. This arrangement is electrically equivalent to that shown in Figure 1 (2). The 130-volt power source and 7000-ohm voltage divider with midpoint grounded produce the same loop current as would two 65-volt batteries in series with their midpoint grounded acting through 1750 ohms. When the polar relay is operated to its spacing contact, the positive terminal of the supply is connected to the loop while the return remains connected to the junction of the resistors. Thus a marking signal causes current to flow through the loop in one direction and spacing signals cause an equal but opposite current flow. This polar operation makes the circuit practically independent of ordinary variations in rectifier voltage and loop current, and of telegraph bias.

The contacts of the polar relay are protected and isolated by an extremely efficient filter, mounted close to the relay socket. The r.f. chokes used are each about 2 mhy, and the parallel resistors could be 390-ohm 1-watt carbons. Not a trace of hash gets through this filter to be radiated.

WA8GVK at Muskegon, Michigan. The right-hand rack is the RTTY station. (The left-hand rack is hi-fi audio.) The AN/FGC-1 has been re-racked in the rear, except for the patch panels. A TT-63 Regenerative Repeater, near the top, is used in conjunction with the AN/FGC-1. Below the 'scope tuning indicator is a 32S-1 and an HQ-180 receiver.

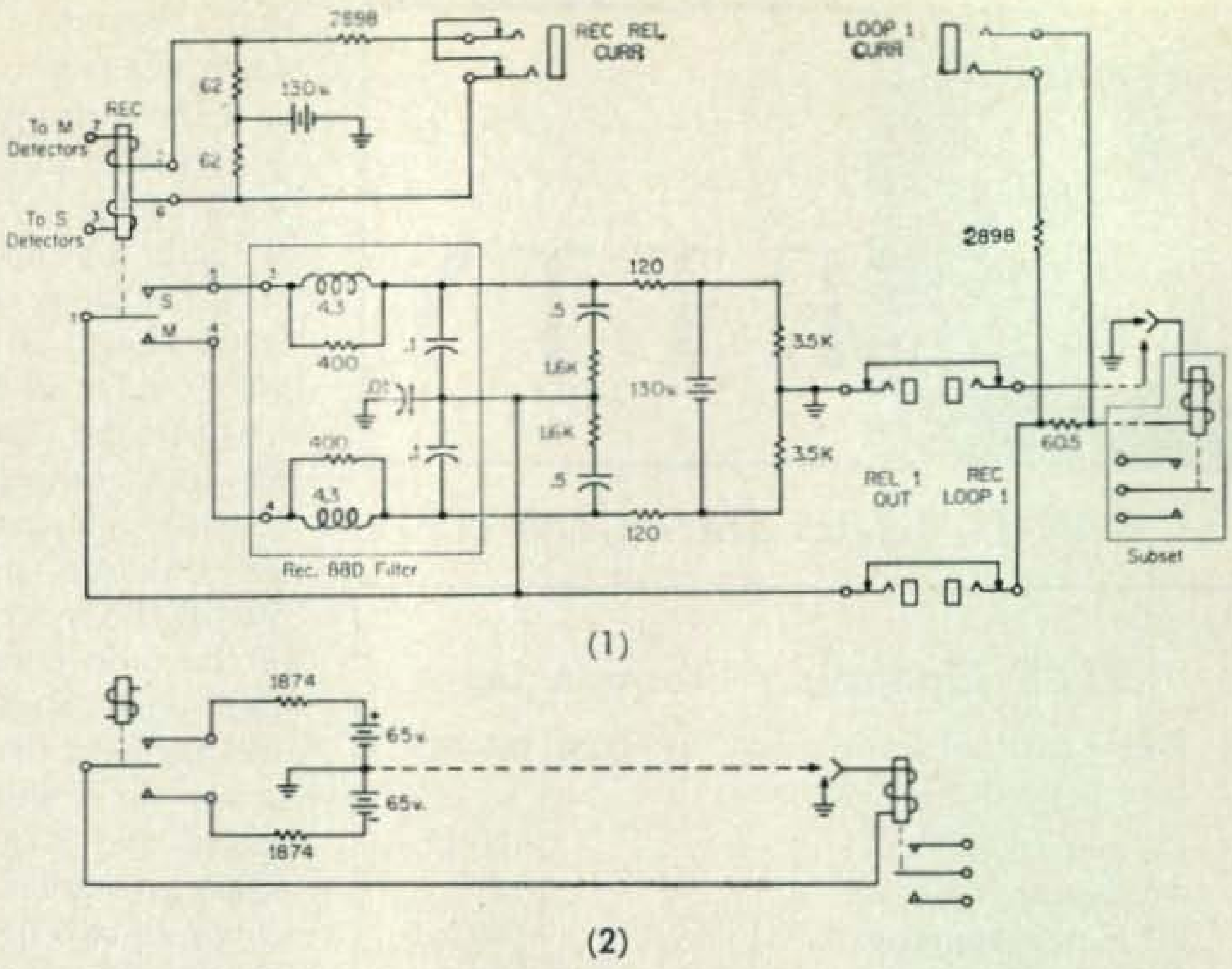


Fig. 1 (1) Simplified schematic of receive relay and loop circuit. (2) Equivalent relay and loop circuit.

Monitoring Circuit

Located just below the REC RELAY panel, and directly connected to it, is the 1¾-inch monitor relay panel. This circuit is sort of a manual "markhold" whose purpose is to prevent the operation of receiving teleprinter by noise currents when the radio receivers are connected to one or more radio circuits on which the distant transmitters are not in operation, or when the receiving circuit is not functioning for some reason. A marking signal of more than about one-quarter-second from the distant transmitter automatically restores the teletypewriter circuit to normal and the monitoring circuit to a non-monitoring condition. If two radio circuits have been monitored simultaneously, the receivers must be disconnected from the idle circuit before messages are received from the other circuit. Figure 2 shows a simplified schematic diagram of the monitoring circuit. For simplicity the filter is not shown.

The monitoring circuit is placed in a monitoring condition by the operation of a key, or push-button, at the Signal Center which operates a relay in the radio receiver cabinet, closing its contacts and connecting negative battery (or power supply—TB) to the winding of relay *A* causing it to operate. Relay *B* is normally operated. The upper contact of relay *A* grounds the spacing winding of the polar receiving relay REC through 6905 ohms, thus tending to hold its armature on the spacing contact. Electrical disturbances may cause it to leave this contact momentarily, but there is no effect as long as it does not remain on the marking contact for more than about one-quarter-second. The second contact of relay *A* connects – TB to the winding of relay *C*, operating it. The bottom contact disconnects the loop circuit from the polar relay armature and connects it to – TB through 1400 ohms, thus holding the loop relay in the subset at the Signal Center steadily on its marking contact and so preventing the operation of the teleprinter due to noise. The operation of relay *C* disconnects the winding of relay *B* from the positive supply (+ TB) which has held it operated and connects it to the armature of the polar relay REC. As noted above,

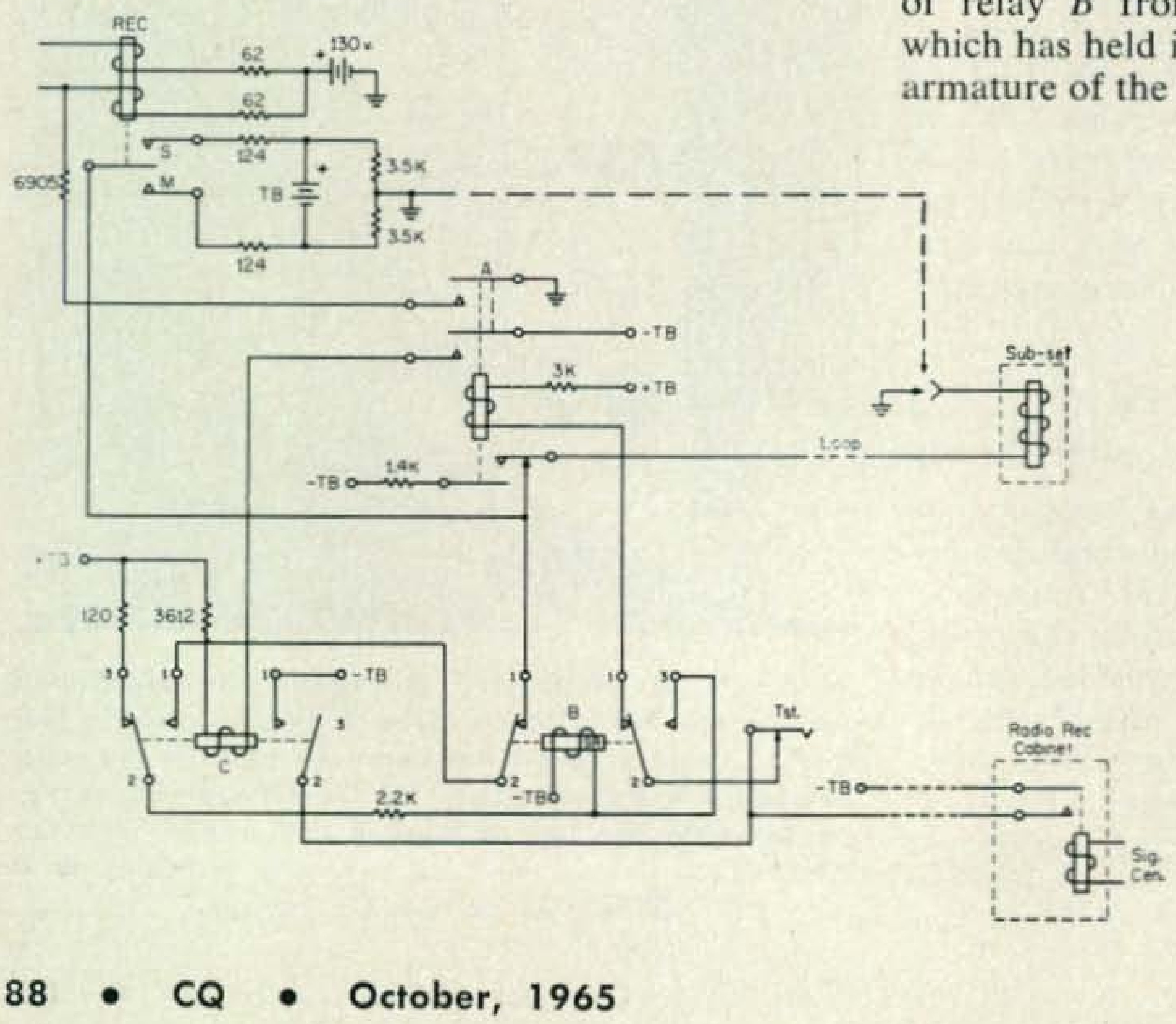


Fig. 2 Simplified schematic of monitoring circuit.

Up In The Air Over RTTY?

this armature is held on the spacing contact which is also connected to + TB and so relay *B*, which is slow releasing, remains operated.

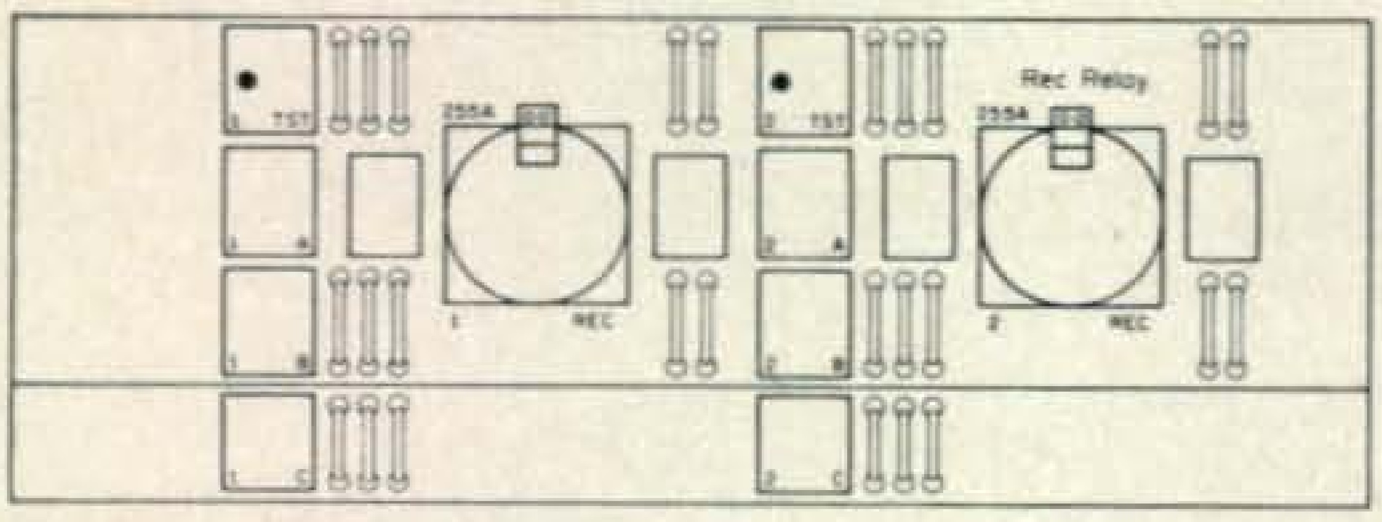
Reception of a *mark* signal for over one-quarter-second operates the polar relay REC to its marking contact, causing relay *B* to release. This releases relay *A* which in turn releases relay *C*. The winding of relay *B* now has – TB connected to one end and + TB to the other; however, the contacts of the relay in the radio receiver cabinet short the + TB around the winding, preventing operation. Opening of the key at the Signal Center momentarily opens these contacts and allows relay *B* to operate and re-establish the monitoring condition. Of course, use of a push-button at the Signal Center immediately establishes the monitoring condition when released.

If you have been following this series on the AN/FGC-1 you no doubt have observed that one of the most interesting features of this terminal unit is the extensive provision of test and patching jacks on every unit. A test meter for both a.f. and d.c. is also provided, on the FREQUENCY INDICATOR panel, and this will be detailed next. Watch for it.

On the Bauds

W1AOH of Darien, Conn., uses narrow shift on 20. WB2OOL of Frenchtown, N.J., uses tape and 95 watts on 80. K2SYM of Poughkeepsie, N.Y., is on 20. WB2AXT of Teaneck, N.J. is on 146.70 nightly and is looking for a diagram for the surplus FRA CRV35122 converter. W2DFX of Center Moriches, WB2AGI of Brookhaven, and WB2DUP of Shoreham, all on eastern Long Island, are getting set for 146.70 f.m.

K3UMJ and W3ILZ of Philadelphia, Pa., are both on 80. RTTY Old Timer W3PYW of Silver Spring, Md., still chases dx (*and very successfully!*) on 20.



The Receive Relay Panel and the Monitoring Circuit Panel, as they are installed in the AN/FGC-1. The main and spare receive polar relay circuits are on a 5¼-inch rack panel, and the monitor circuit is on a 1¾-inch rack panel just below, but wired directly to it.

WA4QVH, ex-K2ZZH, is Radio Officer on the USNS Pvt. Jose E. Valdez and hopes to be Mobile Marine soon, using an NCL2000. WA4DXP of Huntsville, Ala., uses 4-400's on 80, 40, and 20; and, *four* 4X150's on 6 meters, with the Twin City TU and a.f.s.k. oscillator; with Model 14 and 15 machines. OM Smith wants to know why he never has heard RTTY on 7040 kc. (*That frequency is used mostly in the west; look around 7140 kc, for narrow shift.*) K4AWB of Travlers Rest, S.C., works 20. K4BUR of Fairfax, Va., also works 20, but with tape. WA4LWE (*Hope we have it right, this time!*) on Pilot Mountain, N.C., put product detectors in all of his receivers. WA4GWA of Cocoa, Florida, is also on 20.

Chuck Cook, W6SCR of Los Altos, Calif., provides service to local RTTYers on their machine problems. Chuck has a good supply of parts and manuals for 14, 15, and 28 Teletype machines. WB6GOW is looking for a manual on his FRXD-10 Reperforator-Transmitter. (*Try Propagation Products Co., P.O. Box 242, Jacksonville, Florida, OM.*)

K8MYF of Columbus, Ohio, uses tape on 20. W8NLT of Charleston, W. Va., is on 20, too. W9BCY of Ashland, Wis., who also works 20, was visited by W3MHD who was operating /9 from his motel room in Ashland. W9ZGC of South Bend, Ind., uses 150 watts on 20.

DX printed at W2JTP on 20 meters, during late July: I1CN, DL1KB, OZ7OF, DL3IR, LU1AA, FG7XT, YV5AFA.

Comments

As you might note from the above, our "On the Bauds" this month reflects light activity, mostly activity on the eastern seaboard of the U.S.A. For some reason, summer perhaps, we have not been getting very many reports lately on activity from you fellows in the midwest and in the west. Now that fall is here perhaps you can find time to drop us a line with news of happenings in *your* area. And, if you would like to see a picture of your RTTY ham shack in *CQ*, just send along a snap-shot or any glossy print.

73, Byron, W2JTP.

For further information, check number 63, on page 110

Radio Row [*from page 32*]

quantities of material became available to the public. Amateurs in the service had had the opportunity to work with the most sophisticated and versatile communications equipment available. With typical American planning, enough equipment was stockpiled to outfit several other armies and this gear was snapped up by the waiting amateur just as fast as it could be released.

Conversion articles abounded in the ham magazines and surplus ads frequently outnumbered ads for commercial parts and gear in the magazines. Prices were low, profits were high, dealers made a lot of money.

Then came Korea and the market temporarily dried up with the government initially buying back surplus equipment and spare parts at original and sometimes *over* original acquisition cost. The dealers made still more money.

After Korea the surplus market was flooded again with even more exotic surplus equipment, old surplus, and the residue of factories geared to wartime production.

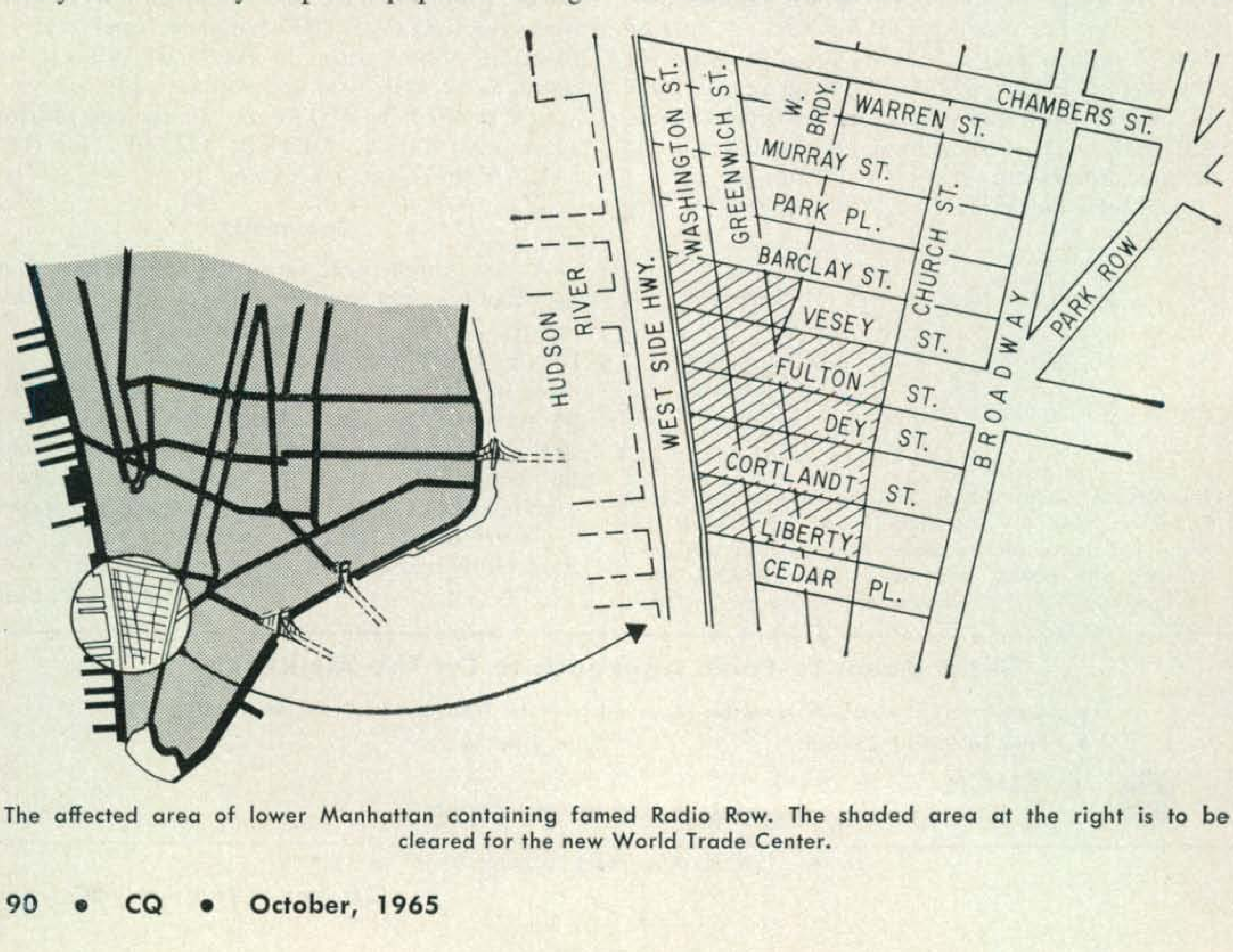
Factories going out of business, plus a rapid cut back on the number of TV set manufacturers deposited vast quantities of goods on the market. Dealers made money, builders saved money, people built more, and surplus was king.

Times were good then, but soon the bottom started to slip away gradually. The war ended over twenty years ago, companies now have tighter inventory control and tend to re-organize instead of go out of business. The avalanche of goods has dwindled down to a trickle. So-called "good" surplus is in short supply and relatively new military surplus equipment is high priced and frequently too sophisticated for amateur use. Parts that once would have filtered down to the surplus market now reach a cost conscience industrial market in a highly competitive economy. Suitable World War II surplus has been depleted by twenty years of picking, and the large number of dealers has dwindled proportionately. Through foresight, some of the dealers have stockpiled equipment and parts during the prosperous years and that is what is being offered today. There is still surplus available from the government but in relatively small quantities. This is doled out year by year.

A new and more profitable market for surplus equipment and parts are the newly forming countries around the world and the various South American and European governments. What would have ben sold domestically is more and more frequently being exported, further diminishing the U.S. market.

What Lies Ahead

What lies ahead is the first lesson in Economics I. It is the Law of Supply and Demand. Dealers can only sell what they have been asked for, or what they can create a demand for. A dwindling Cortlandt Street cannot be blamed entirely on a new building labeled progress, but rather the guilt (if it is guilt) should lie with progress itself. The amateur, like everyone else grows with changing times. He learns through example and perpetuates the art. He creates a demand, that those who earn a living from him must satisfy. It is just that progress is sometimes a painful thing. Most of the stores will relocate and business will go on as usual, but somehow it won't be the same. ■



The affected area of lower Manhattan containing famed Radio Row. The shaded area at the right is to be cleared for the new World Trade Center.

Letters *(from page 12)*

nal models produced. It had a pair of 46's in the final, with a 47 Crystal Oscillator . . . and it worked!

Later, I traded the 4A in on a 32B, very similar to the 30W mentioned in the article. This was a phone transmitter with the same r.f. lineup as the 4A, but with Class B modulation.

Quite a difference in Collins today!

F. C. Miller, WØRQS
5327 N. 52nd Street
Omaha, Nebraska 68104

VHF *(from page 79)*

"As pictured in May 1965 *CQ*, my converter is also based on the K6AXN one. The cavity front end, however, runs 3 to 4 db better than the usual trough-line type front end. This is weak signal performance. I attribute this to greater selectivity of the front end which employs two cavities. One is used as an injection filter and the other is used as a signal tank. Due to the very high *Q*, I have since added a micrometer for tuning each tank.

"The Toledo-Sandusky-Detroit communication is often 20 and even 35 db above the receiver noise. Operation is still in its infancy with the following stations active:

W8JLQ 15 w. carrier c.w. & a.m. 64 el. wide sp. coll.
W8RQI Tol. 15 w. c.w. & a.m. 96 el. collinear
W8HCC Sand. ? w. c.w. & a.m. 64 el. wide sp. coll.
K8AIY Detr. 10 w. c.w. & a.m. 32 el. wide sp. coll.
W8UCT Detr. 3 w. c.w. & a.m. 48 el. coll.
W8RLT Detr. 18 w. c.w. & a.m. 64 el. wide sp. coll.

"432 mc activity continues routinely over the above paths. We had some nice contacts into Toronto, Ontario with VE3AIB and VE3BQN as well as VE3DSU and VE3EMT in London, Ontario. W8RQI has also contacted WØIDY again this year." *(Nice to hear of your 1296 activity. Always seems that you fellows out in the Midwest are ahead of the rest of the country. Keep up the fine work.)*

George S. Haymans, Jr., WA4NED, Gainesville, Georgia: "A little over a year ago a *CQ* staffer suggested that I try an Ebco halo on my 50 mc mobile rig. I did and want to say that the results were wonderful. I have been told that I have the best mobile signal on six meters in this area. Write it up sometime, fellows!

"Now for a small request. I am having a lot of fun with transistor work on six. One of the best low-powered jobs is Vanguard's 150 mw module. I have one mounted in a 3 × 5" Minibox, including a 12 v. battery and actually get good groundwave contacts over a 40-50 mile range. No 59, of course, but many 55 contacts.

"Now I want a small 'linear' to be excited by the Vanguard. I need something that'll work with a 12 v. power supply and deliver one or two watts.

"Any suggestions that won't require bank financing?" *(Unfortunately, I don't recall seeing anything like that in CQ, although in an early Stoner Semiconductors column I believe there was a circuit of a miniscule 10 meter linear. K2UYH is working up something for you along these lines. Meantime, it seems as if a general call for help is due! Readers with the dope George needs, please write: WA4NED, Box 468, Gainesville, Ga.*

Kirk Fourcher, K1MRI, Ridgefield, Connecticut: "I thought you might be interested in a contact I made while looking for counties for the USA-CA award. (I'm trying for a 50 mc-only certificate).

"On July 6, starting at 1755 EST I worked WA9MEF/mobile in three states (Illinois, Kentucky and Tennessee) and seven counties. This was one, long continuous contact which ended at 1934 EST. And I have cards from WA9MEF confirming each county." *(A few more cooperative mobiles with a full tank of gas and you'll be all set!)*

George Kangas, W1LUL, Norwich, Connecticut, wants FM info: "K1IIG in Hartford, K1UGF and I are on

For further information, check number 51, on page 110

For further information, check number 52, on page 110

146.940 mc FM in the New London area and we are looking for skeds. Can anyone supply information on repeaters and such?" *(Write W1LUL at 30 Western Avenue).*

Steve, WA7BSN, Pullman, Washington: "Besides the solid wall of KW's from southern California on six, I have one other gripe: Where are all those 'idiot Technicians' that can't send code at 13 w.p.m.?" *(Sounds to me like you've answered your own question.)*

"Aside from skip, the NW is a vast wasteland on v.h.f. Oh sure, Seattle has some KW's, but I got nobody close to ragchew with." *(Perhaps that's because most stations in your area are Technicians who don't like being rubber-stamped as "idiots.")*

Thirty

Afraid we'll have to hold over the surprise circuit promised last month for the November column. If you can't wait that long, drop a line to K2UYH for the schematic.

Meantime, keep the correspondence and photos rolliig in. Makes for a better v.h.f. corner.

73, Bob, K2ZSQ & Al, K2UYH.

Surplus Crystals *(from page 52)*

limit the extent you can change the frequency as will the care you use in grinding.

For a grinding compound, I have found that common cleanser will work as well as could be desired. Powdered cleansers may claim not to harm the finish on your sink, but they will grind a crystal quite well, and frost the glass at the same time. Put a little cleanser on the glass with a little water, lay the crystal blank flat on the glass and rub gently. I generally move in a figure 8 pattern on the glass, but the main idea is to shift the crystal so it is ground an equal amount over the entire surface.

Next tilt the crystal at a forty-five degree angle and gently grind the edges the same. Grind all four edges on both sides. The grinding of the edges changes the frequency only slightly, but is necessary to keep the crystal active.

Clean the crystal and carefully place it back in its holder, with the spring and the bolts in place, and then check the frequency. A receiver with a calibrated 100 kc oscillator is generally sufficient for most applications unless one is near the band edges. Repeat the process, being especially careful to grind the edges at a forty-five degree angle, until the crystal is at the right frequency. Often inactive crystals that will not oscillate even after cleaning will take off after having their edges ground slightly.

Grinding crystals is neither difficult nor tricky. I would suggest trying a crystal you can afford to lose for the first try, as you can make the cost of failure no more than a 35 to 60¢ surplus crystal. No matter how well you can grind a crystal, there will come a point where the thickness becomes so uneven that the crystal will not oscillate. The amount you can shift the frequency of a crystal depends upon care in grinding, the quality of the crystal material, the original frequency of the crystal, and a certain measure of just plain luck. So the next time you need a crystal for a particular frequency, get out a piece of glass, some cleanser, and rub and scrub your surplus crystal up where you want it. ■

Amateur Ingenuity *(from page 64)*

came so great, one of the fellows volunteered to fake an appendix attack to obtain admission into the hospital where he could steal some tubes from the receiver there. The idea worked. When he emerged from the hospital, hidden under his bandages were enough tubes to finish the project.

By the end of 1943 the receiver was finished and the men listened to the BBC on 9.5 mc. When the receiver was not in use it was put back in the kerosene can with a false section, on top of which was placed cooked rice. The receiver had to be continually dried out and it was taken out of the can and placed on the bake oven in a flour can to dry. One day while it was drying a Japanese guard accidently knocked over the can exposing the receiver. The guard carried his prize away for his own use and whatever became of the receiver no one ever found out.

With the end of the war, ham radio took up where it left off and progressed slowly for a few years until the end of the 1940's when s.s.b. started to peep over the horizon. Things began to happen on Sept. 21, 1947 when O. G. Villard Jr., W6QYT put W6YX, the Stanford University Radio Club station, on s.s.b., and contacted W6-VQD on 75 meters. This was followed by a 20 meter contact with Art Nichols, WØTQK. Although these were not the first s.s.b. contacts in ham radio they were the first after the war and stirred up the ingenuity. Shortly afterward D. E. Norgaard, W2KUJ, published data on a little one frequency s.s.b. exciter called the SSB Jr. in the Dec. 1950 issue of *GE Ham News*. This jiggled the ingenuity of W9DYV, Wes Schum, who mixed the SSB Jr. with a v.f.o. to gain coverage across the band. S.s.b. was on the way, first in the form of a separate receiver and transmitter and then in the form of a transceiver designed by the Collins Radio Company and designated as the KWM-1.

Transceivers were about to arrive on the scene. Buddy Alvernaz, W6DMN, developed a filter exciter made from the BC-453 the Q Fiver. This stimulated W6IQY, Ernie Mason, with the idea of making a transceiver out of the unit. Soon after this Herb Johnson, W6QKI, came on the market with the Swan Transceiver. I guess you know the rest of the story. The period of the late 50's and early 60's showed ham ingenuity at its best. Since then the circuits have simmered down to standards most too complicated for the average amateur to build. What of the future—will anyone build his own gear anymore? Time will tell; let's wait and see what happens next. ■

ARC-port on 40 *(from page 42)*

with the tank capacitor set at 75 mmf. Using an 8 watt lamp on the output, peak the v.f.o. plate coil and final tank at 7050 kc.

For correct operation the 5763 readings should be: E_P 320 v.; E_{SG} 240 v.; I_{CG} 3 ma; I_P 50 ma.

Final Adjustments

Put a 50 ohm carbon resistor on the output of the final tank coil link. Using a field strength meter, peak up all of the slugs for maximum outptut at 7050 kc. With about 4 turns of hookup wire *(L_4)* around the tank coil as pickup, couple to the antenna coil *(L_5)* with RG-58 U coax and 4 turns of hookup wire *(L_5)*. Using the Air-Dux #1010, 15 turns will resonate forty meters. If 60 feet of wire is used, clip it on the end of the coil; if a shorter piece of wire is used, clip down a few turns from the top toward the ground end until the pate meter reads 50 ma. The final should not be loaded up beyond the point where the plate meter does not dip in current.

That is just about the story on how to have a swell little forty meter portable station. The results have been excellent with mine. During the day time it has been no trouble to work into San Francisco. a 500 mile jump. Best of all, the rig weighs a little less than 18 lbs since the large tuning capacitor has been removed. That leaves room for more clothes if you intend to go on an air trip and are limited to 44 lbs of luggage. ■

LM Accuracy [*from page 38*]

output side of C_{106}, eliminating section *B* of S_{104} from the circuit (see fig. 2).

All frequency measurements will be made with the crystal switch on; the 1,000 ohm potentiometer functions as an output attenuator and the new connector functions as the output termination. The original output connector is not used and is left on the front panel.

Operation

Operation of the modified instrument is basically the same as before except that the low frequency range only is used. For instance, to measure the frequency of 3720 kc, set the frequency range to its lower frequency position and calculate which frequency in the 125 kc to 250 kc range will be measured. The actual (or approximate) frequency is either added to or subtracted from the nearest full megacycle which will allow a harmonic to fall into the lower frequency range of the instrument.

Subtracting 3720 kc from 4000 kc results in 280 kc which is the second harmonic of 140 kc and this becomes the frequency to be measured by the meter.

To determine a frequency around 14,120 kc, subtract 14,120 kc from 15,000 kc, giving 880 kc. This is the fourth harmonic of 220 kc which is in the low frequency range of the LM.

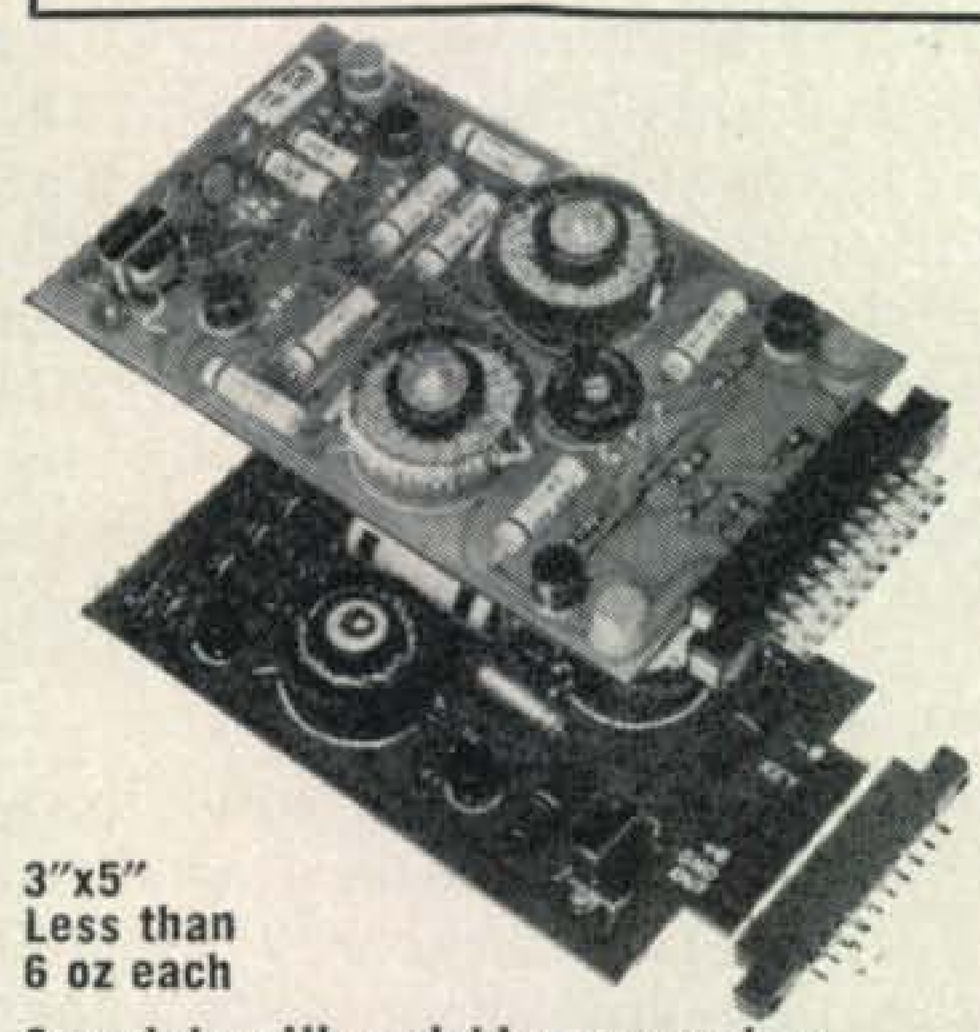
In measuring the 3720 kc frequency, set the frequency meter to 140 kc or until zero beat is obtained in the receiver set to 3720 kc and interpolate the dial reading. If the transmitting frequency of 3720 kc is being measured, zero beat the receiver to the transmitter's frequency, turn the transmitter off, tune the LM in the vicinity of 140 kc until a zero beat is obtained in the receiver and interpolate the reading. The accuracy of the 3 mc portion of the signal is determined by the accuracy of the meter's crystal and the calibration in the low frequency range

Get your **RTTY PRINTER**

ON THE AIR FOR LESS THAN $50.

New SOLID STATE DEVICES

GET YOU GOING, QUICKLY, INEXPENSIVELY AND EFFECTIVELY



3"x5"
Less than
6 oz each

Complete with matching connectors.

W2JAV DEMODULATOR Completely solid state radio teleprinter demodulator employing seven transistors and four diodes. Input impedance is 600 ohms and can be driven from a communications receiver or an AFSK. Will operate with input signal less than 50mv. Unit requires external polar relay and a 8 to 9 vdc supply @ 50MA. W/instructions. **KIT $19.95**

W2JAV AFSK UNIT Completely solid state unit employing two transistors and three diodes. Uses standard 850CPS shift. Adjustable output level from 0 to 200MV terminated in 600 ohms. Oscillator is Zener diode regulated and accuracy is 5% or better. Requires 8 to 9 Volts DC @ 5-10 MADC.
ASSEMBLED & TESTER **$24.95**

WE-255A POLAR RELAY W/Socket Adjusted and tested **$ 3.75**

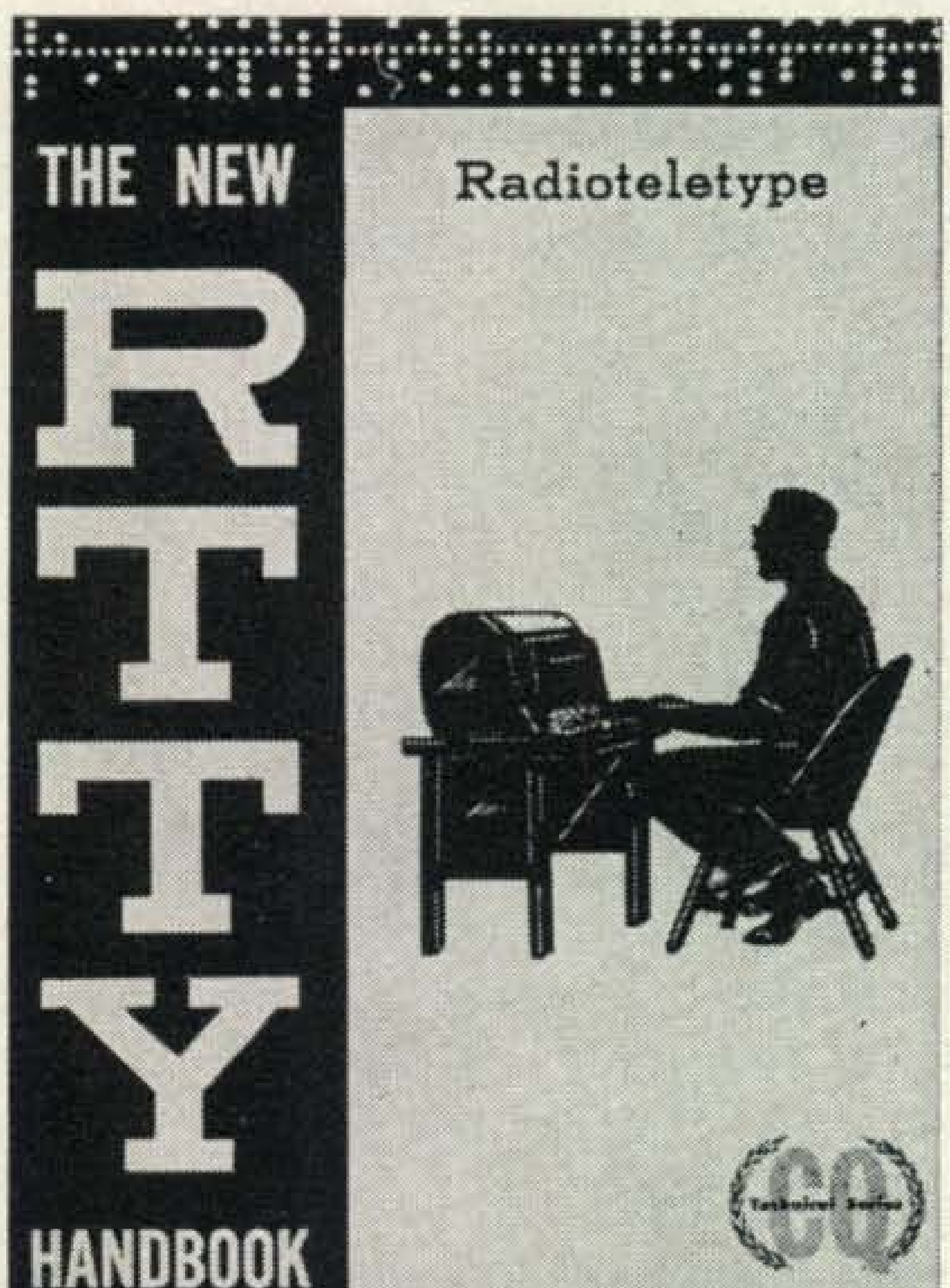
TOTAL $48.65

The W2JAV Demodulator is also available factory assembled, tested and guaranteed. **$29.95.** Also, board only with schematic diagram, **$2.95.** Sorry, AFSK not available in kit form.

ESSCO ***ELECTRONIC SURPLUS SALES CO.*** ***"RTTY Specialists"*** ***324 Arch Street, Camden, N.J. 08102*** **Phone: (609) 365-6171**

For further information, check number 58, on page 110

"THE NEW RTTY HANDBOOK"



A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, operating procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, all written by Byron Kretzman, W2JTP, a well known authority in the field. This book is a must for your library! Only $3.95.

***New York State residents Must add sales tax applicable to your area.**

CQ Magazine
14 VANDERVENTER AVENUE
PORT WASHINGTON, L.I., N.Y. 11050

SIRS: My check (money order) for $______ is enclosed. Please send ______ copies of the "The New RTTY Handbook."

Name______

Address______

City______ State______ Zip______

will be found to be excellent.

For use on MARS frequencies such as 3289 kc, subtract this frequency from 4000 kc; the resulting 711 kc is the fourth harmonic of 177.75 kc. To measure 4030 kc, subtract 4030 kc from 5000 kc; 970 kc is the fourth harmonic of 242.5 kc which is the actual frequency to be measured and interpolated. ■

URC-4 on 6.2 & 220 [*from page 29*]

plastic insulated #26 solid timed wire clockwise around L_5. The coil should be soldered at the junction of the existing antenna coil of L_5 where it couples to the antenna coil of L_6 and terminated at a ground point on the chassis between V_5 and V_8 directly above V_7. This will increase the antenna coupling required to provide the necessary sensitivity. This completes the receiver modification.

Antenna Modification For 50 Mc

The dipole antenna system employs two loading coils which permit the antenna to resonate flat over the frequency range between 120 and 130 mc. It is necessary to modify these loading coils so that the antenna system resonates at 50 mc. Unscrew the vertical rods near the cap with a small wrench. Identify the coil on the ungrounded side with the letter "B." Lift out the two loading coils and remove the wire. Wind new coils from #29 enamel wire with 18 turns on the form marked "A" and 12 turns on the form identified by "B." Apply a coating of Q dope to these coils and when dry reinstall in their original position. Measure the resonant frequency of the antenna with a grid dip oscillator as previously described. It should now resonate between 50 and 51 mc. Remove the one inch pick up loop and replace the antenna assembly on the vertical rods.

Testing

Connect the batteries. Press the "transmit" button and listen for the carrier in a nearby receiver. First rotate the slug of coil L_1 to the fully engaged position. Then slowly unscrew this slug until the oscillator starts operation. Rotate ½ turn counter clockwise beyond the point of where oscillation is first determined. Peak coil L_3 for maximum output with antenna in the fully extended position using a field strength meter as the output indicator.

To align the receiver, press the "receive" button and adjust the slug L_5 until local 6 meter signals are heard. The slug should be about one third of the way inside the form. Placing the cover on the URC-4 may detune the circuits slightly so use the procedure previously described to complete the alignment.

As recommended for the other units converted to prevent transmitting without a load in the U.H.F. position, insert the bakelite piece between switch S_1 and the case, and between the die cast switch stop and the spring clip when the switch is actuated in the V.H.F. position. This action will prevent the switch from being moved to the U.H.F. position.

Results with the foregoing conversions of URC-4 walkie-talkie units have been most rewarding. Many contacts have been established using all three units when travelling throughout the eastern half of the country. Best DX experienced to date has been 18 miles on 50 mc; 104 miles on 144 mc; and 10 miles on 220 mc. These records were all established by contacting well equipped home or field stations using high gain antennas and receivers with low noise figures. During a sporadic *E* opening on six meters transmission via a tone modulated signal was attempted, and the signal was received in Chicago some 600 miles from Washington, but the heavy QRM precluded possible contact. However, in a clean channel it is not beyond the realm of possibility. ■

Propagation [*from page 72*]

CQ DX PROPAGATION CHARTS

OCTOBER & NOVEMBER, 1965

Time Zone: EST (24-hour Time)

EASTERN USA TO:

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

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

For further information, check numebr 56, on page 110

For further information, check number 41, on page 110

For further information, check number 42, on page 110

Guam & Pacific Islands	11-12 (1)* 12-14 (2)* 14-17 (1)* 11-15 (1) 15-16 (2) 16-17 (3) 17-19 (2) 19-20 (1)	05-07 (1) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-00 (1)	00-03 (1) 03-07 (3) 07-09 (1)	03-04 (1) 04-07 (2) 07-08 (1) 05-07 (1)†
Australia & New Zealand	14-16 (1)* 08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-17 (3) 17-19 (2) 19-21 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-19 (1) 19-22 (2) 22-00 (1)	02-04 (1) 04-07 (2) 07-09 (1)	04-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)†
Northern & Central South America	07-09 (1)* 09-14 (2)* 14-17 (1)* 06-08 (1) 08-10 (3) 10-14 (2) 14-16 (4) 16-18 (2) 18-20 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-23 (1) 23-02 (2) 02-06 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-06 (1)	19-20 (1) 20-03 (2) 03-06 (1) 01-04 (1)†
Southern Brazil, Argentina, Chile & Uruguay	08-11 (1)* 11-17 (2)* 17-19 (1)* 07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-18 (4) 18-20 (3) 20-22 (2) 22-04 (1)	19-21 (1) 21-03 (2) 03-07 (1)	21-06 (1) 02-05 (1)†
McMurdo Sound, Antarctica	08-10 (1)* 07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-19 (1)	14-17 (1) 17-19 (2) 19-21 (3) 21-00 (2) 00-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	00-06 (1)	*Nil*

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

CENTRAL USA TO:

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

For further information, check number 27, on page 110

For further information, check number 43, on page 110

For further information, check number 44, on page 110

Far East	16-19 (1)* 15-16 (1) 16-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	02-05 (1)
Pacific Islands & New Zealand	12-14 (1)* 14-16 (2)* 16-18 (1)* 11-14 (1) 14-16 (2) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-17 (1) 17-19 (2) 19-20 (3) 20-22 (2) 22-00 (1)	23-01 (1) 01-06 (3) 06-07 (2) 07-09 (1)	00-03 (1) 03-06 (2) 06-07 (1) 03-07 (1)†
Australasia	14-16 (1)* 16-17 (2)* 17-18 (1)* 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-21 (1)	06-07 (1) 07-10 (2) 10-18 (1) 18-20 (2) 20-21 (3) 21-22 (2) 22-00 (1)	02-04 (1) 04-07 (2) 07-09 (1)	02-05 (1) 05-07 (2) 07-08 (1) 05-07 (1)†
Northern & Central South America	07-09 (1)* 09-10 (2)* 10-13 (3)* 13-14 (2)* 14-16 (1)* 06-08 (1) 08-11 (3) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-19 (1)	05-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-12 (1) 12-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-22 (2) 22-00 (1)	18-19 (1) 19-21 (2) 21-02 (3) 02-04 (1) 04-05 (2) 05-06 (1)	19-20 (1) 20-22 (2) 22-00 (1) 00-02 (2) 02-06 (1) 00-04 (1)†
Southern Brazil, Argentina, Chile & Uruguay	08-10 (1)* 10-12 (2)* 12-14 (3)* 14-16 (2)* 16-18 (1)* 06-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-18 (4) 18-19 (3) 19-21 (2) 21-03 (1)	19-21 (1) 21-02 (2) 02-04 (1) 04-05 (2) 05-07 (1)	21-05 (1) 01-04 (1)†
McMurdo Sound, Antarctica	08-10 (1)* 06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-19 (1)	15-17 (1) 17-19 (2) 19-21 (3) 21-00 (2) 00-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	23-07 (1)	*Nil*

Time Zone: PST (24-hour Time)

WESTERN USA TO:

	10/15 Meters	*20 Meters*	*40 Meters*	*80/160 Meters*
Western & Central Europe & North Africa	08-10 (1)* 07-08 (1) 08-11 (2) 11-12 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (1) 18-20 (1)	18-00 (1)	19-23 (1)
Northern Europe & European USSR	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 23-01 (1)	21-00 (1)	*Nil*
Eastern Mediterranean & East Africa	08-10 (1)	06-07 (1) 07-09 (2) 09-12 (1)	18-22 (1)	*Nil*
West & Central Africa	09-13 (1)* 06-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-10 (1) 10-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	18-23 (1)	18-22 (1)
South Africa	08-12 (1)* 06-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1) 23-01 (1)	17-18 (1) 18-19 (2) 19-21 (1)	18-19 (1)

CQ TECHNICAL BOOKS

CQ ANTHOLOGY I

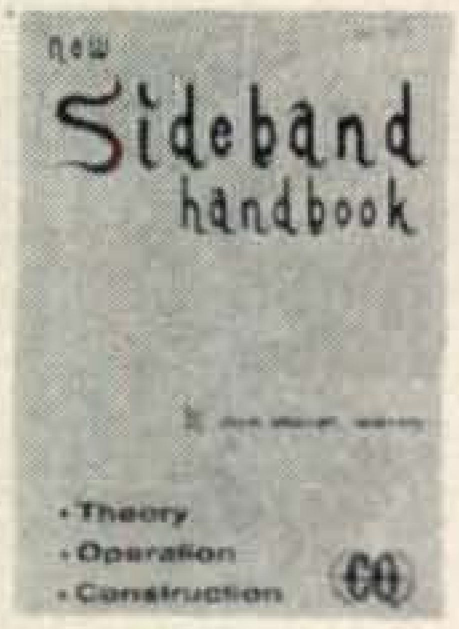
We've looked back through the years 1945-1952 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable.

ANTENNA ROUNDUP

A common denominator for all ham stations is the antenna. Here at last is the cream of antenna information packed into a 160 page book. Forty-seven information-packed articles that will dispel much of the mystery surrounding antennas.

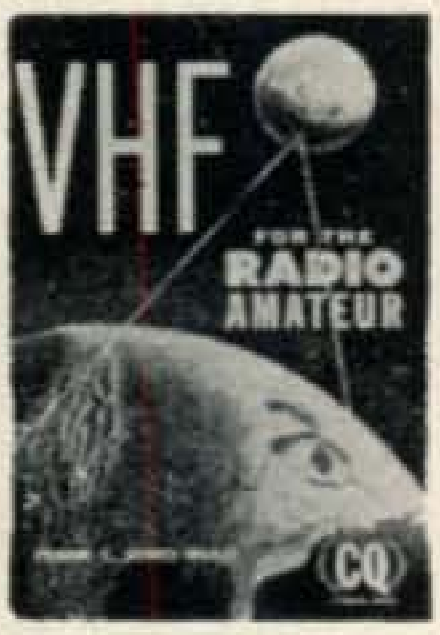
CQ ANTHOLOGY II

Top favorite CQ articles from 1952 to 1959 . . . including some you may have missed . . . compiled into one new information-packed book! No more need to try to locate sold out back copies of CQ. This Anthology includes past articles of lasting interest to every amateur radio enthusiast. Over 250 pages of text. Over 75 different articles. A definite Must for your shack!



SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, who was almost one full year in the preparation of this terrific volume. This is **not a technical** book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff gadgets, receiving adaptors, exciters, amplifiers.

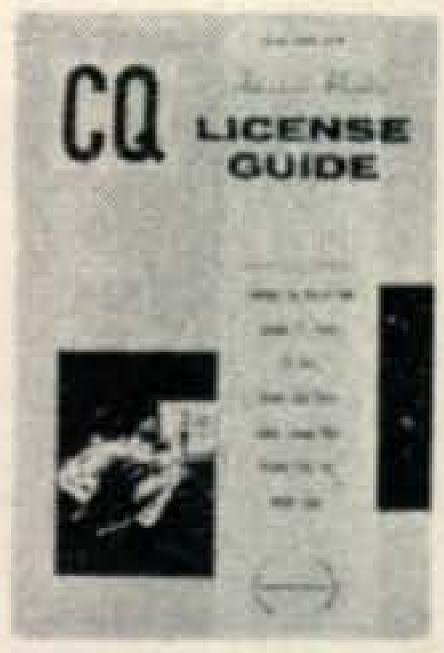


VHF FOR THE RADIO AMATEUR

If you are, or are planning to be a VHF operator, you can't afford to be without this dynamic new handbook written especially for you. Filled from cover to cover with all new and original construction material presented so you can understand it. Written by Frank C. Jones, W6AJF, nationally acclaimed for his VHF pioneering.

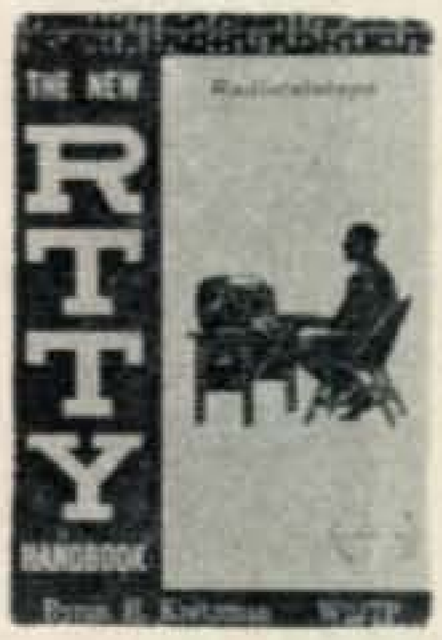
SURPLUS SCHEMATICS

This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many-times more difficult than the most involved puzzle, and purchasing a single instruction book can run as high as $3.50.



CQ LICENSE GUIDE

212 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator.



THE NEW RTTY HANDBOOK

A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section in getting started, all written by Byron Kretzman, a well known authority in the field. First printing sold out. Second printing on hand.

MOBILE HANDBOOK

This new Mobile Handbook by Bill Orr, W6SAI, has been getting raves from top experienced mobile operators. Written for advanced, as well as beginning mobile operators, much of this information cannot be found anywhere else. This is NOT a collection of reprints.

COWAN PUBLISHING CORP. Book Div.
14 Vanderventer Avenue
Port Washington, L.I., N.Y. 11050

CQ ANTHOLOGY I	$2.00	☐
CQ ANTHOLOGY II	3.00	☐
ANTENNA ROUNDUP	3.00	☐
SIDEBAND HANDBOOK	3.00	☐
VHF FOR THE RADIO AMATEUR	3.50	☐
SURPLUS SCHEMATICS	2.50	☐
CQ LICENSE GUIDE	2.50	☐
"NEW RTTY HANDBOOK"	3.95	☐
MOBILE HANDBOOK	2.95	☐
ELECTRONIC CIRCUITS HANDBOOK	3.00	☐
SHOP & SHACK SHORTCUTS	3.95	☐
SURPLUS CONVERSION HANDBOOK	3.00	☐
UNLIGHTED GLOBE	19.95	☐
ATLAS	15.00	☐
CODE RECORD	3.50	☐
REGULAR LOG SHEETS (100)	1.00	☐
SSB LOG SHEETS (100)	1.00	☐
HAM'S INTERPRETER	1.50	☐
TVI HANDBOOK	1.75	☐
BINDER—YEAR WANTED	4.00	☐
DX ZONE MAP	3.00	☐
DIODE SOURCE BOOK	2.50	☐
USA-CA RECORD BOOK	1.25	☐

***New York City and State residents must add sales tax applicable to your area.**

SIRS: My check (money order) for $______ is enclosed. Please send the following items to:

Name____________________

Address__________________

City________ Zone_____ State_______

For further information, check number 62, on page 110

Central Asia	17-19 (1)	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-09 (1)	*Nil*
South-east Asia	14-18 (1)* 13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	07-09 (1) 09-11 (2) 11-14 (1) 18-19 (1) 19-20 (2) 20-22 (1)	03-07 (1) 07-08 (2) 08-09 (1)	05-07 (1)
Far East	14-18 (1)* 12-13 (1) 13-14 (2) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	07-12 (1) 12-14 (2) 14-16 (1) 16-19 (3) 19-20 (2) 20-22 (1)	22-23 (1) 23-00 (2) 00-02 (3) 02-04 (2) 04-06 (1) 06-08 (2) 08-09 (1)	23-00 (1) 00-01 (2) 01-03 (1) 23-01 (1)†
Pacific Islands & New Zealand	13-16 (1)* 16-18 (2)* 18-19 (1)* 11-13 (1) 13-16 (2) 16-18 (4) 18-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-16 (1) 16-18 (2) 18-20 (4) 20-21 (2) 21-23 (1)	21-22 (1) 22-05 (3) 05-07 (2) 07-09 (1)	22-00 (1) 00-05 (2) 05-07 (1) 02-06 (1)†
Aus-tralasia	14-16 (1)* 16-17 (2)* 17-18 (1)* 10-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-21 (1)	06-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	01-03 (1) 03-06 (3) 06-09 (1)	00-04 (1) 04-06 (2) 06-08 (1) 04-07 (1)†
North-ern & Central South America	08-10 (1)* 10-12 (3)* 12-14 (2)* 14-16 (1)* 05-07 (1) 07-11 (2) 11-13 (3) 13-15 (4) 15-16 (2) 16-18 (1)	05-06 (1) 06-09 (2) 09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1) 00-02 (1)	18-19 (1) 19-01 (3) 01-03 (1) 03-05 (2) 05-06 (1)	19-22 (1) 22-01 (2) 01-04 (1) 23-02 (1)†
South-ern Brazil, Argen-tina, Chile & Uru-guay	08-10 (1)* 10-13 (3)* 13-15 (2)* 15-16 (1)* 06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1) 01-03 (1)	19-20 (1) 20-22 (2) 22-03 (1) 03-05 (2) 05-06 (1)	20-22 (1) 03-05 (1) 03-04 (1)†
Mc-Murdo Sound, Antarc-tica	09-11 (1)* 06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-19 (1)	15-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-01 (1) 06-07 (1) 07-09 (2) 09-11 (1)	23-06 (1)	*Nil*

YL [*from page 86*]

Evelyn; V.P., W4QBY, Dorothea; secy., K4ZXS, Georgia; treas., K4TBG, Cathy; certificate custodian, K4RNS, Marge.

New officers for the MINOWs are: Pres., K7RBE, Velda; V.P., K7YDO, Gerry; S-T, K7KQC, Nancy; P/C, K7KSF, Phyllis. Outgoing president K7RAM received a silver pin—a fantail goldfish and tiny gavel hanging from a bar on which MINOW was engraved.

Our deepest sympathy to Lenore Conn, W6NAZ, whose OM Joe, W6MSC, became a Silent Key in August.

YLRL A.P.

Just a reminder of YLRL's 26th Anniversary Party: C.W. section—Oct. 20-21; phone section—Nov. 3-4, 1965. Full rules were published in September *CQ*.

33, Louisa, W5RZJ

Contest Calendar [*from page 70*]

may be used, and only one contact per band is permitted with the same station.

The following rules apply to stations outside of India and Ceylon.

Serial Numbers: The conventional exchange, five and six figures, RS/RST report plus a progressive three figure contact number starting with 001 for the first contact.

Scoring: 2 points for each contact on a specific band with VU2/4S7 stations; 1 point for each contact with DX stations other than VU2/4S7.

Final Score: There was no indication of a multiplier in the rules, therefore it is assumed that the final score will be a total of the QSO points from all bands.

Logs: Should show in this order: Date/Time in GMT, station worked, serial number sent and received, and points. Use a different log sheet for each band.

Include a summary sheet with your call, name and address in BLOCK LETTERS, equipment description, and summary of your score by adding total QSO points from all bands. Sign a declaration that rules and regulations have been observed.

Awards: Certificates will be awarded to each country and each call area in W/K, JA, SM, UA, VK and ZL. (1) To the Top scorer using "All Bands." (2) Top scorer using one band. (3) Those with minimum contact requirements, to be determined by conditions and activity.

There is also an s.w.l. section. Scoring is the same as for the transmitting section and logs and summary sheets should be similarly set out. Only logging of VU2/4S7 stations have point value.

Logs cannot be postmarked later than November 30th and go to: Contest Manager, Glen V. Wickremaratne, 4S7GV, 150/5 Kandy Road, Kurunegala, Ceylon.

1965 CQ World Wide DX Contest

Complete rules will be found on page 31 of last month's issue. A brief summary and an explanation of some of the more controversial points will be found in the August and September CALENDAR.

Check George Jacobs, W3ASK's PROPAGATION column for his usual Contest forecast.

Time is running out but there is still time to get log and summary sheets. Air Mail is a must for overseas areas, so be sure to include sufficient postage (IRCs) with your request.

Our address: *CQ*, Att: Contest Committee, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

Ed. Notes

This issue of the column is being rushed to the printer. Our bags are packed, the Trophies are ready and we are practically on our way to Caracas and the Radio Club Venezolano's celebration. We include the XYL and Stu Meyers, W2GHK, who is also joining the festivities. Should have something interesting to report next month. 73 for now, Frank, W1WY

For further information, check number 29, on page 110

For further information, check number 30, on page 110

Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbreviations and addresses. Commercial and organization ads, 25¢ per word. **Minimum Charge $1.00.** No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day of the second month preceding date of publication.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

QSLs. 3-color glossy. Samples 10¢. Gates Pring Shop, 317-11th Avenue, Juaniata, Altoona, Penna. 16601.

PICTURE of yourself, home, equipment etc. on QSL cards made from your photograph. 250—$7.50 or 1000—$14.00 postpaid. Samples free. Write Picture Cards, 129 Copeland, La Crosse, Wis.

CREATIVE QSL CARDS free, new catalog and samples. Personal attention given. Wilkins Creative Printing. P.O. Box 787-2, Atascadero, California.

RUBBER STAMPS for QSL Cards. Kits available. Free sample impressions. E & R Stamp Co., 50 Gerald Rd., Rantoul, Illinois.

QSL CARDS $2.50 per 100 in three colors. Samples and catalog free. Garth, Box 51C, Jutland, New Jersey.

QSL CARDS. As low as $2.50 per 100. Samples free. Radio Press, Box 24C, Pittstown, New Jersey.

QSL's 3-color glossy. 100 $4.50. Rutgers Vari-typing Service. Free Samples. Thomas Street, Riegel Ridge, Milford, N.J.

QSLs Samples 25¢. Rubber Stamps; Name Call, Address, $1.55. Harry Sims, 3227 Missouri Avenue, St. Louis, Mo. 63118.

QSL's . . . 18 samples 10¢ . . . Filmcrafters . . . Martins Ferry, Ohio.

QSL's WSL's XYL-OM's (Sample assortment approximately 9¾¢) covering designing, planning, printing, arranging, mailing eye-catching comic, sedate, fantabulous. DX-attracting, Prototopay, Snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minn.

QSL's BROWNIE—W3CJI . . . 3111 Lehigh, Allentown, Pa. Samples 10¢ with catalogue 25¢.

QSL's CB, WPE Samples 10¢ Nicholas & Son Printery P.O. Box 11184, Phoenix, Arizona 85017.

QSL CARDS—100 3-color, glossy $3.00. World globe in silver; report form on reverse side; Free samples. RUSPRINT, Box 7575 Kansas City, Missouri, 64116.

HUNDRED QSL's: $1. Samples, dime. Meininger, Jesup, Iowa.

QSL's—Ham and CB, related products. Free Samples. April Sign Co. 56290 Van Dyke, Washington, Michigan.

QSLs. Large Selection, including photos, rainbows, glossy stocks, cuts, etc. Fast Service. Samples, dime. Ray, K7HLR, Box 1176 Twin Falls, Idaho, 83301.

QSLs $2.00 per 100 postpaid. Free sample. Hobby Print Shop, Umatilla, Fla. 32784.

QSL—Special—100 two color—$1.65. Quality. Free samples. Kanuck, Box 461, Dayton, Ohio.

QSLS?? WPES?? SWLS?? Samples 25¢. (refunded). Sackers, W8DED, Holland, Mich.

DON'T Buy QSL cards until you see my free samples. Bolles, Box 9363, Austin, Texas.

"GOLDEN CALL" QSLs samples 10¢. Samco, Box 203, Wynantskill, N.Y. 12198.

QSLs. Samples, dime. Print Shop, Corwith, Iowa.

ELECTRONIC CHASSIS PUNCHING and drilling service, Panels cut, etc. Build that magazine article! Send chassis or request estimate. Hole (16ths) diameters to ½" 5¢; to 1½", 25¢; to 4", 50¢; sq., 5¢ perimeter inch in aluminum to 3/16. Steel 20 ga. add 50%. Mark sizes and centers, allow clearances. Payment with material, minimum $2.00, under 2 lbs returned postpaid. Metalwerk, P.O. Box 1372, Cedar Rapids, Iowa 52401.

ELIMINATE Mobile Vibrator Noise. Revolutionary device outmodes noise-creating vibrator. Completely transistorized unit plugs directly into vibrator socket. No moving parts. Same size as vibrator. 12 Volts. Not a kit. Comes completely wired ready to use. **For negative ground only.** State make and model of transceiver. $11.95 PPD.-$5.00 deposit on all C.O.D. orders. Tel-Trol Systems, 2180 Bronx Park East, Bronx, N. Y.

PRINTED CIRCUIT BOARDS Hams, Experiments. Many different projects. Catalog 10¢ P/M Electronics, Box 6288 Seattle, Washington 98188.

ONE WAY — to GREATER Efficiency!

NEW C-P BROADBAND SUPER STATIONMASTER®

BASE STATION ANTENNA

Soon to be announced—the new, higher-performance broadband antenna by C-P. Communication Products Company, Marlboro, New Jersey—Tel. (201) 462-1880

DIVISION OF PHELPS DODGE ELECTRONIC PRODUCTS CORPORATION

For further information, check number 31, on page 110

TELEPLEX teaches CODE

TELEPLEX performs no miracles. It just seems miraculous when compared to any other method. Get the facts. Don't waste your time and money. Write today for descriptive literature. It's free and interesting.

TELEPLEX CO. • 739 Kazmer Court • Modesto, Calif.

"HOW TO MAKE MONEY IN Mobile Radio Maintenance"

AUTHORITATIVE GUIDEBOOK
ABOUT THE BOOM IN TWO-WAY MOBILE-RADIO; GIVES FACTS, FIGURES, PAY RATES. WRITE TODAY! FREE

LAMPKIN LABORATORIES, INC. Electronic Div. BRADENTON, FLA.

TS-497B Signal Generator 2-400 Meg	$225.00
TS-418A Signal Generator 400-1000 Meg	$300.00
Ballantine 300 Voltmeters	$ 50.00
Tektronix 514D Scopes, DC to 10 Meg	$275.00
Dumont 304H scopes with 264B voltage calabrators	$100.00
Dumont 404 Pulse Generators, .05-105 microsec.	$175.00
Lambda model 50 Power Supplies, 0-500V, 500 ma	$125.00
Lambda C-281M, 125-325V, 200 ma	$ 60.00
Lambda C-481M, 125-325V, 400 ma	$ 95.00
Lambda C-881M, 125-325V, 800 ma	$125.00
Electronic Measurements Power Supplies	
235AM, 0-600V, 500 ma	$225.00
234AM, 0-300V, 500 ma	$125.00
204AB, 0-500V, 300 ma	$100.00

All equipment used and surplus in good condition. Orders FOB Cambridge, Mass.

Sorry we do not issue catalogs or lists.

ELI HEFFRON & SONS, INC.

321-329 Elm Street
Cambridge 39, Massachusetts
Area Code 617-354-8752

For further information, check number 32, on page 110

LOOK! A NEW ELECTRONICS SLIDE RULE

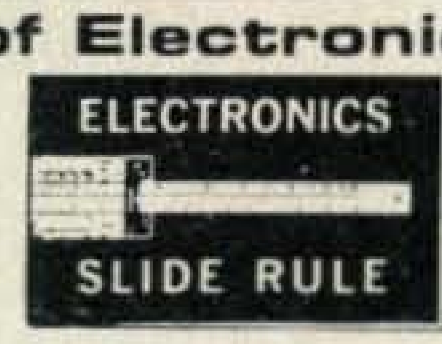
WITH COMPLETE INSTRUCTION COURSE

Professional 10" all-metal Electronics Slide Rule. Designed specifically for technicians, engineers, students, hobbyists. Has special scales not found on any other rule. Enables you to solve electronics problems quickly, accurately. Made to our rigid specs by Pickett, Inc. Slide Rule plus four lesson AUTO-PROGRAMMED Instruction Course with grading service, and top-grain leather carrying case . . . a $50 value for less than $20! Send coupon for FREE booklet. Cleveland Institute of Electronics, Dept. CQ-108, 1776 E. 17th St., Cleveland, Ohio 44114.

SEND COUPON FOR FREE BOOKLET

Cleveland Institute of Electronics
1776 E. 17th St., Dept. CQ-108
Cleveland, Ohio 44114

Please send FREE Electronics Slide Rule Booklet. SPECIAL BONUS: Mail coupon promptly and get FREE Pocket Electronics Data Guide, too!



GET THIS FREE!

NAME ______ (Please Print)
ADDRESS ______ COUNTY ______
CITY ______ STATE ______ ZIP ______

A leader in Electronics Training . . . since 1934

For further information, check number 33, on page 110

THIS COULD BE THE BEST DX ANTENNA YOU WILL EVER OWN!

COMPLETE KIT PRICE **$59.95**

CONTENTS
- 8 FIBERGLASS Arms Specially reinforced at butt and element intercept points
- 2 Quad Arm "X" Mounts
- Boom to Mast "T" Mount
- 1 Instruction Manual

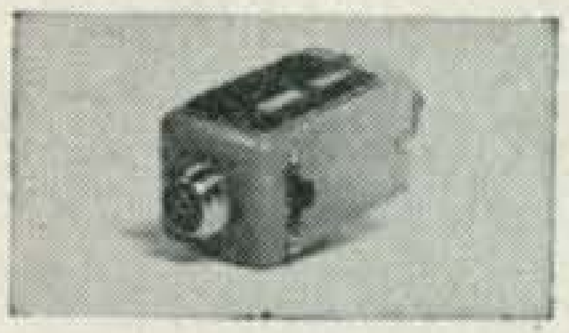
WRITE FOR BROCHURE TODAY

U. S. FIBERGLASS CO.
5101 N.W. 36 Ave. MIAMI, FLA. 33142

For further information, check number 34, on page 110

Signal Lack "Punch"?

The model CPR Speech Compressor TRIPLES your average SSB output power; boosts your average AM modulation from 25% to 75%.



- NEW low noise circuits
- Uses internal battery
- Compression level switch
- For high and low impedance microphones
- Attack time .15 seconds; release time 1 to 3 seconds
- ONLY $14.95

NOW AVAILABLE with PL68 or PL51 output for PTT circuit; input connectors supplied $16.25

ALL FULLY WARRANTED . . . MONEY BACK GUARANTEE
Send for full description of our product line.

COMMUNICATION COMPONENTS COMPANY
P. O. Box 8721 Dept B Orlando, Florida 32806

For further information, check number 35, on page 110

EASY TO LEARN CODE

It is easy and pleasant to learn or increase speed the modern way—with an **Instructograph Code Teacher.** Excellent for the beginner or advanced student. A quick, practical and dependable method. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready, no QRM, beats having someone send to you.

ENDORSED BY THOUSANDS!

The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands of successful operators have "acquired the code" with the **Instructograph System.** Write today for full particulars and convenient rental plans.

INSTRUCTOGRAPH COMPANY

4711 SHERIDAN RD., CHICAGO 40, ILL.
4700 Crenshaw Blvd., Los Angeles 43, Calif.

For further information, check number 36, on page 110

GREATER BAY AREA HAMFEST—Peacock Gap Country Club, San Rafael, Calif. October 16-17th. Write Box 113, Hayward, Cal.

WHOLESALE ELECTRONICS, Resistors 3¢, Multimeters $9.95, speakers 49¢, electrolytics 10¢. Hundreds of items. Catalog 25¢. Refundable. ROYAL Box 2591, El Cajon, California 92021.

ATTENTION HAMS! We buy, sell ham gear. Repair and alignment facilities available. Hold Advanced and First phone. Used Gear always reconditioned. Money back guarantee. KitKraft Company, P.O. Box 406—Canal St. Station, New York N.Y. 10013.

CASH, SONY TRANSISTOR TV's etc. swapped for G-R, H-P, L & N, etc. Equipment, special tubes, manuals, military electronics. Engineering Associates, 436 Patterson Road, Dayton, Ohio. 45419.

HIGHLY EFFECTIVE HOME STUDY REVIEW for FCC commercial phone exam preparation. Free literature. COOK'S SCHOOL OF ELECTRONICS. Box 747, Riverhead, New York 11902.

RTTY GEAR for sale. List changes Monthly—Write for information—Elliot Buchanan, W-6-VPC, 1067 Mandana Blvd., Oakland, California 94610.

C. FRITZ—Back on the Job! Bringing hams greater returns over a quarter century! Samples—25¢, deductible. Box 1684 Scottsdale, Arizona (formerly Joliet, Illinois).

GALAXY V, 115/230 supply, deluxe accessory console, VOX, calibrator, remote VFO, all Galaxy, 90 days old, $695 new, take $495. 75A-1, manual, speaker, excellent condition $85.00. Don Payne, W4HKQ, Springfield, Tennessee.

BLUE BOOK Used list free! Check our low prices. Over 1,000 items—Communicator III, 6M—$169.00; Galaxy $300—$216.00; NCX3—$245.00; SB33—$249; HG-303—$45.00; 32V1—$149; AF68—$99; HT40—$49; MTI—$49; MB560A—$39; HT 37—$275; HX50—$259.00; Invader 200—$285.00; NC98—$72; 75A1—$199; SX101A—$219; SX117—$269; FREE CATALOG. We buy for cash—What do you have? WRITE: LEO, WØGFQ, WRL, Box 919, Council Bluffs, Iowa.

FREE Sales Catalog—laboratory and microwave test equipment—including military types. Wanted—your surplus equipment, tubes, components. LECTRONIC RESEARCH, 715C Arch St. Phila., Pa. 215-627-6771.

NAME TAGS First, last name and call letters permanently engraved in phenolic. Pin back. $1.28 postpaid. Waynard Folsom, Box 8308, Anchorage 99504.

WAY-OUT AF MARS-CAP FREQUENCIES WITH YOUR HAMBAND AND 100÷ WATT TRANSVERTER. COMMAND XMTR CONVERSION. SIMPLE INEXPENSIVE. PLANS-SCHEMATICS $1.25. W5NSN.

Ruby Laser Rods. Single crystal ruby rods are now available for the university student and amateur experimenter from one of the nation's leading fabricators of sophisticated optical elements. Rods are ¼" diameter, 3" long; finely polished, and with flat and parallel ends silver coated for immediate installation, $75.00 per unit plus $1.00 postage and handling. All rods guaranteed to last. Moneyback if returned unharmed in 10 days. Valpey Corporation, Department 510, Holliston, Massachusetts.

CRYSTAL BARGAINS. Free list. Nat Stinnette, W4AYV, Umatilla, Fla. 32784.

FINE NEW BOOK—4000 words German-English for Hams and SWL's. Send $1.25 or 11 IRCs for your copy to Christian Zangerl, OE9CZI, Dornbirn, Nachbeurstrasse 28, Austria.

FREE! Giant bargain catalog on transistors, diodes rectifiers, components; Poly Paks, P.O. Box 942P, Lynnfield, Mass.

MANUALS—for surplus electronics. List 10¢. W3IHD, 4905 Roanne Drive, Washington, D.C., 20021.

THIS COMPANY is looking for Ham & CB cartoon artists and ideas. $10.00 per idea IF ACCEPTED. For information, write AMBRU PRODUCTIONS, 10 Burbank Street, Yonkers, New York 10710.

100.00 Kc. crystal in HC-13/U Holder—same pins as FT-243. Only $3.00 each with Free Bonus 200 Kc crystal—postpaid, USA, Quaker Electronics, Hunlock Creek, Pa.

Technical Manuals—lowest prices USA, teletypewriters, receivers, transmitters, text equipment and etc. Large lists. Send 10¢ coin-stamps. Quaker Electronics, Hunlock Creek, Pa.

WANTED: Commercial or Military, Airborne or Ground . . . Equipment and Testsets, Collins, Bendix, Others . . . We Pay Freight . . . RITCO, Box 156, Annandale, Virginia.

CRAZY . . . NOT QUITE. LET'S DEAL. . . . We want to become Nevada's largest ham store! Look! . . . Swan, Transcom, Galaxy, Hallicrafter, Hammarlund. . . . No honest deal refused. Write: Sierra Electronics, P.O. Box 212/ Sparks, Nevada.

WANTED—An APR-14, 13 receivers. SG-13, H-p4, SG-1, SG-2, MD-83, 479 Collins, in any condition. T-368-C xmtrs. R-390, 390A, R-388, 389, 391. Receivers. RT-66 thru 70 Rt units RT/77-GRC-9, GRC-10, GRC-19. RCA, Bendix, Collins Aircraft Radio and Radar Equip. Hewlett Packard, General Radio, Tektronix, etc., Test Equipment. GRC, PRC, GRR, TCC, ARC, sets ARM, PRM, URM, UPM, URM, SG Test sets any and all types. You name it. Call E. Charol, Tech Systems Corp., 42 W. 15th Street. N. Y. 11, N. Y. CH 2-1949 Collect.

LIKE NEW—B&W 5100 Transmitter. Perfect condition. Used only a few hours. $150.00. Dave Forster, 35 Monticello, S.W. Grand Rapids, Michigan.

I need and will pay top price for a DeFOREST 15 panel receiver for my antique radio collection. Same also applies to PARAGON, GREBE, CLAPP-EASHAM, KENNEDY and similar material. WORCESTER, R.D.1, Frankfort, NY.

SELL: Elimac 4x250B tubes. Guaranteed good. $6.50 each, $10.00 pair. Prepaid in U.S.A. Send check or money order. Everett Stidham, Jr., W5JLQ, 722 South 30th, Muskogee, Oklahoma.

INTERESTING OFFERS GALORE in the new "Equipment Exchange—Ham Trader"! Rush $1 for next 12 issues. Brand, WA9MBJ, Sycamore, Illinois.

FOR SALE Complete instructions including 28 page booklet and 22" × 36" schematic for converting the ART-13 transmitter to a.m. and s.s.b. Satisfaction guaranteed. $2.50. Sam Appleton, 501 No. Maxwell St., Tulia, Texas.

REMOTE CONTROL UNIT, brand new $5.00. Postpaid. (Cost Navy $125.00) MDC, 923 W. Schiller, Phila. 40.

ANTENNA tuning unit, brand new $3.00 postpaid (cost Navy $85.00). MDC, 923 W. Schiller, Phila. 40, Pa.

FOR SALE: NC 303 brand new, in original carton plus extras $300. EZ Way 400 foot tower with ground post, CDR Ham rotor and Hy-Gain 4 element Tri-Bander beam antenna $300.00, or Package Deal $450. McCormack 35a Edgewater Pl. Edgewater, N.J. 07020.

WANTED—QSTs for private collection. 1920-Jan., 1919-Jan., Feb., March, April, May, 1918-All, 1917-March, October., Nov., Dec., 1916-Feb., May, June, July. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050.

STAMP COLLECTORS: Will swap stamps (your choice) for amateur and military radio equipment, supplies, tech manuals, etc. John Reilly, 35-19 167th Street, Flushing, New York 11358.

LEARN CODE the V method, money back trial, guided sending, records, tapes, write. Page Electronics Institute 90037.

IDEAL MOBILE—same type #3012 (152-162 M.C.) and (40-50 M.C.) tuners for sale. Receive highway patrol, police, fire, secret service, taxi, mobile, telephone, etc. Also, Federal "DIRECTOR" Electronic Siren-PA, 12 volts all transistorized. 4 lbs. 150 watts siren, 125 watts audio output w/two speakers. Richard M. Jacobs WAØAIY, 1015 Glenside Place, University City, Missouri 63130.

COLLINS 75A-4 OWNERS: Don't trade up! Investigate our conversion that makes the 75A-4 a real dream. W2VCZ—30 Pitcairn Ave., Ho-Ho-Kus, N.J. 201-652-8494.

Wanted: Complete set, preferably bound volumes, CQ for 1945 through 1963. Must be in excellent condition. Write Charles Miller, W4AXV, 2875th GEEIA Squadron, Box 460, APO San Francisco 96323.

BOUND VOLUME 1964 **CQ** for sale. Order now and be sure to receive your copy. Limited quantity. First come first served. Send $15.00 to Dept. H.W., **CQ** Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

FOR SALE—HRO-50T with 5 coils and SSB xtal osc. plug-in adaptor, Heath HX10 Exciter-transmitter, Heath HA10 Linear, Heath HO10 Scope. All wired and tested by an engineer. Any reasonable offer considered. Wells Chapin, 2775 Seminole Road, Ann Arbor, 48104, Michigan, Telephone: 313-663-1337.

SELL—Johnson Viking Matchbox for 250 watts. W. E. Little, 2007 Montaigne, Richmond 35, Va. Best offer takes.

RTTY: Send for list of teletype equipment and supplies. SASE. Jim Cooper, 834 Palmer Ave., Maywood, N.J.

Apache $160, SB-10 $70, Mohawk $160, or complete AM-CW-SSB station for $350. All in exceptionally fine condition. W3LNW.

"S & H" GREEN STAMPS. Needed for Missionary Ham Station. Have your friends help too. Father Jude, WA2YNO, St. Paul's Abbey, Newton, New Jersey 07860.

RCA 6V FM30-44mc. 60 watt model MI transceivers. Complete with heads, mikes, and cables, $35 Sid Nelsen, Leeds, N. Dak.

HALLICRAFTERS SX-122 with R-48A speaker, recently new, $269.95. Melvin E. Kesner, WA3DWF, Box 68, Accident, Maryland, 21520.

XMTR—Globe HG-303, 75 watts, 80-10 mtrs, CW only, $60; Sylvania 132, 7 inch CRT, general purpose scope, $65; Lafayette HE-75, 30-50 mc. FM rcvr, $45; Lafayette HE-15 CB xcvr, $25; RCA 154, AF signal generator, $20; two (2) Signal Corps TG-5-B single wire telegraph units, @ $15, both $25; Battery Charger, 6v. @ 6 a., $5; All shipped prepaid, check or money order, or trade for VHF, RTTY equipment. A. Demartini, 5 Stratford Court, Demarest, N.J.

FOR SALE Complete Station HT37—75S1 TA33JR BEAM. ONE OWNER EQUIPMENT IN PERFECT FACTORY CONDITION. TAKE ALL FOR $550. NO LESS. CHUCK BERG K9QIZ 3825 N. AVERS, CHICAGO.

FOR SALE: DX-100, $100; SX-71, $90. BOTH IN GOOD CONDITION. Clarence Lawson, K2GUX, R.D.#2, Box 140. SENECA FALLS, N.Y.

SX-111, almost new, $155.; DX-60, ½ year old, $50. Also want Galaxy V with AC supply. WN6OGG, 3171 Walker, Rossmoor, California 90720.

WANTED: KILOWATT LINEAR WITH POWER SUPPLY. HW-32, HP-13, HP-23. MOBILE RIG FOR 15M. WA5JYN, 427 MEADOW LANE, SAN ANTONIO, TEXAS.

Flatbush Radio Club—Auction, October 18th, 8 PM. at the Sgt. Meyer Levin Hall, 1628 East 14th Street, Brooklyn, N.Y. For information call 859-3030.

For further information, check number 55, on page 110

For further information, check number 57, on page 110

For further information, check number 40, on page 110

READER SERVICE

NAME____________________ CALL________
(Please Print)

ADDRESS____________________________

CITY_______________________________

STATE_______________ ZIP CODE________

Please send me more information on your ads in the Oct. 1965 *CQ* keyed as follows:

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77			Total Inquiries				

Void after Oct. 28, 1965

CQ MAGAZINE, Dept. RS

14 Vanderventer Ave.
Port Washington, L. I., N. Y. 11050

advertisers index

WRL HAS THE BEST RECON-DITIONED DEPT. *in the U.S.A.*

30 years of electronic experience and two generations of the same ownership.

Leo I. Meyerson
President—WØGFQ

Larry B. Meyerson
Sales Manager
WØWOX

WRL HAS 37 HAM and CB Spe-cialists—to give you The Best Service Anywhere!

WRL OFFERS YOU THE BEST!
National
SWAN
GALAXY
DRAKE
Collins
HALLICRAFTERS
SBE
and many more!

WORLD RADIO LABORATORIES

"THE HOUSE THE HAMS BUILT"

WRL'S ALL NEW *1966 CATALOG* IS FILLED WITH FANTASTIC VALUES. HUNDREDS OF ITEMS AT THE LOWEST POSSIBLE PRICES — ORDER YOURS NOW! *IT'S FREE!*

FREE *ALL NEW*
1966 HAM/CB CATALOG

WORLD RADIO LABORATORIES
3415 WEST BROADWAY, COUNCIL BLUFFS, IOWA 51504
☐ Rush me your Free 1966 Catalog
Name____
Address____
City____ State____ Zip____

DON'T GAMBLE!

Trade with the World's Most Recognized Dealer in Amateur and CB Equipment.

You can depend on WRL for

- THE VERY BEST SERVICE
- HIGHEST TRADE-IN ALLOWANCES
- LOW-BUDGET PAYMENTS WITH WRL'S CHARG-A-PLAN
- OUR CENTRAL LOCATION MAKES SHIPPING CHARGES MUCH LESS
- NO DOWN PAYMENT
- FREE TECHNICAL ADVICE

For further information, check number 28, on page 110

six pack

National offers six of the world's finest receivers to meet *your* particular requirement.

Receiver number one provides greater amateur band performance and features than any amateur receiver ever built.

Receiver number two has the widest frequency range (from 5 kc to 30 Mc) of any general coverage communications receiver ever built for lab or commercial application.

Receiver number three is *completely* solid-state for high reliability, versatility and portability. It operates from 12/24 V.D.C. or 115/230 V.A.C. This receiver draws less current than a couple of dial lamps (when its dial lamps are switched off), and provides instant-on operation.

Receiver number four incorporates specific features for high selectivity and has a six-pole filter to provide built-in steep-skirted 500 cps, 2.5 Kc, 5.0 Kc, and 8 Kc bandwidths with *passband tuning* for CW and SSB. Also *AGC threshold control* to knock out background QRM. Also a 50 db notch filter.

Receiver number five has a phase-locked frequency synthesizer to replace conventional high frequency oscillator crystals for superior stability and over-all calibration.

Receiver number six offers frequency meter performance with 1 Kc dial calibration and accuracy over its entire tuning range, 24 feet of bandspread per megacycle, and 10 Kc per turn tuning rate.

Each of these receivers is called the HRO-500. National's new HRO-500, at $1295, is the finest *total* receiver you can buy . . . at any price.

Interested in trying out National's new sixpack?
See your National dealer for an opener.

NATIONAL RADIO COMPANY, INC. ® 37 WASHINGTON STREET, MELROSE, MASS. 02176

World Wide Export Sales: Auriema International Group, 85 Broad St., N. Y. C.; Canada: Tri-Tel Assoc., 81 Sheppard Ave. W., Willowdale, Ont.

For further information, check number 7, on page 110

Mobile rigs using the **RCA-4604** "quick heat" tube *conserve* filament battery power while operating. It requires *no* filament power in standby, resulting in reduced battery drain . . . you'll be drawing filament battery power *only* when transmitting.

Similar in capabilities to the famous RCA-6146 Family, the sturdy RCA-4604 has a maximum plate dissipation of 25 watts under ICAS conditions in cw and fm telephony service. At this service, it can be operated with full input to 60 Mc and with reduced input to 175 Mc.

For additional information on the RCA-4604 and its use in mobile rigs, contact Commercial Engineering, Sectior J-15-M, Harrison, N.J.

RCA ELECTRONIC COMPONENTS AND DEVICES

RCA®

The Most Trusted Name in Electronics

For further information check number 14 on Page 110