RADIO NEWS

JANUARY
1948
35¢

ANC

SEALING ELECTRON GUN ASSEMBLY OF 6-15 CM. KLYSTRON.

FTR

STORY WITHOUT WORDS

...here's how it can boost *your* profits

As surely as the "gasoline buggy" replaced the horse-drawn carriage, the Miniature Selenium Rectifier—an original Federal development—is destined to take the place of the rectifier tube in AC-DC receivers. Already, more and more manufacturers are building it into their radio sets—and more and more maintenance shops are installing it in the sets they service.

What about *you?* Here is really a big chance for you to make *extra money*—by *modernizing* AC-DC sets now using a rectifier tube—giving them faster starting, better all-around performance. And as new sets using the Miniature Rectifier as original equipment come to you for servicing, you'll want to be ready with replacements. It's your opportunity to be a *leader* by introducing this improvement *now*—by installing Federal's Miniature Selenium Rectifier in every AC-DC receiver you service.

Available through major jobbers from coast to coast—complete with detailed instructions.

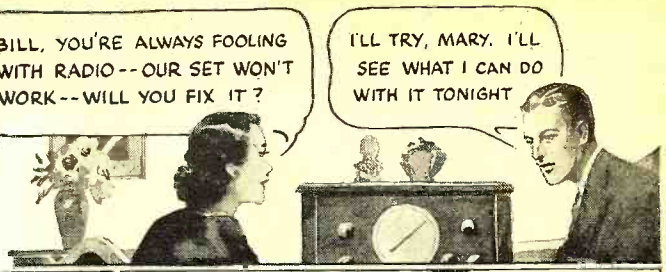
KEEPING FEDERAL YEARS AHEAD... is IT&T's world-wide research and engineering organization, of which the Federal Telecommunication Laboratories, Nutley, N. J., is a unit.

Federal Telephone and Radio Corporation

SELENIUM and INTELIN DIVISION, 1000 Passaic Ave., East Newark, New Jersey

In Canada: — Federal Electric Manufacturing Company, Ltd., Montreal.
Export Distributors: — International Standard Electric Corp., 67 Broad St., N.Y.C.

A FREE LESSON SHOWED BILL HOW HE COULD MAKE GOOD PAY IN RADIO!



I will send you a Lesson on Radio Servicing Tips FREE

TO SHOW HOW PRACTICAL IT IS TO TRAIN AT HOME FOR

GOOD JOBS IN RADIO

I want to give you a copy of my Lesson, "Getting Acquainted with Receiver Servicing"—absolutely FREE! And with it, I'll send my 64-page illustrated book, "How to Be a Success in Radio," also FREE. It describes many fascinating Radio jobs, tells how N.R.I. trains you at home in spare time, how you get **practical** experience with BIG KITS OF RADIO PARTS I send. MAIL THE COUPON!

VETERANS

You can get this training in your own home under G. I. Bill. Mail coupon for full details.

Future for Trained Men Is Bright in Radio, Television, Electronics

It's probably easier to get started in Radio now than ever before, because the Radio Repair Business is booming. Trained Radio Technicians also find profitable opportunities in Broadcasting, Radio Manufacturing, Public Address work. Think of even *greater* opportunities as public demand for Television, FM, and Electronic devices continues to grow! Get the facts on all these opportunities. Send for FREE books now!

Many Beginners Soon Make Extra Money in Spare Time While Learning

The day you enroll I start sending EXTRA MONEY manuals. You LEARN Radio Principles from my easy-to-understand, illustrated lessons—PRACTICE what you learn by building, testing and experimenting with parts I send—USE your knowledge to make EXTRA money fixing neighbors' Radios in spare time while still learning! From here it's a short step to your own *full-time* Radio Shop or a good Radio job!

Find Out What NRI Can Do for You

Mail Coupon for Sample Lesson and my FREE 64-page book. It's packed with facts about Radio's opportunities for you. Read the details about my Course. Read letters from men I trained, telling what they are doing, earning. See how quickly, easily you can get started. No obligation! Just MAIL COUPON NOW in an envelope or paste it on a penny postal. **J. E. SMITH, President, Dept. 8AR, National Radio Institute,** *Pioneer Home Study Radio School,* **Washington 9, D. C.**

Our 34th Year of Training Men for Success in Radio

My Radio Course Includes Training in
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You Build These and Other Radio Circuits with BIG KITS OF PARTS I SEND YOU!

By the time you've conducted 60 sets of Experiments with Radio Parts I supply, made hundreds of measurements and adjustments, you'll have valuable PRACTICAL Radio experience for a good full or part-time Radio job!

SUPERHETERODYNE CIRCUIT (right) Preselector, oscillator-mixer-first detector, i.f. stage, diode detector—a.v.c. stage, audio stage. Bring in local and distant stations on this circuit you build yourself!

MEASURING INSTRUMENT (above) you build early in Course. Use it in practical Radio work to make EXTRA money. Vacuum tube multimeter, measures A.C., D.C., and R.F. volts, D.C. currents, resistance, receiver output.

A. M. SIGNAL-GENERATOR (left) build it yourself! Provides amplitude - modulated signals for test and experimental purposes. Gives valuable practice!

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Mr. J. E. Smith, President, Dept. 8AR
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Mail me FREE, without obligation, Sample Lesson and 64-page book about how to win success in Radio and Television—Electronics. (No salesman will call. Please write plainly.)

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COVER PHOTO: Spot welding parts for tiny reflex klystrons in the research laboratories of Sylvania Electric Products Inc. at Flushing, New York. The tube measures only 3 inches over-all and is designed for 6 and 15 centimeter applications. (Photo by Walter Steinhard)

RADIO NEWS

First in radio-electronics

Average Paid Circulation over 148,000

Trade Mark Registered U.S. Patent Office No. 378

CONTENTS — JANUARY, 1948

DEPARTMENTS

VOLUME 39 • NUMBER 1

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"THE hottest ham performance ever at this price . . ." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

One stage of high gain tuned RF and a type 7F8 dual triode converter assure an exceptionally good signal-to-noise ratio. Image ratio on the AM channel on band 5 (44 to 55 Mc.) is excellent as the receiver is used as a double superheterodyne. The new Hallicrafters dual IF transformers provide a 455 kilocycle IF channel for operating frequencies below 44 megacycles and a 10.7 megacycle IF channel for the VHF bands. Two IF stages are used on the four lower bands and a third stage is added above 44 megacycles. Switching of IF frequencies is automatic. The separate electrical bandspread dial is calibrated for the amateur 3.5, 7, 14, and 28 megacycle bands.

Every important feature for excellent communications receiver performance is included.

Model SX-43

$169.50

FEATURES FOUND IN NO OTHER RECEIVER AT THIS PRICE

- ALL ESSENTIAL AMATEUR FREQUENCIES FROM 540 kc to 108 MC
- AM - FM - CW RECEPTION
- IN BAND OF 44 TO 55 MC: WIDE BAND FM OR NARROW BAND AM . . . JUST RIGHT FOR NARROW BAND FM RECEPTION
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- TEMPERATURE COMPENSATION FOR FREEDOM FROM DRIFT
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- SEPARATE RF AND AF GAIN CONTROLS
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- SEPARATE ELECTRICAL BANDSPREAD CALIBRATED FOR THE AMATEUR 3.5, 7, 14 AND 28 Mc BANDS

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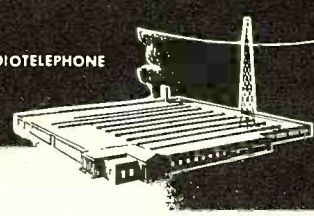

hallicrafters RADIO

THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

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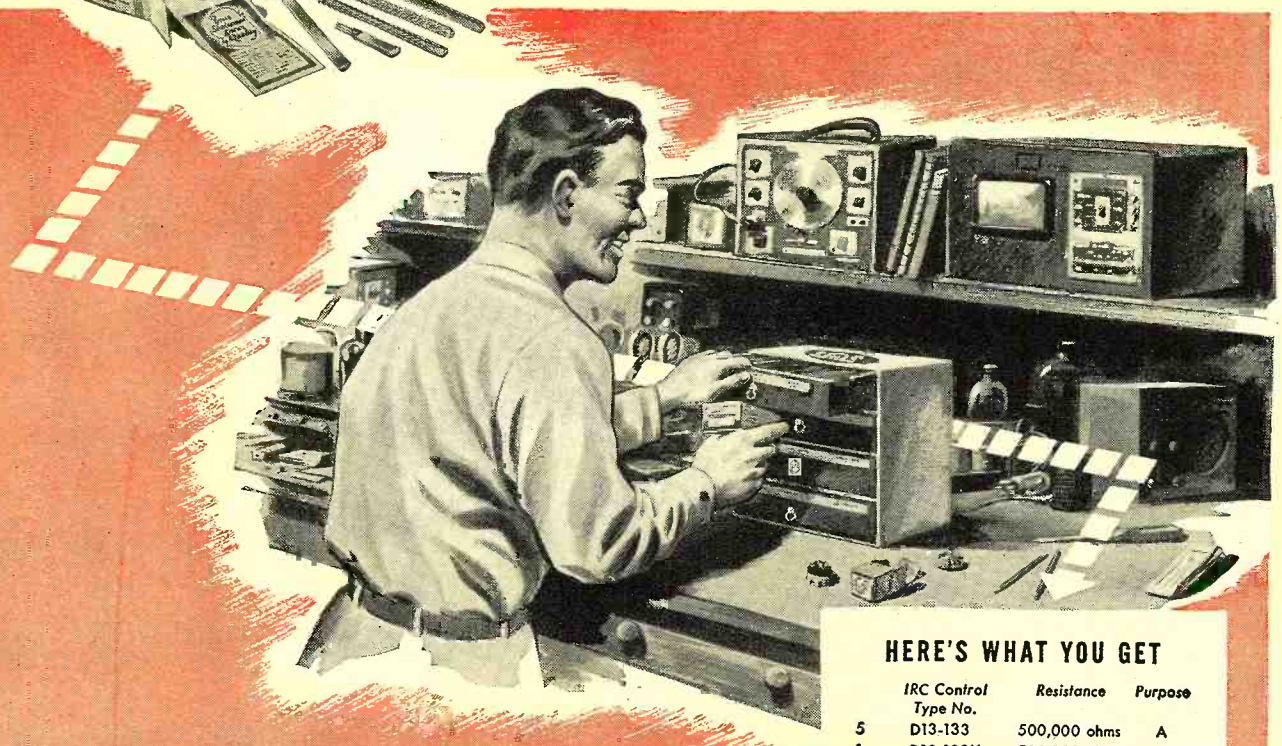
This New IRC JUNIOR Control Cabinet Belongs on Your Bench



Here's one selection of 9 "hot-number" controls, switches and shafts you'll use every day! The new IRC Junior Control Cabinet contains 9 of the most-used ½, 1 and 2 meg. type D controls with the added adaptability of the tap-in shaft feature—plus 4 switches and 4 special shafts.

This inexpensive assortment of popular controls will save you time and money, and reduce your need for exact replacements. Factory-packed in a handsome four drawer cabinet of sturdy cardboard. Cabinet attractively finished in blue, yellow and silver with twelve individually identified compartments. Order the new inexpensive JUNIOR Control Cabinet from your IRC Distributor today. International Resistance Company, 401 N. Broad Street, Philadelphia 8, Pennsylvania. In Canada: International Resistance Company, Ltd., Toronto, Licensee.

HERE'S WHAT YOU GET

	IRC Control Type No.	Resistance	Purpose
5	D13-133	500,000 ohms	A
1	D13-133X	500,000 ohms	B
1	D13-137	1.0 meg.	A
1	D13-137X	1.0 meg.	B
1	D13-139	2.0 meg.	A

Purpose: A-Tone or Audio Circuit control; B-Tapped for tone compensation.

SWITCHES

3	#41	S.P.S.T.
1	#42	D.P.S.T.

SHAFTS

1 Type "A" double-flatted tap-in shaft is included with each control—plus:

3 Type "E" with universal knurl for special type push on knobs.

1 Type "H" with universal groove for many Delco, RCA, Sears-Roebuck and Westinghouse models.

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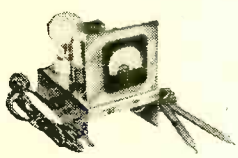
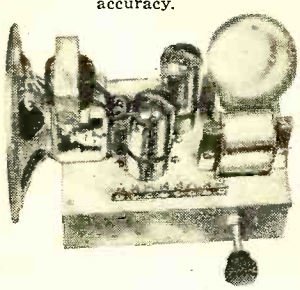
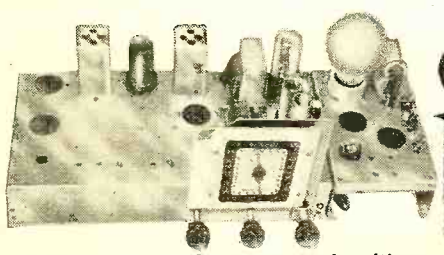


I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional speed and accuracy.

Practice *Does It!*



Soldering, wiring, connecting Radio Parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.



Building this Signal Generator and multi-purpose Tester will give you the kind of valuable experience and practice that is so important as a foundation for making good money in Radio. It makes a breeze out of fixing Radios, and you don't have to spend money on ready-made Equipment.

VETERANS
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For the RECORD

BY THE EDITOR

NEVER in the history of radio and electronics has the outlook for qualified technicians been brighter than now as we usher in a New Year. Lush markets are developing in TV, FM, magnetic recording and, in the not too distant future will come the long heralded Citizens' Radio Communications Service. Long "just around the corner," television has become a permanent fixture in thousands of American homes. We predict that close to a million TV sets will be in operation by the end of 1948.

Television has long been held back by the high cost of production and lack of enthusiasm on the part of prospective purchasers who did have the wherewithal to buy high priced equipment. With the advent of medium priced TV receivers, production is growing by leaps and bounds so that Mr. and Mrs. Average American will soon be purchasing television sets on an equal basis with console radios. Our entire concept of entertainment will change, just as it did when radio came into its own.

But television is not a plaything and cannot be serviced properly by the untrained. It takes technical "know how" to do the job intelligently and it also requires special test equipment and techniques not applicable to radio servicing.

We visited many service shops during 1947 and found few men capable of handling TV installations or maintenance. Those who were qualified had received proper training at some well established television institute. In addition, they had augmented their training by keeping abreast of television developments in technical journals. These technicians are the ones who will survive competition as television mushrooms throughout the country—not the diehards that fumble their opportunities by neglecting to study the intricacies of TV and other high frequency equipment and prepare themselves for this "new era" in radio and electronics.

Frequency modulation has deeply rooted itself as a hardy offspring of radio. We see a tremendous future demand for replacement tubes and service for FM receivers. No longer will satisfactory reception be limited to evening hours. Actual listening time will be greatly increased with the result that FM sets will be in operation for longer periods of time each day. This means an increase in service and sales, as well as special antenna installations. The average FM receiver uses far more tubes than the average radio set, in addition to more parts and circuits which are more critical to maintain. Here again we find a real need for technicians familiar with high frequency systems. We've seen few servicemen who were able to do a thorough alignment job on FM units.

And what about magnetic recording—now established as a highly practical medium of entertainment for the masses. This comparative newcomer to radio-electronics is just getting its wings. Fidelity and mechanical requirements have been satisfactorily met. The great potential industrial market awaits practical magnetic recording for a host of special applications other than for entertainment. Here's another golden opportunity for wide-awake technicians to advance through service and sales. The sale of magnetic wire and tape and accessory items will become a lucrative business for radio dealers and servicemen.

So important is this new art that RADIO NEWS has prepared several timely articles on various phases of wire and tape recording for our next issue. We'll have some real scoops for you in the design of recording heads and other data that will enable you to experiment with magnetic recording in your own homes and radio shops.

Serious study and application today is necessary to insure individual success in the future presented by radio-electronics and television. We have pointed to this necessity on many occasions but it bears repetitition time and again.

Our government too is fully cognizant of the growing and vital need for qualified technicians who are specializing in some field of radio-electronics. Progressive nations do all that they can to encourage the training of scientists and technicians. This brain power is one of the most potent defensive weapons we can possess. Therefore, progress in the fields of radio, electronics, television, etc. in peacetime can give us the necessary experience and training so essential to our security.

Yes, 1948 can well be the most progressive and prosperous year in the entire history of electronic development and all of us have a stake in its future. . . . . O. R.

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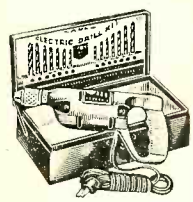

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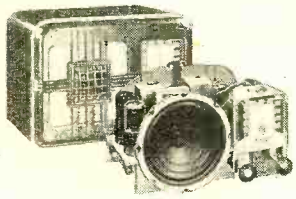

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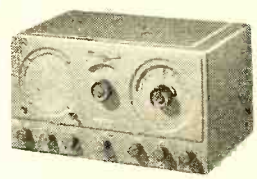
Less Speaker, $169.50



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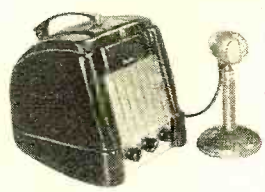

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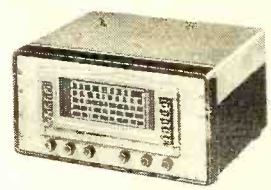

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24 HOUR DATA SERVICE

On November 30, 1947, we instituted our new photostat service to supply you with information on any newly issued, or old, receivers. For 10c (stamps are OK) we will send you the schematic, voltage data and parts list and everything else which will fit on the two pages. Additional manufacturers' data is 5c a page with a maximum charge of 35c for everything up to seven pages. If the manufacturers' data requires more than seven pages, each additional page is 3c. Here is a way to get whatever service data you need between Rider Manual publication dates.

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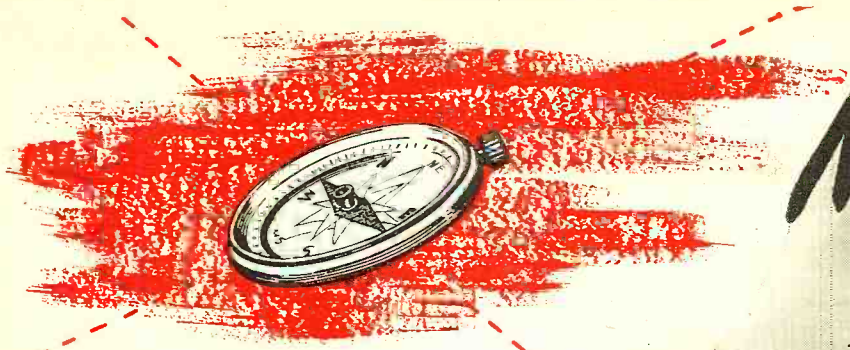


Now!

ear FM from ALL directions

Here's the antenna news for which dealers, and owners of FM receivers have been waiting. This new Ward-engineered non-directional dipole picks up FM signals efficiently from all directions, does not require orienting! Engineered for quick assembly and easy mounting, it comes complete for only $13.50 list!

Equal in signal strength to a high-gain folded dipole, the new "turnstile" is especially recommended for metropolitan areas where FM transmitters are in several directions from the receiver.

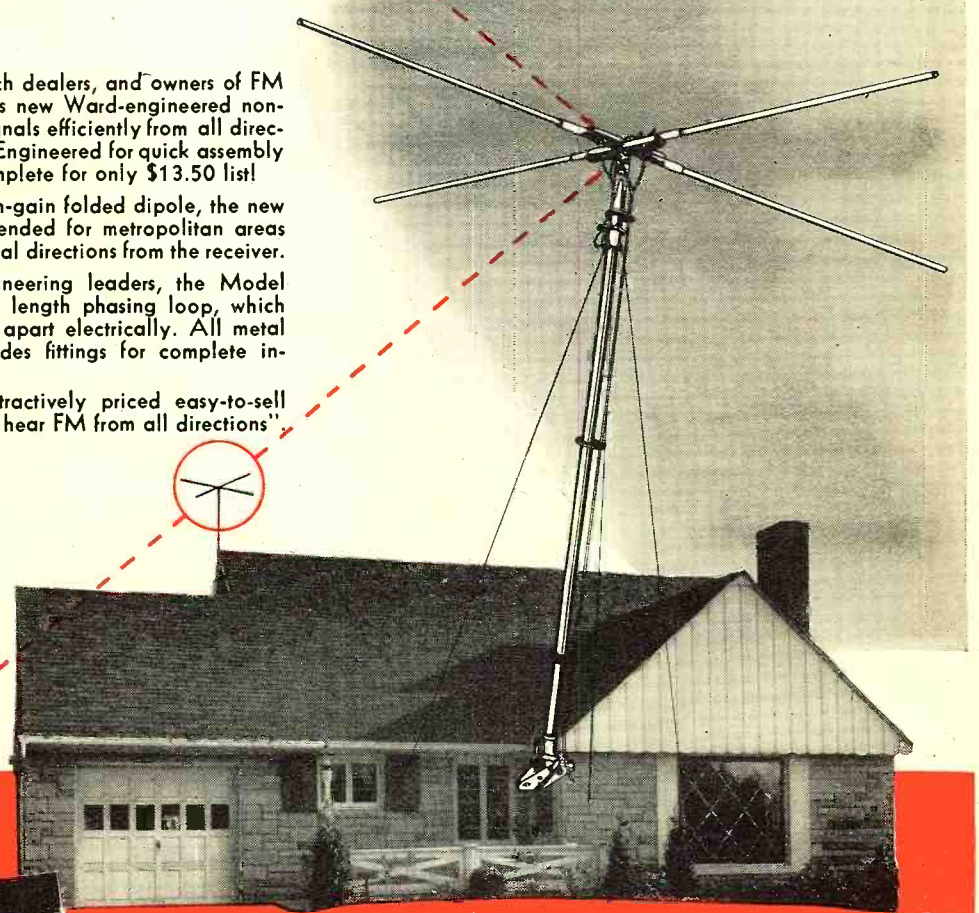
Product of Ward antenna engineering leaders, the Model FMT-61 has a one-quarter wave length phasing loop, which places the elements 90 degrees apart electrically. All metal weather-proof construction includes fittings for complete installation.

Your dealers will want this attractively priced easy-to-sell "turnstile" dipole that "let's you hear FM from all directions". Place your stock order today.

MODEL FMT-61

List Price

$13.50



THE NEW

WARD

NON-DIRECTIONAL TURNSTILE FM DIPOLE

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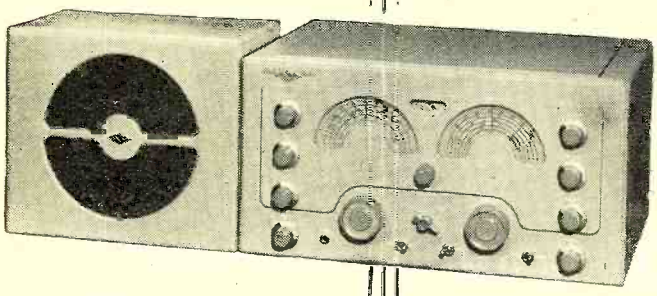
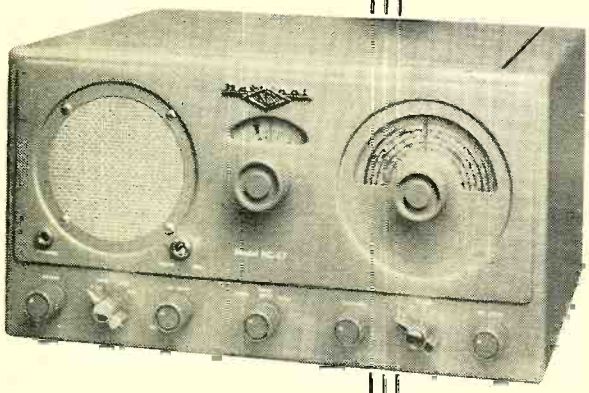


NEW

NATIONAL NC-183

National's most recent development. 16 tubes including voltage regulator and rectifier. Big, husky brother of the NC-173, the NC-183 has two stages of RF, push-pull audio and a ten inch speaker. This is the job you have been waiting for! $255.00

SPEAKER (additional) $14.00



NEW

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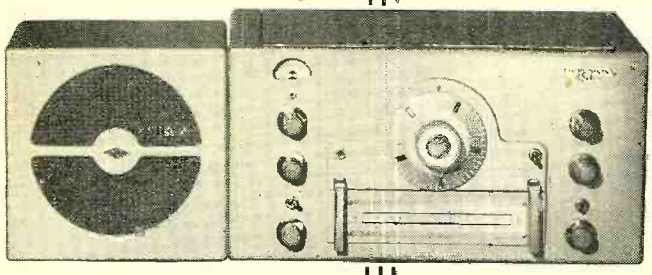
In the NC-57, National's engineering skill brings big receiver features and performance within reach of limited budgets. 540 kc. to 55 mc. in five bands. 1 RF, 2 IF, Automatic Noise Limiter, Antenna Trimmer, Self-contained speaker and 115 V.A.C. power supply. Matching S-meter available $89.50



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NATIONAL HRO-7

Latest of the famous HRO series—way ahead of previous models. New voltage regulated HF oscillator, new effective noise limiter, new easy-to-read calibration charts, modern appearance. QRM? No DX? Poor location? Let the HRO-7 show you what a real receiver can do!

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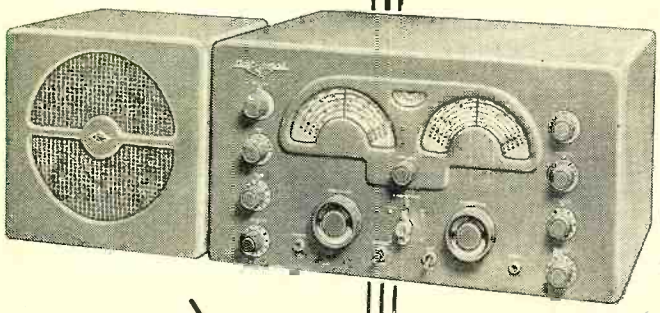
POWER SUPPLY $20.36



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RN-9

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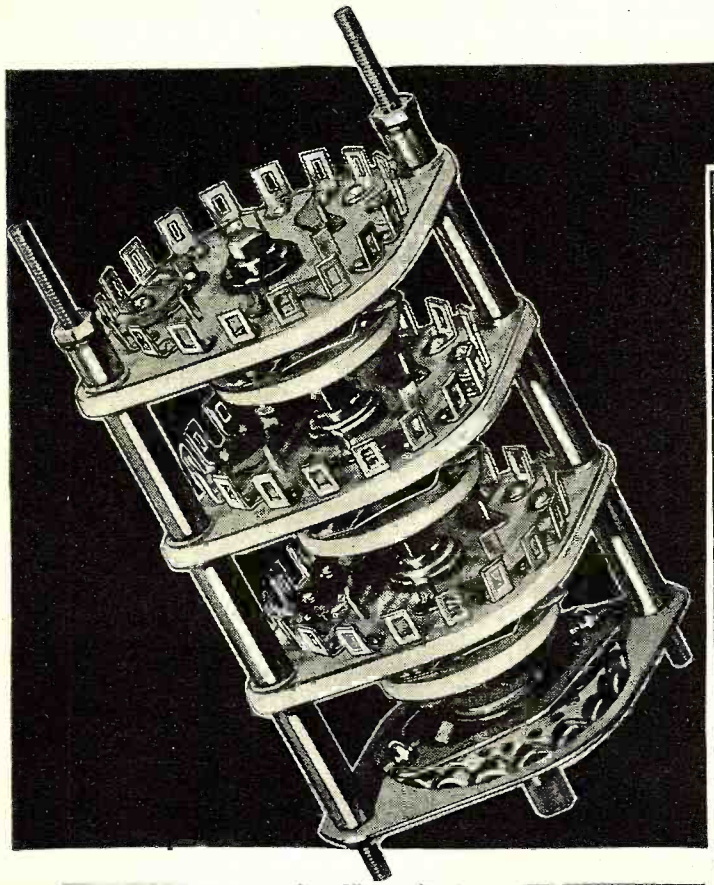
Centralab's medium-duty power switches for special industrial and electronic uses!



Efficient performance up to 20 megacycles — specially designed for transmitters, power supply converters, X-ray equipment etc.

HERE THEY ARE — Centralab's famous medium-duty power switches — now ready for a broad new range of industrial and electronic uses!

Look at some of the exclusive features which these sturdy switches offer you: 1) for accurate positioning, square operating shaft snugly fits staked sleeve in steatite rotors. 2) for peak performance, solid silver contacts are individually aligned and adjusted. 3) for flexibility, units can be assembled with shorting or non-shorting contacts. Switching combinations are 1 pole, 17 positions—and 3 poles, 5 positions per section. 20° double roller indexing.

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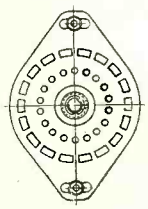
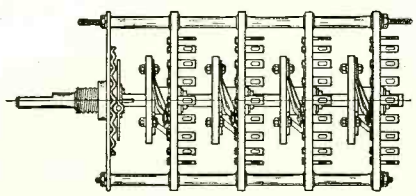
RATINGS: 7½ amperes at 60 cycles, 115 volts A.C. Minimum voltage breakdown between critical points is 3,000 volts RMS, 60 cycles. See how these fine Centralab switches can fit your industrial and electronic needs. Write today for Centralab's complete switch bulletin number 722!

Positive Action — Solid Silver Contacts

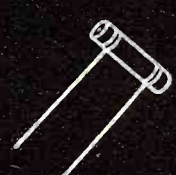




Ceramic Trimmers
Bulletin 630

Ceramics
Bulletin 720

Variable Resistors
Bulletin 697



Ceramic Capacitors
Bulletin 630

Selector Switches
Bulletin 722

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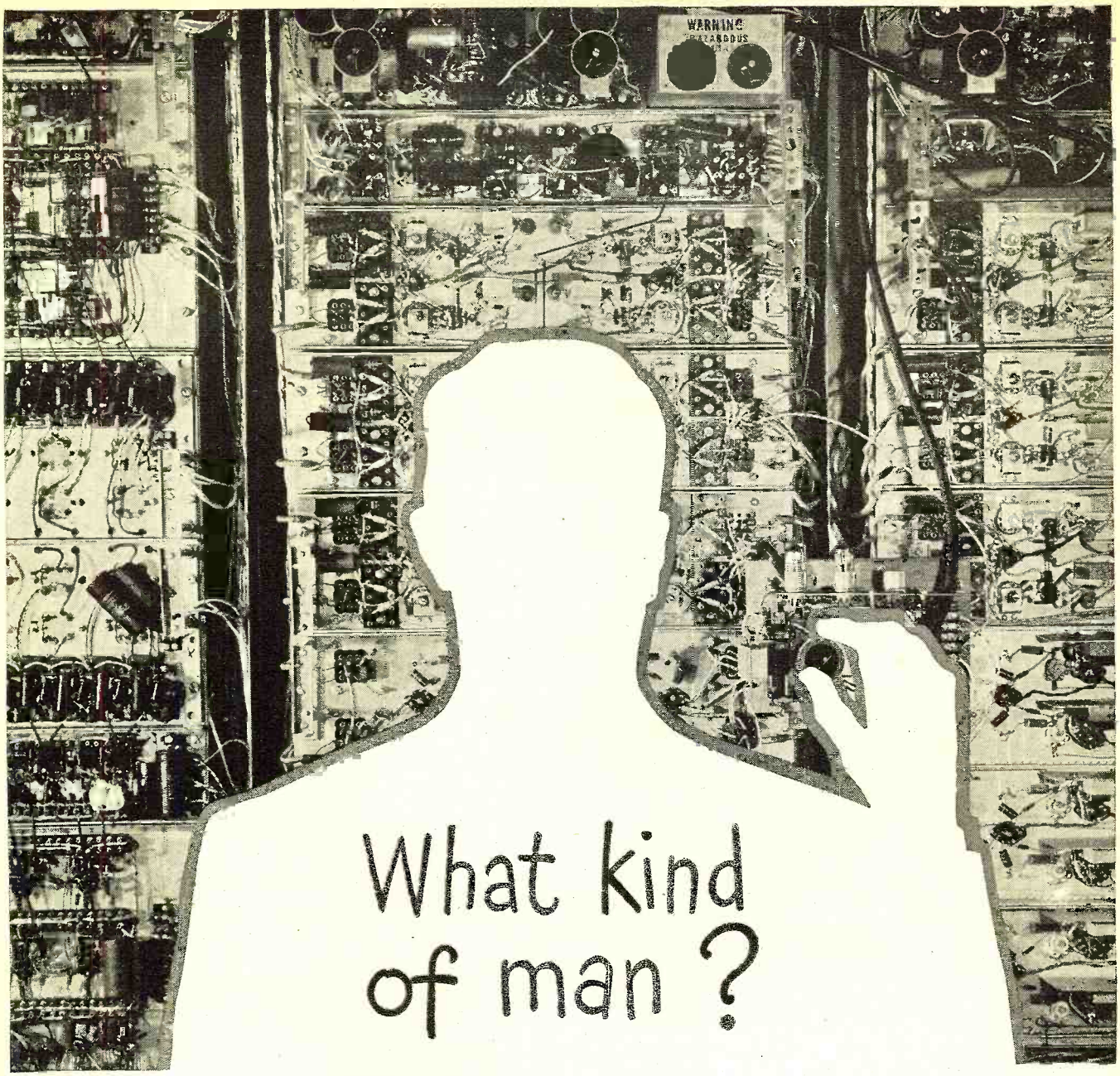

What kind of man?

WHAT KIND of men are the 2,300 scientists and engineers of Bell Telephone Laboratories?

Men of many types, working in different fields of research, may contribute to each development.

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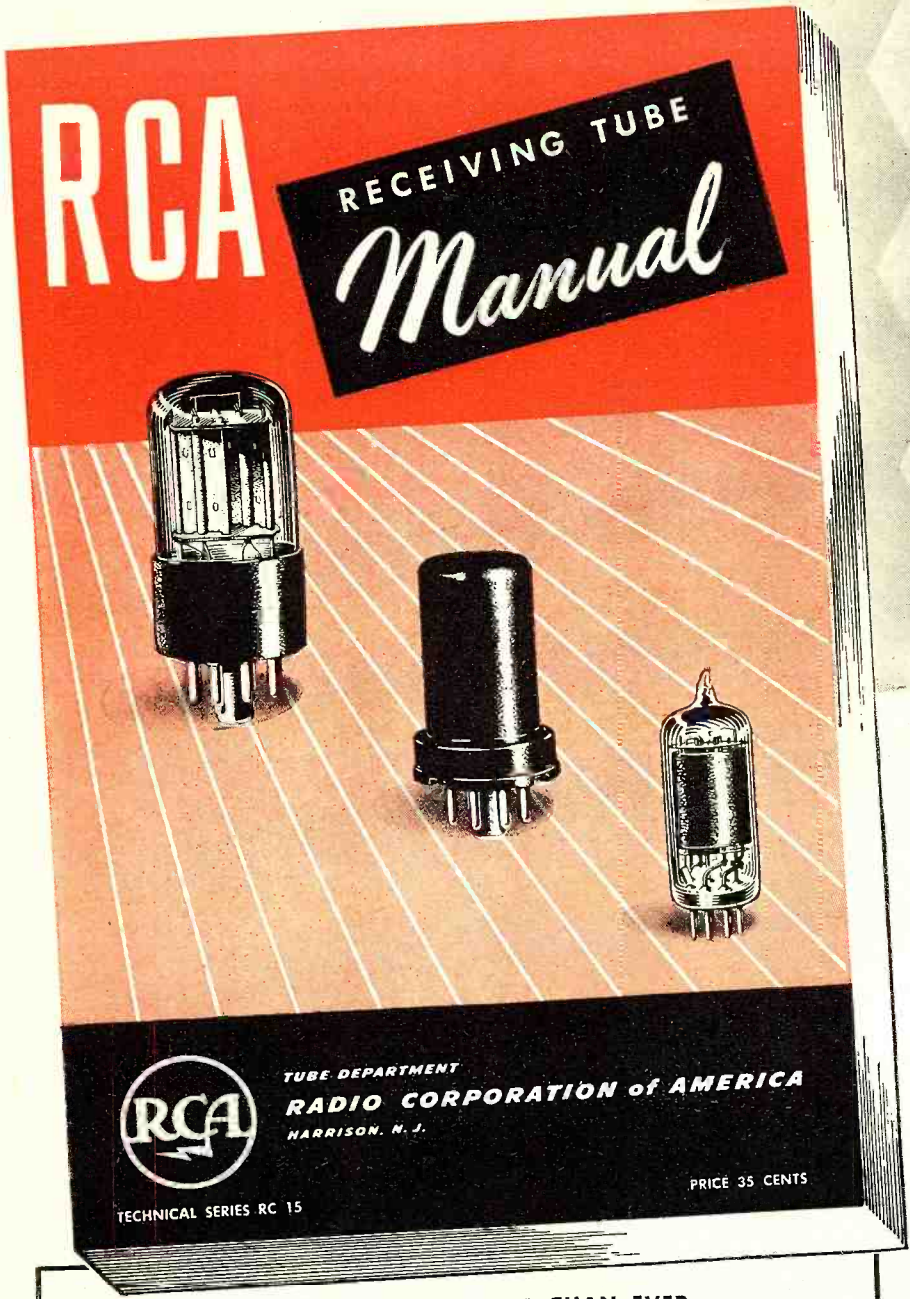

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Months of planning and preparation went into the new RC-15 Receiving Tube Manual to produce what is unquestionably the most complete and authoritative reference guide to receiving-type tubes ever published.

Patterned after the famous "RC-14," it has been extensively revised and expanded. Features RCA's complete receiving line including miniatures and kinescopes. The highly popular introductory section on tube and circuit theory has been increased to 55 pages and includes new reference data on FM applications. The widely used Resistance-Coupled Amplifier Charts are in entirely new form, and provide 27 combinations for each tube type. The completely revamped circuit section gives diagrams and parts values for up-to-date receiver and amplifier designs.

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RADIO CORPORATION of AMERICA
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Spot Radio News

★ ***Presenting latest information on the Radio Industry.***

By FRED HAMLIN
Washington Editor, RADIO NEWS

SANTA CLAUS, according to reports, was nicest this year to frequency modulation. And on the basis of FM's year-end good luck, it looks as if it is going to have an even better 1948 than was reported in these columns last month.

AS THIS WENT to press, indications are that FM will come up to the new year with a number of excellent factors in its favor, according to Everett L. Dillard, president of the FM Association. Some of these factors made themselves known during 1947—still a banner year despite set-backs in the minds of FM experts. Others are already seen distinctly for '48.

BAD PRODUCTION luck slowed FM activities during the early months of '47, Mr. Dillard points out, but the production wheels were spinning full tilt before the end of the year. This meant three things. FM receiver production reached a new high of a million and FM tuners increased the number of potential listeners. FM production of station equipment broke that bottleneck, although not soon enough to influence appreciably the total number of stations on the air at year's end—some 325, as contrasted with the estimated 700 predicted by the Federal Communications Commission last spring. And third, FM's future, as a result of these things, seemed fast-moving and bright for the coming year.

MR. DILLARD IS particularly happy about this. He says that, with year-end set production going at an all-time high in the FM field, possibilities are that production will reach some seven million sets in 1948. It should reach a peak schedule along about February-March. The FCC prediction of 700 stations should come true about March 1. "Everything included," he says, "next year should see FM offering 100 percent coverage of metropolitan markets and, with good programming still a stressed feature, should see the beginning of its use as a mass advertising media."

WHILE WE'RE ON THE SUBJECT, one department where radio history will be made in the FM field in '48 will be networks. Mr. Dillard, who is also president of the FM Continental network, reports that it is progressing very well, indeed, with 28 stations on the string at last counting, and some 90 applicants heard from. The stations are hooked up with nearly six hundred miles of wire line and—more significant—1400 miles of radio relay. Continental did its first commercial broadcast beginning September 12, a half hour program sponsored by *Stromberg-Carlson*. More are in the offing. Inspired by Continental's lead, other networks are beyond the rumor stage in the North and South Carolina area, in Missouri-Kansas, and in Wisconsin-Indiana-Michigan. The Michigan network, with headquarters at Ann Arbor, was particularly successful this fall broadcasting football games. It may be anticipated that little networks will tie in with each other to forward national FM hook-ups.

FROM THE LOOKS OF THINGS, everybody is surveying the FM network field with eager eyes. Latest to be heard from is an organization called "Rural Radio Network, Inc.," organized to serve upstate New York farm areas. The group has received a conditional grant from FCC for six new FM stations—the maximum number of FM's that can be operated by the same interest. Stations will be located at Newfield, De Ruyter, Cherry Valley, Highmarket, South Bristol, and Wethersfield. Far from being local stations with a few network programs, Rural Radio proposes to do just the opposite—all stations will carry the same programs. Each station will furnish part of the daily program, and others will pick it up. Programs will be designed for farmer audiences, featuring weather and market reports, religion, music, agricultural talks, quizzes, children's material. Rural Radio is backed by a foundation of nine farm organizations and is non-profit-making. The groups back of it include New York State Grange, New York State Farm Bureau Federation, Cooperative Grange League Federation Exchange, Dairymen's League Cooperative Association, New York State Federation of Home Bureaus, New York State Poultry Council, New York State Vegetable Growers Association, New York State Horticultural Society and New York Artificial Breeders Cooperative. Matching farm groups in other states are watching the Rural Radio hook-up with interest and look toward the day when it may be possible either to increase the number of stations on the

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If you choose to come to Chicago, we shall find comfortable living quarters for you. If you train at home, we shall send you modern, practical equipment. In either of these two methods, you will have the supervision of some of the finest instructors in the country. Fill in coupon below and we shall send you, absolutely FREE, full information about our program of building men for better opportunities in RADIO-ELECTRONICS. DeForest's Training, Inc. also includes instruction in FM Radio, Television and Industrial Electronics.

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network or organize similar networks on a non-profit basis in other farm areas.

SO SUCCESSFUL was the 1947 National Radio Week that it will be featured again next fall, though earlier than last. That seems to be the concensus of leaders in the Radio Manufacturers Association and the National Association of Broadcasters, co-sponsors of the 27th anniversary celebration. Dates of the '48 show will be earlier to avoid conflict with the national elections. Nationwide participation of broadcasters, manufacturers, and the radio trade were reported on the '47 program and at least one significant event points a trend for next year. That was a civic celebration of National Radio Week in Cincinnati, sponsored by the Cincinnati Gas & Electric Co. This was so successful that it has been suggested that a special effort be made in 1948 to enlist all public utilities in the annual observance. Steps are already being taken toward that end, according to NAB president Justin Miller and RMA president Max F. Balcom. The RMA-NAB group also plan to carry the radio-in-every-room campaign over into the new year. One highlight of the '47 radio week was recognition by President Truman, marked by a letter to Justin Miller. "Please accept my heartiest congratulations," the President wrote. "You know already how strongly I feel the importance of radio communication to the welfare of the nation and of the world. In contrast with its use in totalitarian nations, radio in America has developed as a servant of the people, rather than as a servant of the government. This fact imposes upon American broadcasters the responsibility of striving always to improve and increase their contribution to better understanding among our citizens and among the nations of the world. I know that this responsibility will be met in a way that will reflect credit upon both the industry and the nation."

LOOKING AHEAD for the entire industry Mr. Balcom, RMA's president, sees as "excellent" the outlook for 1948 and the years ahead—"assuming that nothing happens to disrupt our present economy." "The next ten years," he adds by way of caution, "will, however, bring changes that will affect us all." Perhaps the most potent change factors, he believes, will be FM and television. "Both will continue to grow in importance in the field of home entertainment and will bring inevitable readjustments both in manufacturing and broadcasting."

MR. BALCOM STRESSES the importance of the radio-in-every-room campaign to the future health of the industry. "Instead of our having reached over 90 per-cent of saturation of American homes," he points out, "we are only about 37.5 per-cent of

(*Continued on page* 171)

BOBBY-SOXERS

play their radios long and hard
..buy plenty of tubes, parts, and repair time
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RADIO TUBES

DON'T begrudge 'em their fun. It's the last fling before demure seventeen, studious nineteen, and engaged twenty-one . . . Jive aside, they're smart kids—and loyal. When they buy, it's with an eye to established reputation.

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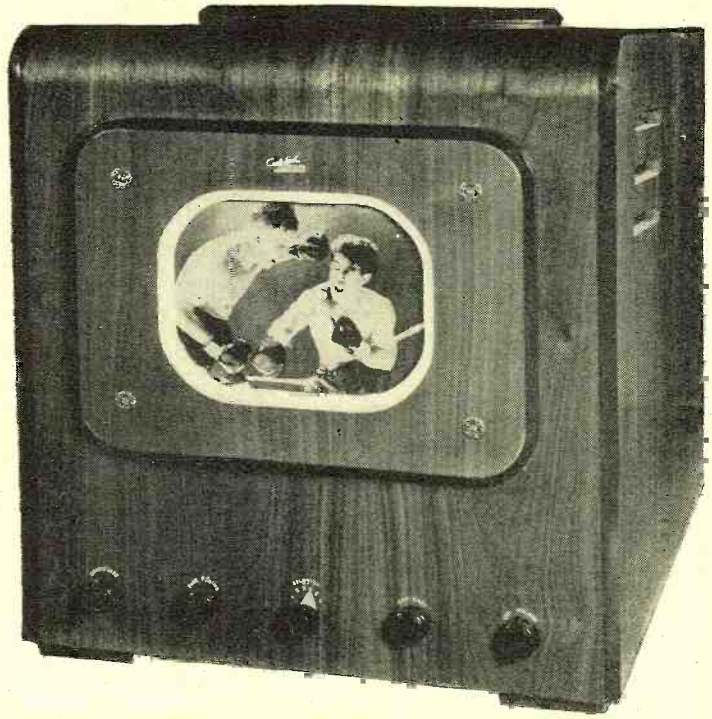

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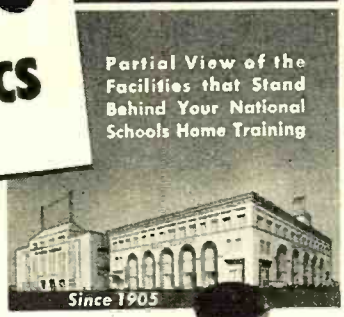


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GENERATOR CONDENSERS

PHILCO part No. 61-0177—.5 mfd.—¾" x 1⅛"—4" lead-slotted mounting strap for easy installation—Standard Merchandise—*not* war surplus—Present list price $1.00.
Our special—over 85% off **14c**

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Clean stocks — long leads — mounting feet — made to fit where you need them.
For 6F6-6K6—to 4 ohm voice coil—size 2" x 1⅝" x 1⅜".
50L6-35L6-25L6 to 4 ohm voice coil 1⅝" x 1⅝" x 1⅜".
Specify quantity of each type you need at..... **49c**

CATHODE CONDENSERS

10 Mfd. at 25 working volts—1⅛" x 1¾" tubular type—aluminum cans—overall cardboard sleeve—tinned leads—quality construction by a national manufacturer—backed by the famous R. S. & E. guarantee—list price **75c.** Priced to make you money at **12c** each
lots of 10 for..... **1.08** 100 for..... **9.00**

MULTI-USE WIRE

An old favorite — back again!
Stranded No. 22 tinned wire—glass "ROCKBESTOS" 1000 volt insulation—fireproof aircraft wire—a wartime development—at this low price you can use the best—
100 feet..... **45c** 1000 feet..... **3.89**

AEROVOX GL 8-600

Genuine Aerovox 8 mfd.—600 volt working—inverted screw mounting—aluminum can 1⅜x4½"—6" insulated leads. List Price $4.00—quantity limited—order now on this one time item at only..... **99c**

CRC MODEL 451A AC-DC Volt—Ohm—Milliammeter

A dependable instrument of wide utility—sensitivity 1000 ohms per volt.
Ranges: Volts AC, DC, and Output Ranges,
0-10/50/100/500/1000;
Ohms full scale, 500,000.
Ohms center scale, 7200.
NET complete with batteries **14.90**

CRC MODEL 312 Volt—Ohm—Milliammeter

An economy pocket meter featuring a 2" moving vane meter.
Reads: AC-DC volts, 0-25/50/125/250;
Mills AC-DC, 0-50;
Ohms, 100,000;
mfd. .05-15.
Jacks provide range selection.
NET Complete with cord and plug..... **6.75**

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Standard types—Set Manufacturers close-out—all Guaranteed

Shure P30—Shure's newest and finest—osmium tipped permanent needle—1.8 volts output—fits standard mounting holes.
List Price $7.50 You pay us **2.69**

SHURE P93—W57A—pin type terminals—¾ oz. pressure—1.6 volt output—6000 cycle cut off.
List price $4.45—our Special..... **1.98**

Astatic L-70—new postwar design—solder terminals—1¼ oz. pressure—1 volt output—4000 cycle cutoff.
List price $5.55—we quote you... **1.98**

Pep-Up PHILCO CHANGERS

At last! All the parts you need to restore brilliant tone and volume to "sick" changers! You'll need all three items—sell your customer a 100% reconditioning job—
Selenium cell only, no holder..... **$1.80**
Sapphire needle only, no mirror..... **$1.20**
Special original equipment lamp..... **27c**
RECONDITIONING KIT—all three above items—postpaid—special at..... **3.21**

RADIO RULE

Here is a clear 6" plastic rule—a necessity for radio students, draftsmen, hams, all who desire cleaner, more precise work—National advertised at $2.00. Order yours today postpaid only..... **35c**

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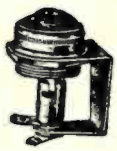

- Miniature bayonet socket
- Mount in 1" hole
- Lamps removable from front of panel
- Available in red, green, or amber—quantities limited—order now

List Price $1.30
At RSE'S 85% off—you pay **19c**
Back again—by popular demand!

Triplett 606B-VOLTAGE TESTER

Checks voltage and polarity. Range: 0-440 AC-DC volts—definite indications for 115, 220, and 440 volt lines. Separate polarized vane for AC or DC indication. Built in test leads. Excellent for checking wiring, fuses, general factory installation and maintenance. Every plant — every electrician needs several at this low price. Regular net 16.67
Special at..... **8.95**

Triplett VOLTMETERS

Panel meters by Triplett! Top quality instruments—new—boxed—five popular types—priced right—your chance to get those meters you've always wanted—
MODEL 332—0-150 A.C. volts—3" round flush mounting black brass case.
MODEL 231—0-150 A.C. volts—2" round flush mounting bakelite case.
MODEL 237—0-150 A.C. volts—2" square flush mounting bakelite case.
MODEL 221—0-30 D.C. volts 2" round flush mounting bakelite case.
MODEL 324—0-400 D.C. volts—3" round projection mounting—bakelite case.
Supply limited—order now—list models you desire. **2.95 EACH**

RESISTANCE LINE CORDS

Standard 3 terminal 135 ohm AC-DC cords—sturdy construction—flexible—5½' long—complete with plug—for sets having approximately 69-75.2 volts drop in the filaments—Regular list price 1.17—
Only 33c

Include full remittance with orders of $3.00 or less. Include 25% deposit with all C.O.D. orders of $3.00. or more. All shipments sent express collect if postage is not included. Prices subject to change without notice.
BE SURE TO INCLUDE SUFFICIENT POSTAGE. EXCESS WILL BE REFUNDED.

RADIO SUPPLY & ENGINEERING CO., Inc.

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Listen! IT'S A Jensen SPEAKER

Jensen Speech Master REPRODUCERS NOW WITH ALNICO 5 PM DESIGN

JENSEN Speech Master Reproducers have long been widely used in moderate-level intercom, paging and P. A. systems. Now, in ALNICO 5 design, they are once more available for all applications where clear, crisp, intelligible speech and good "talk-back" performance are required. Ideal for amateur, commercial, police and aviation phone communication as separate units or integral equipment. In amateur CW they aid selectivity, help signals override QRM and QRN. The husky voice coil withstands keying transients.

JENSEN MANUFACTURING CO.
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Jensen
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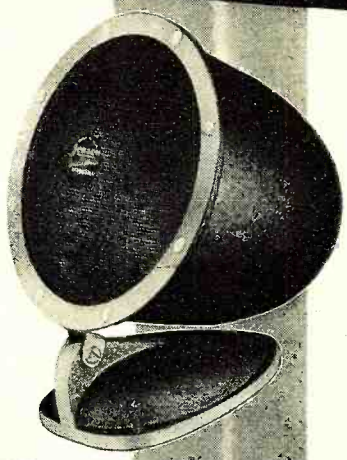
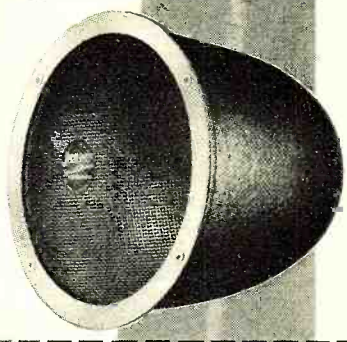


MODEL AP-10 SPEECH MASTER (Desk Type)

ALNICO 5 PM design. Complete with swivel base and tilt adjustment. Double dustproofed, fully enclosed and protected. Internal mounting bracket for ½ x ½" transformer. Power rating 5 watts. Height 6¾", depth 5⅛", diameter 5". Attractive hammered gray finish with satin chrome trim. 36" RC cord. Shipping weight 5¼ lbs.

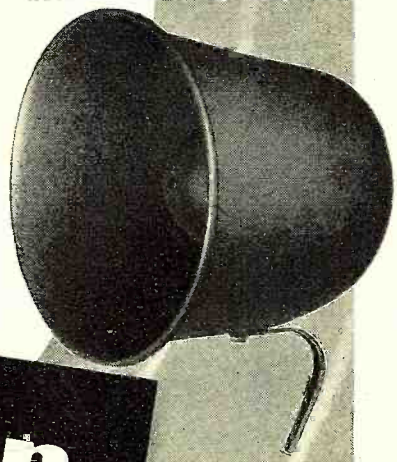
	List Price
AP-10 (ST-590) with 3-4 ohm voice coil	$13.90
AP-10 (ST-591) with 45-50 ohm voice coil	14.50



MODEL AP-11 SPEECH MASTER (Panel Type)

Similar to AP-10 but without swivel base. Clearance eyelets for mounting screws. Mounts in 4-27/64" cutout. Depth from front panel 4½". Power rating 5 watts. Screws and drilling template furnished. Shipping weight 3¼ lbs.

	List Price
AP-11 (ST-592) with 3-4 ohm voice coil	$11.30
AP-11 (ST-593) with 45-50 ohm voice coil	11.90



MODEL AR-10 REFLEX SPEECH MASTER REPRODUCER

Specially designed reflex horn increases efficiency in mid-range, giving added effectiveness and punch to speech quality when used for paging, intercom and call systems operated at moderate levels. Reflex construction prevents direct access of snow or rain to speaker diaphragm. Power rating 6 watts. Space within case provided for mounting ½ x ½" transformer. Over-all diameter 10", depth 8". Complete with bracket for wall or post mounting.

	List Price
AR-10 (ST-643) with 3-4 ohm voice coil	$20.00
AR-10 (ST-644) with 45-50 ohm voice coil	20.75

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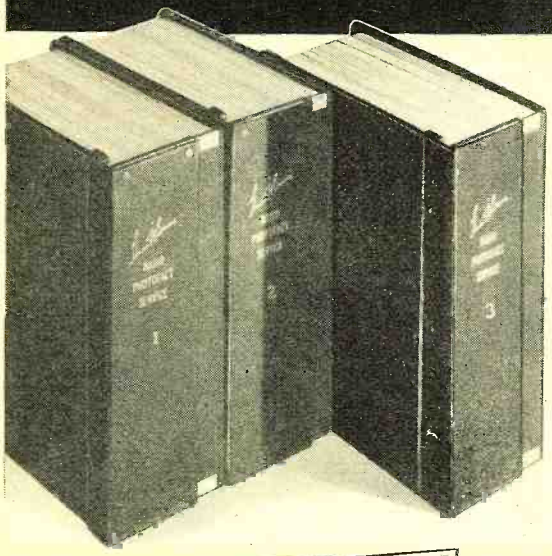

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New companion to popular Volumes 1 and 2 to bring your file of post-war receivers right up to January 1948! The most accurate and complete Radio Data ever compiled . . . an absolute *MUST* for all Servicemen. Everything you need to know for faster, more profitable servicing, in handy, unified form—large size schematics with the exclusive PHOTOFACT Standard Notation; photo views keyed to parts lists and alignment data; complete listings of parts values and proper replacements; alignment, stage gain, circuit voltage and resistance analysis; coil resistances; dial cord stringing; disassembly instructions; record changer analysis and repair instructions. Send in your order today for the *only* Service data that meets your *actual* needs!

Volume 1. Covers all post-war models up to Jan. 1, 1947.
Volume 2. Covers post-war models from Jan. 1, 1947 to July 1, 1947.
Volume 3. Covers post-war models from July 1, 1947 to Jan. 1, 1948.

YOUR PRICE, EACH VOLUME, IN EASY-TO-USE DELUXE BINDER **$18.39**

SPECIAL OFFER

To All Servicemen Whose PHOTOFACT Folder Files Are Incomplete . . .

If you haven't a complete file of all PHOTOFACT Folder Sets to date, you can trade in the Folder Sets you now own for complete Volumes at amazingly low cost. Write us today for details of this special offer, stating what Sets of Folders you now own (use coupon below).

Howard W. Sams 1947 Automatic Record Changer Manual

Nothing like it! COVERS MORE THAN 40 DIFFERENT POST-WAR MODELS. Absolutely *accurate, complete, authoritative*—based on actual study of the equipment. Shows exclusive "exploded" views, photos from all angles. Gives full change cycle data, information on adjustments, service hints and kinks, complete parts lists. Shows you how to overcome any kind of changer trouble. PLUS—for the first time—complete, accurate data on leading WIRE, RIBBON, TAPE, and PAPER DISC RECORDERS! 400 pages; hard cover; opens flat. Don't be without this manual. *ONLY* . . . **$4.95**

Howard W. Sams Dial Cord Stringing Guide

There's only one *right* way to string a dial cord. And there's only *one* book that shows you how. It's the Howard W. Sams DIAL CORD STRINGING GUIDE. Here, for the first time, in *one* handy pocket-sized book, are all available dial cord diagrams and data covering 1938 through 1946 receivers (over 2300 models). Licks the knottiest dial cord problem in a matter of minutes. This low-cost book is a "must" for servicing. You'll want one for your tool kit and one for your shop bench. Order today. *ONLY* **75c**

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FREE! New PHOTOFACT Cumulative Index

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TOPS IN PERFORMANCE... TOPS WITH AMATEURS

A Versatile Transmitter With Every Feature An Amateur Desires

The ST-202-A Transmitter exemplifies Stancor's aim . . . that of helping the amateur get the most from his hobby by providing him with the equipment he needs at reasonable cost.

The major features listed below have gained for the ST-202-A an enviable position of popularity among discriminating amateurs.

Descriptive bulletin available at your Stancor dealer or from the factory.

Amateur net price of ST-202-A Kit, less accessories $92.80

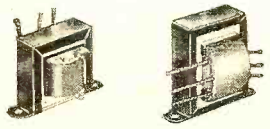
STANCOR'S ST-202-A Transmitter Kit

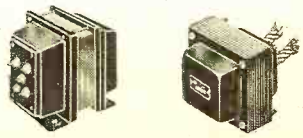
AVAILABLE AT ALL AUTHORIZED STANCOR DISTRIBUTORS

FEATURING...

- 100-125 WATTS INPUT TO FINAL AMPLIFIER
- CW OPERATION
- ALL AMATEUR BANDS BETWEEN 3.5 and 30 MCS.
- BAND-SWITCHING OF EXCITER STAGES
- ONLY TWO TUNING CONTROLS (*Exciter and Amplifier*)
- SELECTION OF SIX CRYSTAL POSITIONS
- ADJUSTABLE LINE OUTPUT CIRCUIT
- TWO SEPARATE POWER SUPPLIES INCLUDED
- EASE OF CONSTRUCTION (*Cable Wiring Harness Supplied*)
- COMPACT DESIGN—APPROX. 14" x 13" x 9"
- AMPLITUDE OR FREQUENCY MODULATOR MAY BE APPLIED
- PRICED TO PLEASE THE AMATEUR

SEE YOUR STANCOR DISTRIBUTOR FOR A COMPLETE LINE OF STANCOR QUALITY TRANSFORMERS





standardize on STANCOR TRANSFORMERS

STANDARD TRANSFORMER CORPORATION • ELSTON, KEDZIE AND ADDISON • CHICAGO 18, ILLINOIS

Within the INDUSTRY

JACK E. SNYDER, assistant general manager of *Concord Radio Corporation,* was elected president of the Chicago Chapter of the National Electronics Distributors Association (NEDA) at a recent meeting of that organization.

Mr. Snyder succeeds Al Oliver, deceased, to the presidency. In accepting the new post he asked members of the group to suggest specific business problems which will be used as the basis of discussions at meetings.

He has been associated with *Concord* for the past 17 years and is well-known in the radio industry.

* * *

WALLY B. SWANK, former sales manager of the *E. F. Johnson Co.,* Waseca, Minnesota, has recently formed his own organization in Syracuse, New York, where he will represent the manufacturers of several lines of electrical and electronic equipment for New York state, with the exception of the New York City area.

He is a graduate of Purdue University and served as a radio engineer for a Chicago radio manufacturer before serving as a manufacturers' representative in several Midwest territories.

Mr. Swank will maintain offices at 400 Cherry Road, Syracuse 9, New York.

* * *

K. BLAIR BENSON, formerly associated with *General Electric Company,* has been appointed Senior Engineer at *United States Television Mfg. Corp.*

At *General Electric,* Mr. Benson was in charge of the design and development of projection television receivers and worked on many electronic devices for military use as well as in the television receiver engineering division of the company.

As a specialist on projection television, Mr. Benson will devote his time at *UST* in that field.

NATIONAL SAFETY COUNCIL has announced the formation of a Radio and Electrical Equipment Manufacturers' Committee with a view toward developing another permanent section of the Council for industry-wide study and attack on accident problems.

The new committee is headed by E. K. Taylor, safety director of *Zenith Radio Corporation,* with O. C. Boileau, safety director of the *RCA Victor Division,* serving as vice-chairman of the Radio and Electronics Division while H. B. Duffus, supervisor of the accident prevention service of *Westinghouse Electric Corporation,* is acting as vice-chairman of the Heavy Apparatus Division.

M. F. Biancardi, safety engineer of *Allis-Chalmers Co.,* is vice-chairman of the Light Apparatus Division, and C. R. DeReamer, general safety supervisor of *General Electric's* executive department, is serving as vice-chairman of the Appliance and Lamps Division.

C. E. Woodward, safety director of the *A. O. Smith Corp.,* will edit the Newsletter; J. M. Transue, protection director of *Philco Corporation,* is the sub-committee chairman. G. W. Greenwood, safety director of *Western Electric Co.,* is acting as secretary of the committee.

* * *

WILLIAM H. KNOWLES, chief engineer, heads the new Resistor Analysis Council just formed by *International Resistance Company* as a service to the industry.

Composed of a group of *IRC* electrical and mechanical engineers, plus production specialists, the new council operates as a consultant to engineers and designers, providing confidential analysis of resistor requirements for any mechanical or electrical resistor problem.

Interested engineers and designers may have the resistor requirements of their products analyzed by sending as much pertinent data as is available to the Resistor Analysis Council at *International Resistance Company,* 401 N. Broad Street, Philadelphia, Pa. There is no obligation to purchase *IRC* products.

* * *

JENSEN INDUSTRIES, INC., of Chicago, manufacturers of a line of phonograph needles, have appointed five new representatives to handle the company's product.

Herbert G. Arcadius, who was formerly connected with *Meissner,* is the new Midwest representative covering Indiana, Illinois, Michigan, and southern Wisconsin.

Robert M. Hardie, former sales manager of *Thordarson,* was named as representative for southern California. A. J. Nelson was appointed for the Rocky Mountain area.

Now...

New BATTERY OPERATED RCA VOLTOHMYST

you can use it anywhere!

Measures voltage resistance . . . and current

ABOUT THE HANDIEST METER in the service field! In one instrument, for one price, you get an electronic voltmeter, ohmmeter, and ammeter . . . *battery-operated* to make it completely independent of power-line sources.

Use it to test car radios, farm sets, railroad signal equipment, aircraft radio, industrial electronic devices . . . opens up hundreds of profitable new opportunities beyond the limits of power lines.

With it you can measure both a-c and d-c voltages to 1000 volts, resistance to 1000 megohms, and direct current to 10 amperes. A new low-cost, RCA crystal probe can be attached if you want to make v-h-f measurements.

Most important, this instrument is easy on batteries. They last up to 10 months in normal service. A neon pilot light flashes when the instrument is on . . . serves as a reminder to turn the instrument off when not in use.

Linearity and stability are excellent.

Here is one of the best buys in test equipment on the market today. We'll be glad to send you complete descriptive and price information on this time and money saver. See it at your RCA Test Equipment Distributor.

TEST AND MEASURING EQUIPMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal

A. T. R. Armstrong, now operating the *Controlite Engineering & Sales, Ltd.*, of Toronto, will be the new *Jensen* representative for the Dominion of Canada outside of British Columbia and Alberta.

R. T. Bork was named to service the Minneapolis-St. Paul area.

* * *

ANDREW SMOY, president-owner of the *A. J. Smoy Co.*, recently announced the outright purchase of *The Atlas Coil Company* of Chicago.

Plans are now being formulated to consolidate the manufacturing facilities of both companies under a single roof. The *Smoy* organization, which is located at 3451 West Belmont Avenue in Chicago, manufacture transformers, coils, and special components.

Mr. Smoy was formerly production manager of the Transformer Division of *Utah Radio Corporation.* He was associated with that company for 16 years.

* * *

P. R. MALLORY & CO., INC., has instituted a new merchandising program designed to assist radio servicemen in developing their businesses.

The program, "Good Service for Good Business Plan," makes available to servicemen a complete kit of material for improved shop identification, customer follow-up activity, and simplified service records.

A program of service meetings under the sponsorship of *Mallory* distributors is now under way. A sound film covering all details of the plan, together with information on recent developments in the company's products are featured at the meetings.

* * *

JOHN K. WEST has been elected to the post of Vice-President in charge of Public Relations for the *RCA Victor Division* of *Radio Corporation of America.*

Mr. West previously was the Director of Public Relations for *RCA Victor,* a position to which he was appointed in 1945. In this capacity he was largely responsible for the creation and development of the *RCA* Exhibition Hall in Radio City, of which he is manager.

Associated with *RCA Victor* since 1930, Mr. West has served the company in various capacities.

* * *

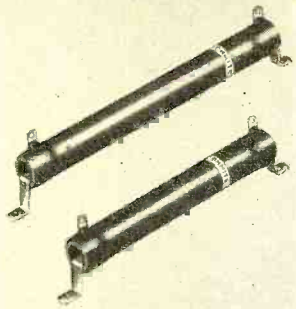
JOHN L. UTZ was recently appointed manager of the Atlantic Division of *Philco Corporation.*

Joining *Philco* in 1936 in personnel work, Mr. Utz was soon transferred to sales in the Philadelphia organization of *Philco Distributors.* In 1940 he became the district representative

(*Continued on page* 108)

Be Right with.. OHMITE

Wire Wound Resistors



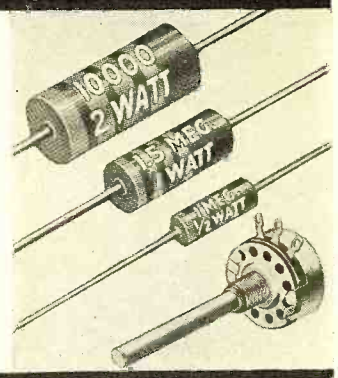
Ohmite offers a complete line of dependable resistors wound on a ceramic tube and protected by vitreous enamel. Ratings from 5 to 200 watts. Available in the fixed type for general use, and in the "Dividohm" type with adjustable lugs for use as a multi-tap resistor or voltage divider. Many standard types and mountings.

Composition Resistors and Potentiometer

"Little Devil" resistors are individually marked. In ½, 1, and 2-watt, ± 10% tol. Also ± 5% in ½, 1-w sizes. RMA values, 10 ohms to 22 megohms.

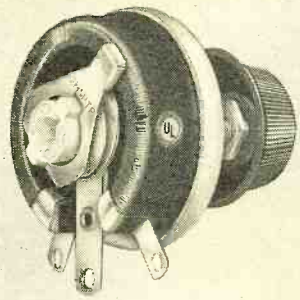
Type AB, 2-watt molded element potentiometer for industrial use. 50 ohms to 5 megohms in linear taper.

Both items sold only through Ohmite distributors.

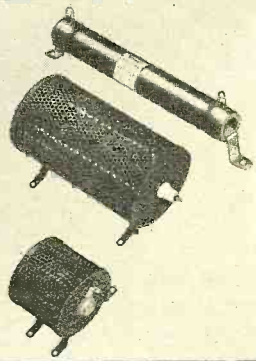


Vitreous Enameled Rheostats

Available in 10 sizes, ranging from 25 to 1000 watts, in a wide range of resistances. Ceramic parts insulate the shaft and mounting. The resistance winding is permanently locked in vitreous enamel. The metal-graphite brush provides unmatched smoothness of action. Engineered and constructed for long, trouble-free life.

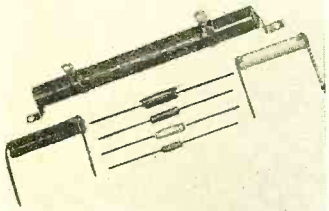


Non-Inductive Resistors



Used as dummy antennas for radio transmitters, load resistors in high-frequency circuits, terminating resistors for radio antennas. Vitreous-enamel type wound on a tubular ceramic core. Also dummy antenna units consisting of several resistors arranged concentrically, connected in parallel. Sizes: 50 to 250 watts.

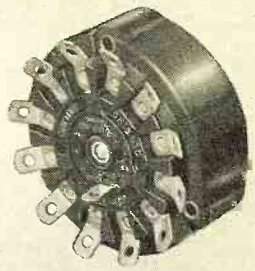
Radio Frequency Plate Chokes



To adequately cover higher radio frequencies now used by amateurs, police, and other communication facilities. Single-layer wound on low power factor steatite or molded plastic cores and covered with a moistureproof coating. Seven stock sizes from 3 to 520 megacycles. Two units rated 600 ma; all others 1000 ma.

All Ceramic Tap Switches

A popular switch for use with tapped transformers in power supply units. Compact, dependable, and convenient to operate. Available in ratings of 10, 15, 25, 50, and 100 amperes, A.C. Contacts are of the silver-to-silver, non-shorting type. Switch shaft is insulated by a strong ceramic hub. Ceramic body is unaffected by arcing.

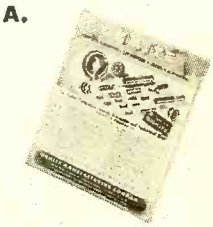


OHMITE MANUFACTURING CO., 4883 Flournoy St., Chicago 44, U. S. A.

OHMITE

Write Today for Ohmite Catalog No. 19

Provides 16 pages of useful data on the selection and application of rheostats, resistors, tap switches, chokes, attenuators, and other equipment.



RHEOSTATS RESISTORS TAP SWITCHES CHOKES

CRYS A S

In the greatest purchase of radio transmitting crystals ever made by one wholesaler in the history of the Radio Parts Industry, Sun Radio acquired title to over a half million dollars ($500,000.00) of Army Surplus. precision built, exactly tooled crystals in moisture proof holders which are shock mounted. Can you visualize the immensity of this stock of ours!. . . thousands, or should we say miles, of gleaming BRAND NEW CRYSTALS IN MOISTURE PROOF HOLDERS manufactured by the world's finest crystal manufacturers (RCA, Bliley, Western Electric, Valpey, etc.) lying in long rows; lovely to look at but even better to own. We can't claim that we can supply every frequency, because they are offered "First come, first served", but we do claim that we can supply the early birds with the below listed frequencies AT THE LOWEST PRICES YOU HAVE EVER SEEN . . . We say it's sensational!!! Please note that crystal shipments of 6 or less are packed in cloth containers to expedite handling . . . No worry because all crystals are shock mounted and guaranteed delivered perfect. All crystals have Army MC harmonic ratings but Sun encloses directions for deriving the correct fundamental frequency in kilocycles . . . And all frequencies are checked before shipment to insure your satisfaction. And remember, you may never again see the day that you can buy BRAND-NEW CRYSTALS IN MOISTURE PROOF HOLDERS at the prices that we have listed here. . . .

CRYSTALS WITH A MILLION USES

Fractions Omitted

412kc	423kc	434kc	444kc	459kc	474kc	488kc	498kc	509kc
413	424	435	445	462	475	490	501	511
414	425	436	446	463	477	491	502	512
415	426	437	447	466	479	492	503	515
416	427	438	448	468	481	493	504	516
418	429	440	451	469	483	494	505	518
419	430	441	453	470	484	495	506	519
420	431	442	457	472	485	496	507	522
422	433	443	458	473	487	497	508	523

49¢ EACH

I.F. Frequency Standards

450kc	454.166kc	461.111kc
451.388kc	455.556kc	464.815kc
452.777kc	459.259kc	465.277kc

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Crystal Frequency Standards 98.356kc

Easily altered for 100kc Standard Mounted in low loss 3 prong holder.

3.89 EACH

For Crystal Controlled Signal Generators 525kc

526.388	531.944	536.111
527.777	533.333	537.500
529.166	534.722	538.888
530.555		

99¢ EACH

Assorted Miscellaneous CRYSTALS

Fractions Omitted

370kc	375kc	379kc	383kc	387kc
372	376	380	384	388
374	377	381	386	

priced at a fraction of the cost of their holders alone.

39¢ EACH

For Ham and General Use

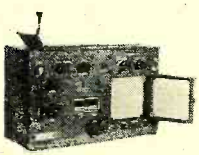
Fractions Omitted

390kc	394kc	398kc	404kc	408kc
391	395	401	405	409
392	396	402	406	411
393	397	403	407	

79¢ EACH

* Payments must accompany order. Enclose 20c for postage and handling. Minimum order—$2.00 plus postage.
# Crystals are shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

I-222 Signal Generator



Brand new; Frequency from 8 MC to 230 MC in 2 bands. Calibration graph furnished. Crystal controlled check points. 110V AC power supply. Output attenuator. Dial calibration 10 points per division. A true laboratory instrument.

A $350 value for only.....**$54.95**

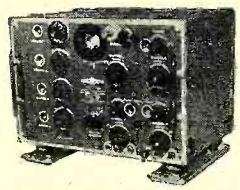
HV Mica Condensers

.005 mfd. 2500 W.V., A sensational value. ....**49¢** Each

3 FOR.....**$1.25**

100 WATT BENDIX TRANSMITTER

Four Separate Electronic Coupled Oscillators



These can be easily converted to 20-40-80 meters. Crystal required for 10 meters. Each electronic coupled oscillator dial has 3000 divisions enobling quick precision shifting. This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks; one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11 x 12 x 15 inches, weighing 35½ lbs. Complete, simple instructions for conversion furnished. Uses three 807, four 12SK7 tubes; one 2-inch 5 amp. R.F. meter.

A complete coverage transmitter, for the new or experienced amateur. A TRUE HAM VALUE—BRAND NEW, complete with tubes..... **$49.95**

110 Volt AC Superheterodyne Receiver

This crystal fixed frequency receiver comes with full conversion instructions for variable tuning of all ham bands and broadcasts. A highly selective superheterodyne receiver, 110 V.A.C. power supply built in. Uses the following tubes: 6K7 RF Amplifier; 6F7 Detector and A.V.C.; 6C8 Output and Noise Suppressor; 80 Rectifier. Dimensions: 3½ x 19 x 11½ inches. Comes complete brand new, with one set of coils and two sets of tubes..... **$16.95**

Extra Coil Sets With Set Only.....**$2.95**

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OF WASHINGTON, D. C.

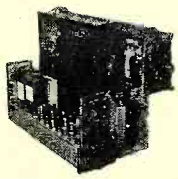
938 F STREET, N. W. WASH. 4, D. C.

Sun Radio FOR THE HOTTEST VALUES IN Surplus Parts

SPERRY AMPLIFIER

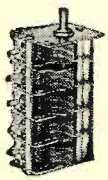
Manufactured by Sperry Gyroscope Co. These amplifiers contain 2 beam power output tubes (1632) similar to 25L6, 2 twin triodes (1633 & 1634) similar to 6SC7, 2 mica condensers, dozens of color coded half watt resistors, 3 bathtub condensers, 2 dual bathtub condensers, 1 bathtub condenser with 4 sections, 3 hermetically sealed transformers, 2 wafer shielded rotary switches with resistor assembly, 1 volume control, 4 octal sockets, measurements 9½" x 5½" x 3½". Brand new. Easily converted to excellent audio amplifier..... **$3.95**

WAVEMETER BC-1073A



These units are only slighty used and are guaranteed in good condition. They contain a high quality resonant cavity wavemeter, oscillator, heterodyne amplifier, electric turning eye, complete with nineteen tubes (8-65N7-GT, 1-6SJ7, 1-6SA7, 2-6V6GT, 2-6H6, 1-5Y3GT, 1-9002, 1-9006, 16U5, 1-6SF5) 110-volt A.C. power supply. 27" x 20" x 6⅛"—Net weight 95 lbs. These units tune from 150 to 210 megacycles. Orginal cost $550.00, your cost..... **$24.95**

5-GANG TUNING CONDENSER



Brand new . . . 5-gang, 365 mmfd. per section . . . a truly precision built condenser. Each rotor and stator individually separated with ceramic insulation. A $13.50 value in the greatest offering ever made in tuning condensers for only..... **$2.95**

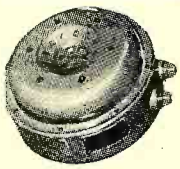
AC VOLTMETER

Brand new Westinghouse 3" square panel meter 0-150v Ideal for checking primary voltage..... **$3.49**

TS13 HANDSET

Combining a 200 ohm carbon mike and 2500 ohm earphone wth butterfly switch for talk-listen. Has 6" flexible rubber cord with 1-PL55 and 1-PL68 plugs attached . . . BRAND NEW..... **$2.95**

NAVY SPEAKERS



Stromberg Carlson and RCA waterproof speakers. Brand New in original cartons. 25 Watt PM driver unit with projector mounted in heavy duty round metal baffle. Ideal for communication receivers and sound systems at the lowest price ever offered. . **$14.95**

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(A) Small four-section telescopic aerial ideal for portable receivers, transceivers or test equipment.

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(B) 22" tapered high frequency aerial covering 150 to 200 MC. Ideal for mobile or fixed station use.

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SET $129.90

Walkie Talkies, BRAND NEW, operating weight 27½ pounds including knapsack. Range up to 25 miles in open country. Frequency 52.8 to 65.8 MC. Transmitter and receiver with regular hand set. Each unit comes complete with spares included as pictured. Ready to operate.

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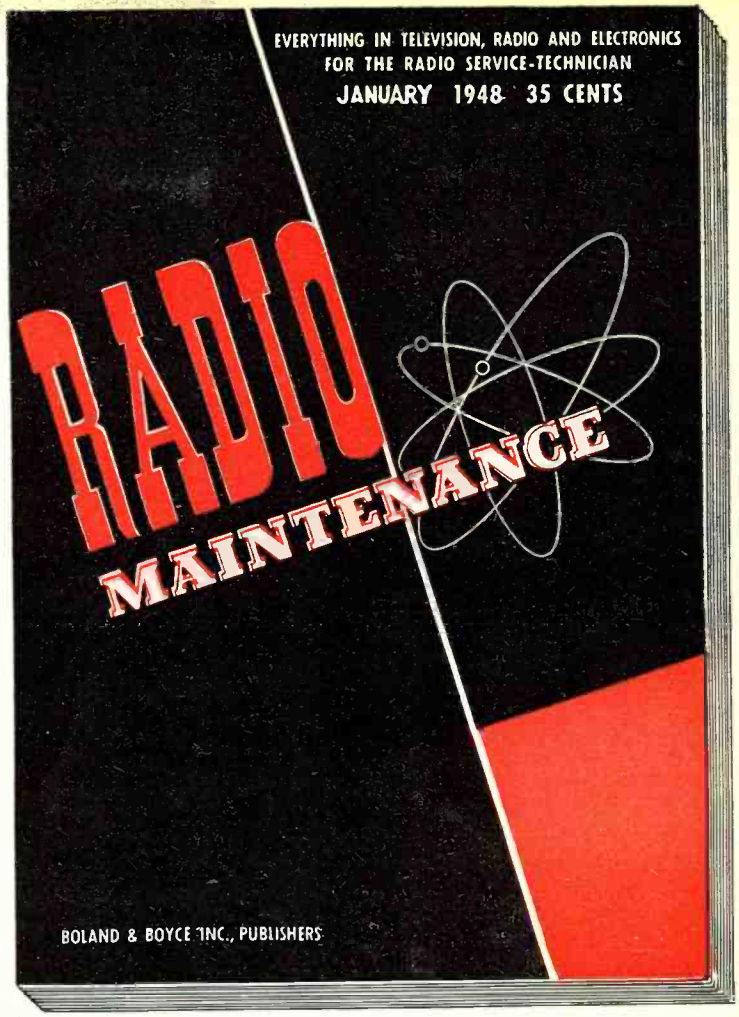

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FM continues to grow more and more rapidly. RADIO MAINTENANCE is keeping pace with this development in its series on FM. Our readers have enthusiastically received our previous articles on this subject and are asking for more. Every article will give thorough coverage—completely illustrated—of a specific phase of FM. All these articles will form a complete reference library on the subject—a library that will always be up-to-date—always handy—providing easy-to-understand information by top experts. RADIO MAINTENANCE rapid, trouble-free servicing techniques are here applied to FM. The latest type of test equipment is explained and illustrated. All circuit diagrams are clear and easy to follow. With this invaluable reference library you will have the advantage in FM. Get your subscription order to RADIO MAINTENANCE in today and every servicing advantage will be yours!

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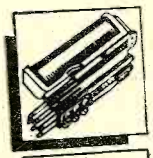
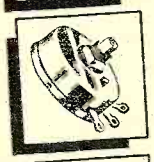
Every radio man will recognize the unusual values represented by these new Wells Kits. Parts assortments of the most popular types have been picked from our vast stocks of brand new, guaranteed Government material. In many cases, you will notice the value of just one item exceeds the cost of the whole kit. Whether or not you have an immediate use for these kits, they are made up of the sort of material that is always useful.



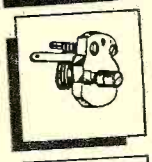
K100 RELAY KIT
6—Assorted A.C. and D.C. relays. .7 to 14,000 ohms. 3 to 20 ampere contact rating..... $2.95

K101 VOLUME CONTROL KIT
12—Carbon volume controls. 100 ohms to 7 megohms..... $1.95

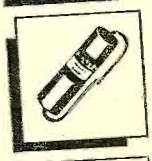


K102 VOLUME CONTROL
12—Wire wound volume controls. 5 to 70,000 ohms. 3 to 5 watt rating..... $2.95

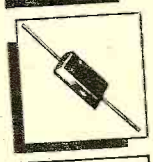
K103 PHONE PLUG AND JACK KIT
2—PL55, 2—PL68, 2—PL54 plugs. 2—JK26 and 4 other jacks to match above plugs..... $1.95



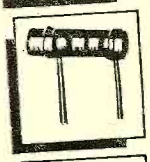
K104 AIR TRIMMER CONDENSER KIT
10—Trimmer condensers, ½ to 120 mmf..... $1.95



K105 METAL TUBULAR CONDENSER KIT
16—Tubular condensers. .001 to 1. MF. 100 to 1600 volt..... $2.35

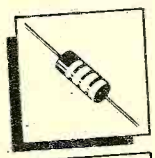


K106 MICA CONDENSER KIT
10—Silver Mica and 10—Moulded mica condensers. 4½ mmf. to .01 MF..... $2.75

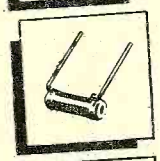


K107 CERAMIC CONDENSER KIT
12—Ceramic condensers. 1 to 7500 mmf. 500 volt minimum. Zero and negative temperature coefficient $1.75

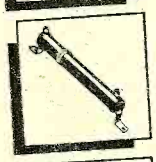
K108 ROTARY SWITCH KIT
10—Ceramic and Bakelite rotary switches. 1 to 10 poles. 2 to 12 positions $2.75



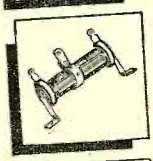
K109 CARBON RESISTOR KIT
100—Insulated resistors. 100 ohms to 2 megohms. ¼ to 1 watt. 5 to 20% tolerance..... $1.75



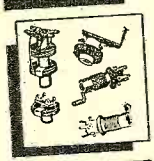
K110 WIRE WOUND RESISTOR KIT
10—Wire wound resistors with ceramic core. 3 to 35,000 ohms. 8 to 20 watts..... $1.35



K111 WIRE WOUND RESISTOR KIT
10—Wire wound resistors. 5 to 75,000 ohms. 20 to 50 watts..... $1.75



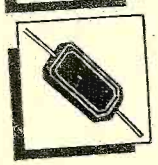
K112 ADJUSTABLE WIRE WOUND RESISTOR KIT
10—Adjustable resistors. 3 to 15,000 ohms. 10 to 50 watts..... $2.05



K113 COIL AND CHOKE KIT
25—R.F., A.F., I.F., and antenna coils and chokes..... $2.45

K114 CRYSTAL KIT
10—Crystals with holders. 186.3 kc. to 4,000 kc..... $1.85

K115 KNOB KIT
50—Bakelite knobs. Push-on and set-screw types..... $1.85



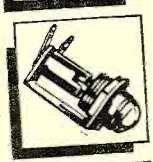
K116 MOULDED PAPER CONDENSER KIT
12—Moulded paper condensers. Most popular sizes. .005 to .1 MF. 100 to 600 volt..... $1.45

K117 BAKELITE TUBE SOCKET KIT
15—Sockets. 4, 5, 6, 7 and 8 contacts..... $1.00

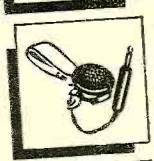
K118 CERAMIC TUBE SOCKET KIT
10—Ceramic sockets. 4, 5, 6, 7 and 8 contacts $1.45

K119 NEON LAMP KIT
10—Standard neon lamps. NE2, NE11, NE15, NE16, NE51..... $1.35

K120 CODE PRACTICE KIT
1—High frequency buzzer. 1—J37 telegraph key..... $1.45



K121 JEWEL LIGHT KIT
3—110 volt jewel light assemblies. 4—6 volt assemblies plus 3 extra jewels..... $2.10



K122 HEAD SET KIT
1—Head set type HS 32. Single receiver with strap, cord and plug..... 95c

K123 COAXIAL CABLE
100 ft. RG8U coaxial cable..... $2.95

K124 COMBINED KITS
All kits K100 to K123.
One of each..... $38.45

With the exception of a few heavier kits such as K100, K108, K111, K112, K123, all will be shipped via parcel post if you add 10c for postage for each kit. Otherwise shipment will be made via express.

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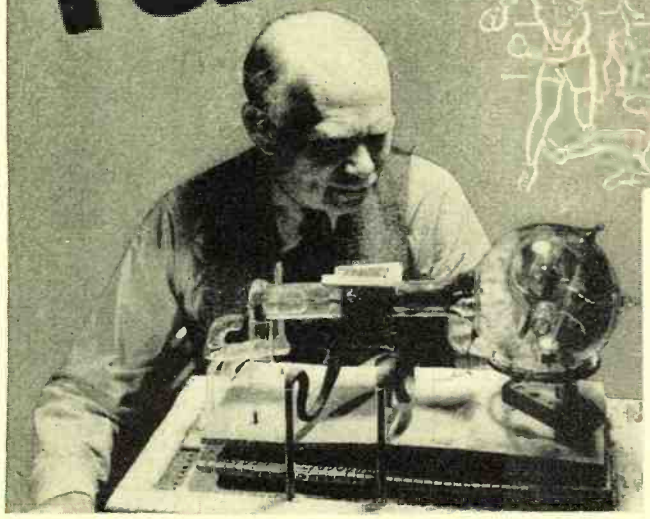

Dr. Lee de Forest

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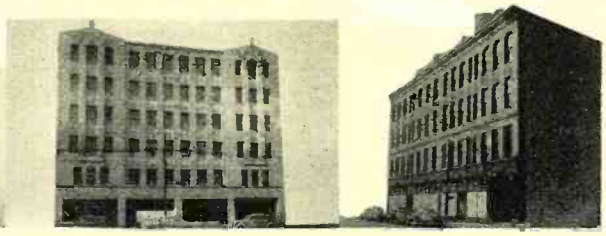

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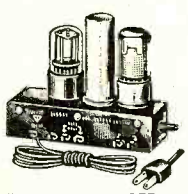

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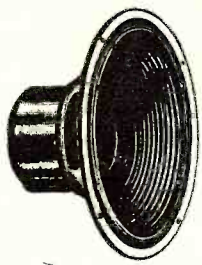

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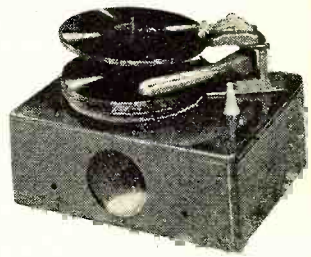

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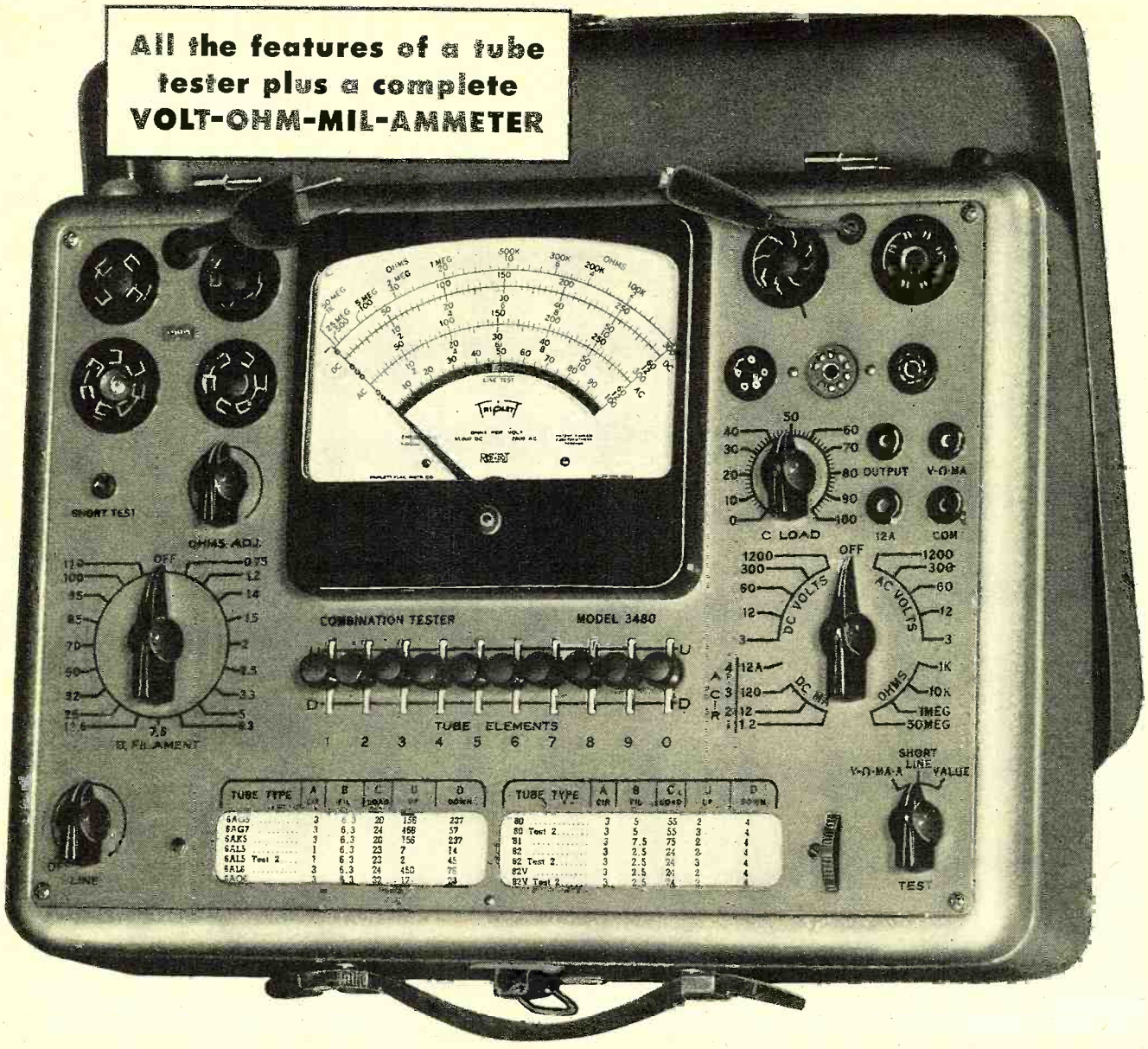

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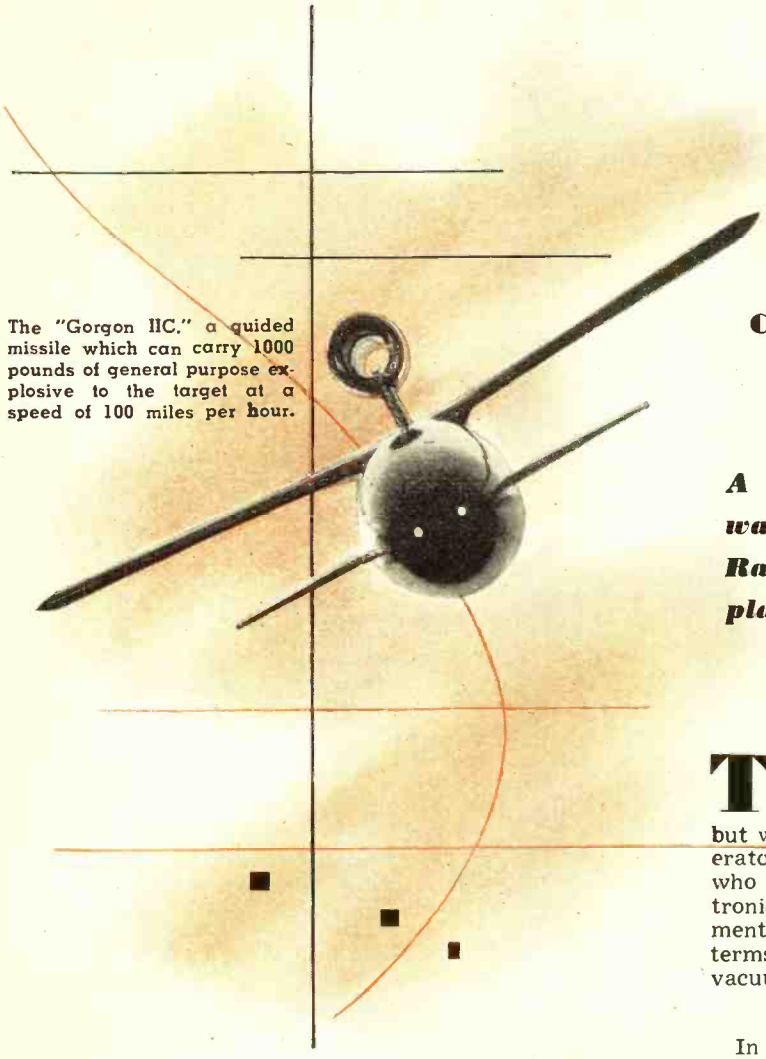
GUIDED MISSILES



The "Gorgon IIC," a guided missile which can carry 1000 pounds of general purpose explosive to the target at a speed of 100 miles per hour.

By

C. E. CHAPEL, 1st Lieut., U.S.M.C. (Ret.)

Consulting Ord. & Aero. Eng. and
Chief of Research & Development.
Northrop Aeronautical Institute.

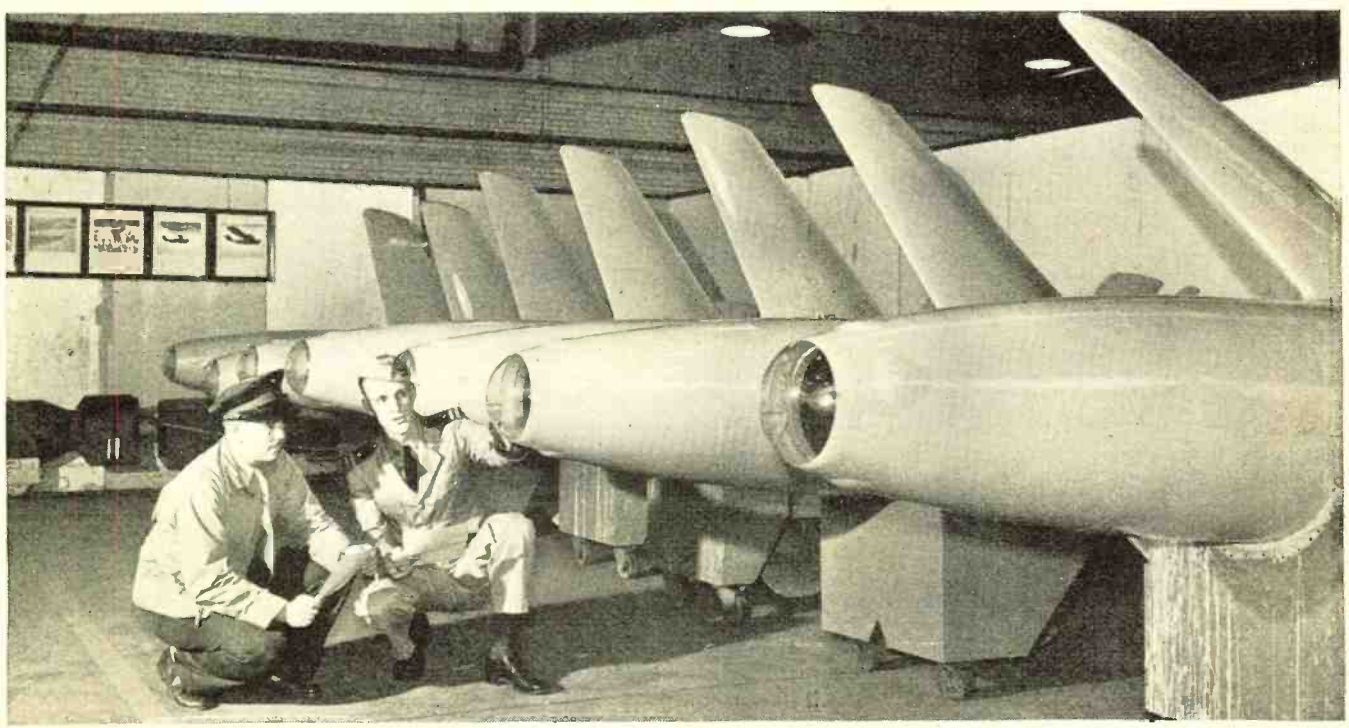
A new era of pilotless aircraft for war and peace has been inaugurated. Radio and electronic equipment again plays major role in these developments.

THE atom bomb and guided missiles will be the principal weapons for the defense of the United States of America in any future war. None of us want war, but we all want to be ready for it if it comes. Radio operators, radio technicians, radio servicemen, and everyone who has the slightest interest in the broad field of electronics should possess a basic understanding of the fundamentals of guided missiles. Reduced to their simplest terms, they are nothing more than new applications of vacuum tube circuits.

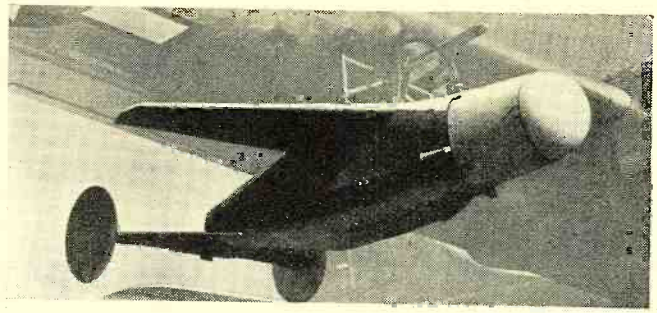
Definition of Guided Missile

In order to obtain a clear idea of the design, construction, and operation of guided missiles it is necessary to

A group of guided missiles undergoing final inspection at the Naval Air Modification Unit, Philadelphia. Each of these pilotless aircraft is equipped with an intelligence unit enabling it to seek out and carry its explosive load directly to the chosen target.

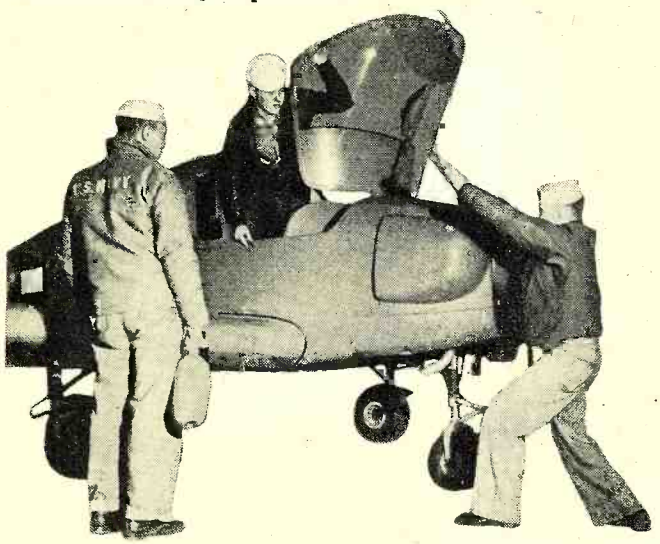


Guided missile roars into the air with the aid of four Mons-auto rockets. After expiration of the thrust of 40,000 pounds, the rockets and sled will fall free and the "Loon" will head out over the Pacific to its target.

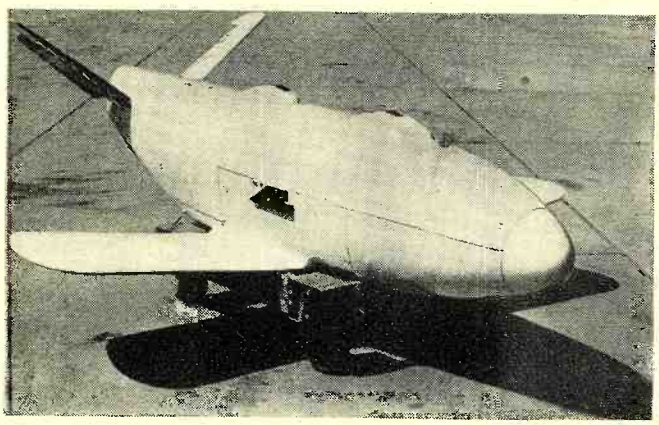


Launched by Navy "Privateer" patrol bombers outside the range of enemy anti-aircraft fire, and guided to distant targets by radar, these Navy "Bat" bombs sank many tons of enemy shipping. Operating on somewhat the same principle as live bats, which emit a short pulse of sound and direct themselves by the echoes, robot bats are guided by radar echoes from the target. Approximately 12 ft. in length, with a 10 ft. wing span, the "Bats" carry a heavy load of high explosives. Two "Bats" are carried by each "Privateer," the Navy's giant patrol bomber.

Navy target drone, used for gunnery training of Navy personnel, is prepared for a test flight by its crew.



The "Gargoyle," an air-to-ground, radio-controlled powered glide bomb, carrying a standard 1000 lb. general-purpose or armor-piercing payload. It can be launched from airplanes.



agree upon certain terms which are commonly used. First, a missile is a weapon which can be thrown or projected through space, such as a spear, an arrow, or a bullet. Each of these objects is guided along its flight path at the moment of its launching, but thereafter it is subjected to various external forces that affect the accuracy with which it travels toward the target.

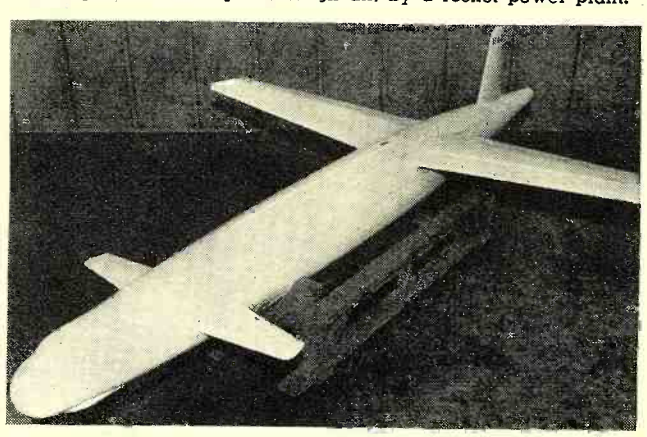
Second, a guided missile may be defined as a weapon which travels through space and carries within itself a means for controlling its path of flight. This definition is broad enough to include bombs, rockets, and even conventional airplanes. For example, a pilotless aircraft is a guided missile having aerodynamic surfaces large enough to supply the principal support for the aircraft in flight. Therefore, the lessons learned from the operation of pilotless aircraft may be applied in the design and construction of other forms of guided missiles.

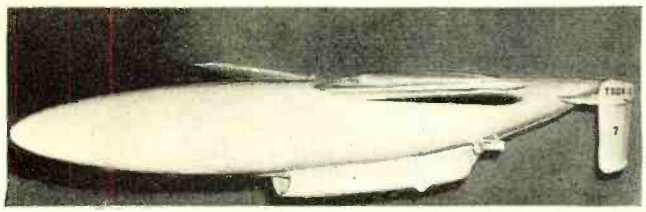
Classification According to the Place of Launching and the Target

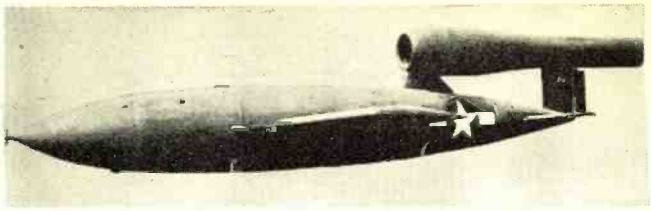
Guided missiles may be classified according to the place of launching and the target. In general, they may be launched from the surface of the earth, either from the land or from the sea, or they may be launched from some type of aircraft. Thus, they may be launched from the ground, from a ship, or from an airplane.

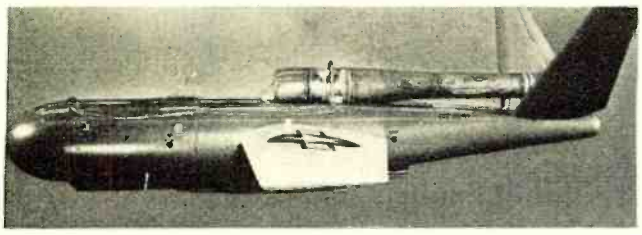
In a similar manner, guided missiles may be classified according to their targets, which may be ground installations, ships, or aircraft. Considering the place of launching and the target together, the classification breaks down into the following types: (1) Ground-to-air, (2) ship-to-air, (3) ground-to-ship, (4) ship-to-ship, (5) ground-to-ground, (6) ship-to-ground, (7) air-to-air, (8) air-to-ground, and (9) air-to-ship. *(Continued on page 122)*

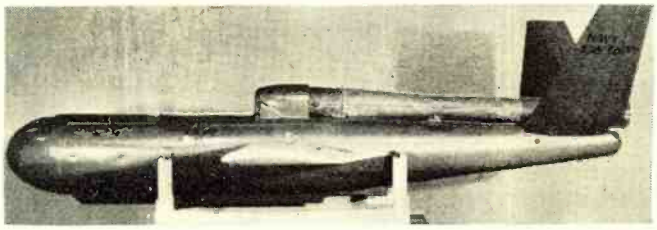
The "Gorgon," a guided missile resembling a freak-tailed white shark, carries a 100-pound, specially-shaped charge and is sent at a speed of 550 m.p.h. through air, by a rocket power plant.

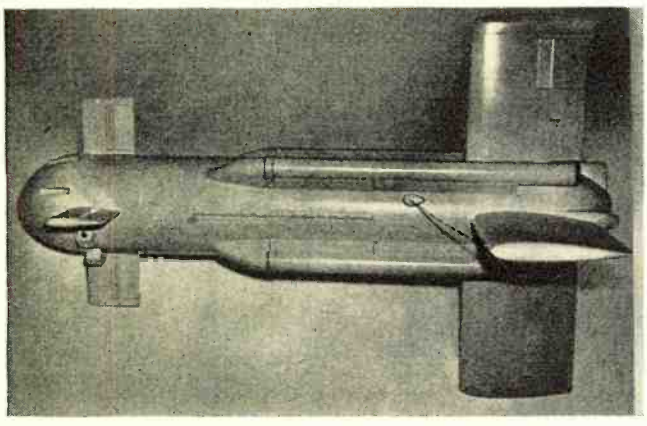


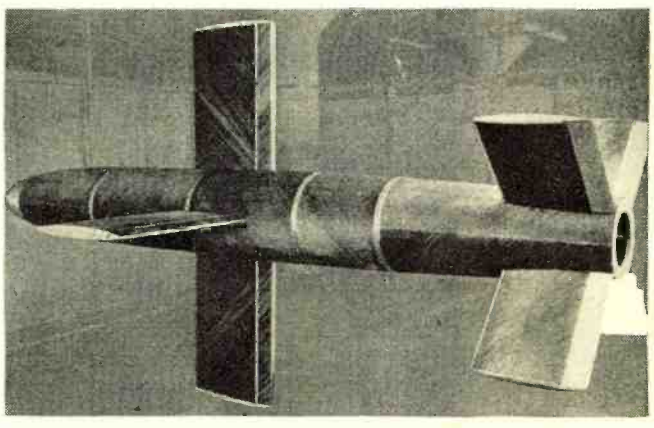


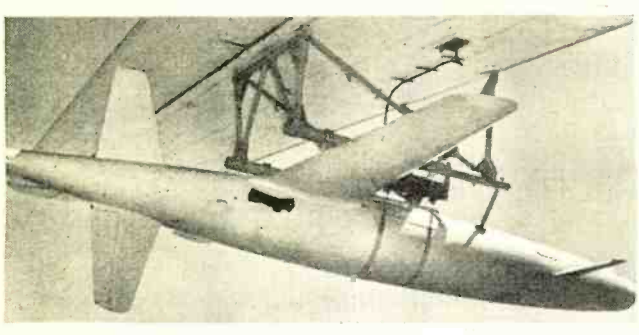


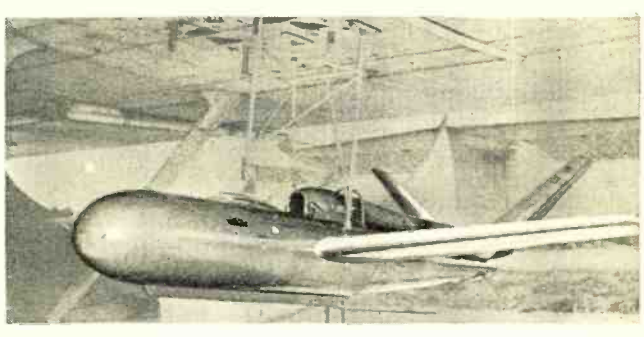












The TD2N-1, an air launched target, jet powered guided missile.

The KDD "Katydid," a jet-propelled, radio-controlled pilotless drone used as a practice target for fighter planes. The span is 12 feet, 2.6 inches, and the length is 11.1 feet. Equipped with a resonating jet engine equivalent to 45 hp. and having a speed of over 200 m.p.h., it can perform all the maneuvers of a fighter plane through radio control of the "rudder-vators" in its V-shaped tail. It can remain aloft 40 minutes, when a parachute packed under the forward hatch is released by a radio signal. This turns off the jet and allows the drone to float to earth where it can be recovered for further use.

The KAN-1 or "Little Joe," a short-range anti-aircraft missile designed to be launched from a shipboard catapult, with the aid of standard rockets. It is radio-controlled, flare-sighted, and powered by "Jato," a Navy-type solid fuel rocket.

The "Gorgon" slung underneath a Navy PB4Y-2 (Navy modification of Consolidated-Vultee's Army B-24 four-engine heavy bomber) ready for test flight. This is an air-to-air guided unit.

The KUW-1, "Loon," pilotless aircraft propelled by jet engine.

Another type of jet powered target missile being used by the Navy. Known as the KDD-1 "Katydid," it is designed to be launched either by catapult or from a target-carrying aircraft.

Mockup, or exact sized model of the KAQ-1, popularly known as the "Lark," one of the air-launched test-type guided missiles.

A radio-controlled, jet-powered target drone resting in its launching rack under the wing of a Navy PBY. This is a small pilotless aircraft whose flight can be made to simulate suicide dive bombers and torpedo plane attacks. Working on the principle that a "few hours on a drone is worth two weeks of any other kind of gunnery training," the Navy went all out to develop target drones for the benefit of its anti-aircraft gunners. These target drones were frequently used while the fleet was on its way to and returning from attacks against the enemy and proved far more popular with the gunners than the usual type of towed sleeve targets used by the Navy before the development of this type of more realistic target.

Utility Amplifier Unit

Construction details for an audio amplifier that features high fidelity performance on phono or mike input.

By
THOMAS A. PATTERSON, JR.

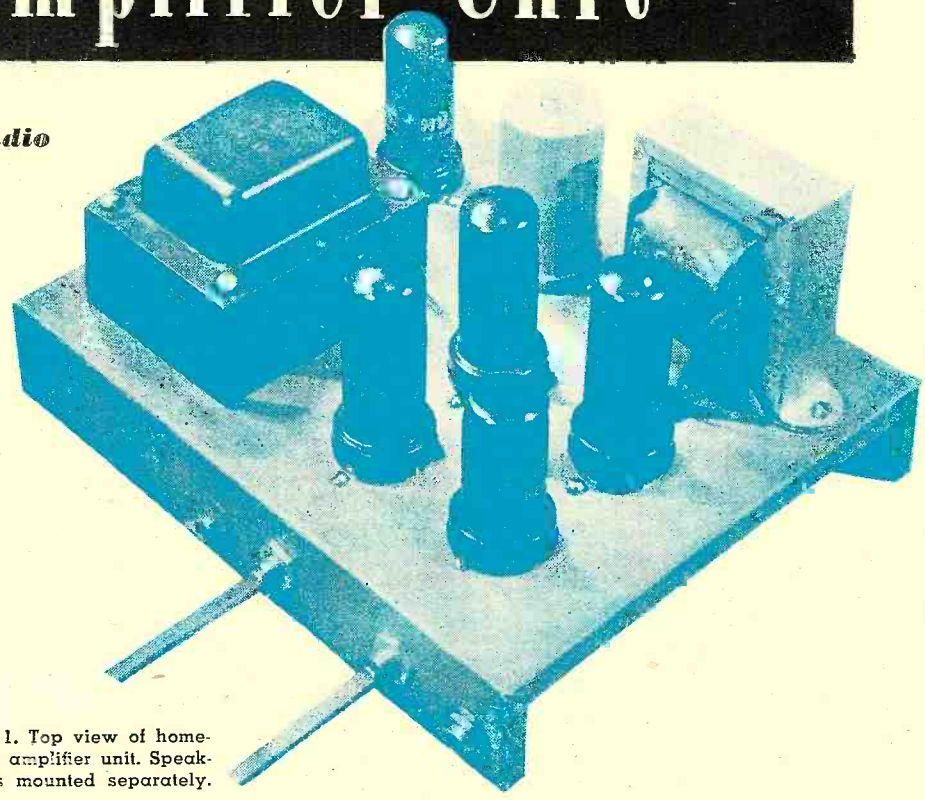


Fig. 1. Top view of home-built amplifier unit. Speaker is mounted separately.

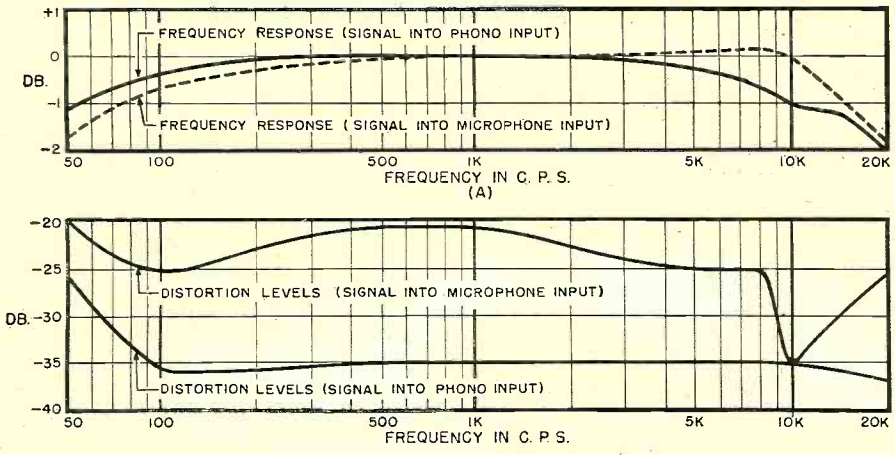
OCCASIONALLY the need arises for an amplifier which must be inexpensive and yet render a fairly high degree of fidelity. To fulfill this purpose the unit and circuit described herein was developed. One of the major factors entering into the design of this equipment was its future use as a part of a unitized, all-purpose receiver set-up.

At the present time an old but faithful communications type receiver is being used as an AM tuning unit, with an FM tuner under construction and a new all-band AM tuner in the planning stage. These new and extremely interesting tuning systems are companion units of the amplifier.

The chassis used for the amplifier is a standard commercial make, light gauge steel, 7½" by 9" by 2" deep. The entire circuit diagram of the unit, as it is presently in use is shown in Fig. 3.

The power supply section was built with a 40% safety factor, thereby providing a satisfactory operating level without need for voltage control or a regulating system. The power transformer is a *Stancor* P-6012, delivering 350-0-350 v.a.c. at a rating of 90 ma. Since the total drain of the circuit is approximately 65 ma., this unit is ample. Any other commercial unit of similar rating can be equally well employed, the other requirements being 6.3 v. at 2 amps., and 5 v. at 2 amps. The rectifier tube selected is a 5Z4, though there are others which may be substituted if more readily available —such as a 5W4 or 80. The original resistance type filter circuit shown in Fig. 3 was slightly different from the one used in the present model. However, since it is interesting and occasionally necessary, it is also shown. This system, which allows the use of a PM speaker, is merely a brute force filter circuit with dropping resistors for the various voltages, and carefully placed electrolytics to eliminate last traces of hum. Without a doubt, the present method is far more satisfactory, not to mention the gain in quality to be had from using a dynamic speaker.

Fig. 2. Frequency response and distortion levels of amplifier. Curves were plotted with 0 db. reference level at 1000 cycles. A —35 db. distortion level represents 1.8 per-cent distortion, while —25 db. represents 3.8 per-cent distortion.



Other than circuit components and their values, there is little or no startling innovation in the amplifier circuit as a whole. As mentioned before, the future use of this unit as a part of a large receiver design was the governing factor in planning the input circuits. The first stage, a 6SJ7, has a high voltage gain characteristic, high enough to handle the low output of a crystal microphone or a photoelectric cell such as is used in sound motion picture equipment. As a verification of the latter statement, the author has used the first two stages of the original design model to feed push-pull parallel 6L6's in an emergency at a small theater with more than satisfactory results. A gain control is not used on this stage, but is incorporated at the input of the next following stage. At this point better and smoother control operation is obtained since the possible control noises are not amplified by the high gain circuit.

It might be wise to mention at this point the fact that the grounding of

one side of the filament circuit was found to be very necessary for the elimination of all traces of a.c. hum. However, a twisted pair is still used for the filament leads, the grounding being accomplished at the filament terminal of the 6SJ7 socket. Generally, it is immaterial as to which side is grounded, though if difficulty is experienced in removing the hum, the ground can be changed over to whichever side does the most good. If individual ground connections are used on each tube without using a twisted pair, a good point of construction to observe is that the grounding should be done at the same pin number of all tubes.

The second stage of the circuit is a 6N7, with a phonograph input introduced to the first grid through the 500,000 ohm potentiometer and the 250,000 ohm isolating resistor. As many as four input circuits have been paralleled across this point with very satisfactory results. This input level is also just right for the introduction of the signal from a tuning unit without an audio stage. From this stage the signal is resistance-capacity coupled to push-pull grids of 6V6's, without unusual design other than noting the balancing network in the center of the grid return circuits. The push-pull stage is biased to "class A" operation with the 200 ohm, 10 watt resistor, bypassed with a 20 μfd., 25 v. condenser. A slight gain in power output can be had by changing the bias to "class AB_1," though the increase in harmonic distortion vs. the net gain hardly makes it worthwhile, especially if the use calls for highest possible fidelity such as is desirable for home use on high quality record players or with an FM tuner. A very small amount of inverse feedback is introduced by means of the 500,000 ohm resistors from the 6V6 plates back to the plates of the 6N7.

The selection of a good output transformer is extremely essential to fidelity reproduction, one which will properly match the plate resistance of the output tubes as well as the impedance of the proposed termination (line or voice coil), and provide a reasonably flat response curve over the 20 to 20,000 c.p.s. audio spectrum. The present operating model employs a *Halldorson* universal unit, type E5-603, with reasonably good results, with plans calling for replacement by a high fidelity unit when possible.

Fig. 2 shows frequency response curves, the notes thereon serving as sufficient explanation.

With a reasonable amount of care in the construction of this unit, it should not present any problems to the home builder, and will be found to be an extremely dependable and stable amplifier. The cost of the entire set, including tubes and chassis, should generally be less that a twenty dollar bill, thus coming into the low price bracket—which makes it at once appealing.

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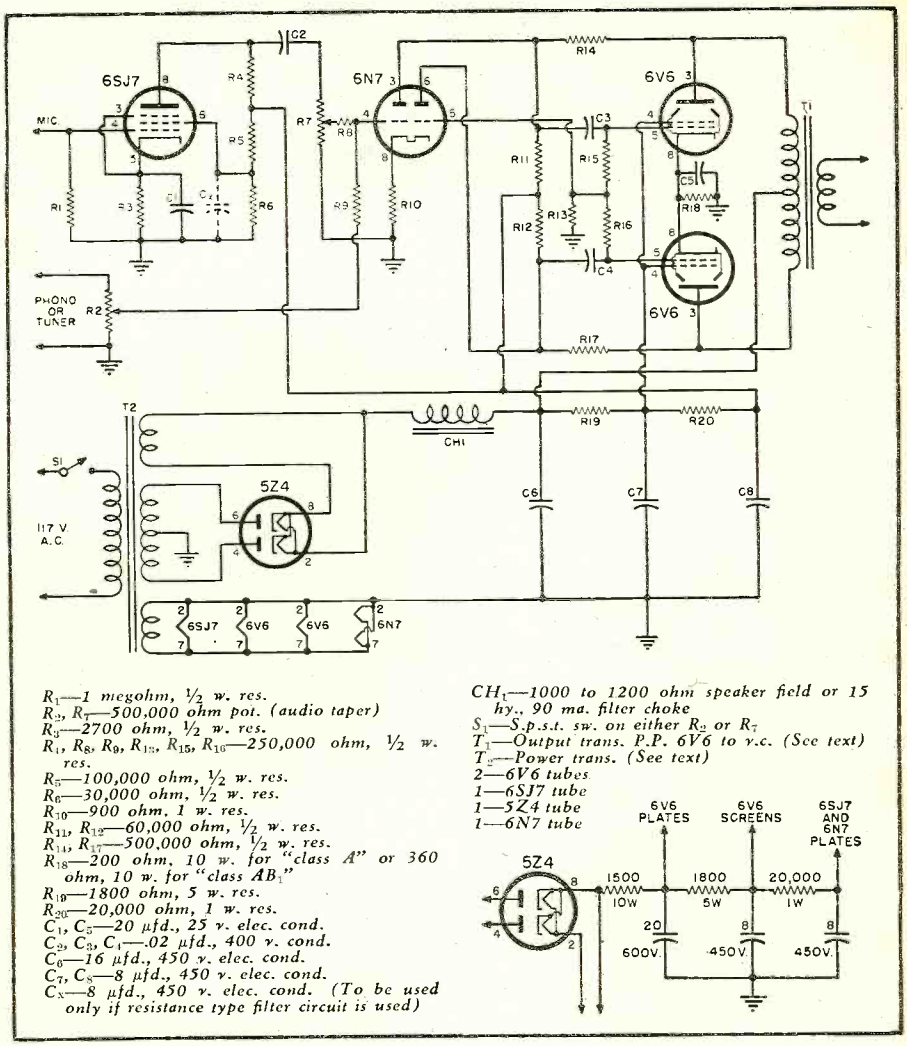
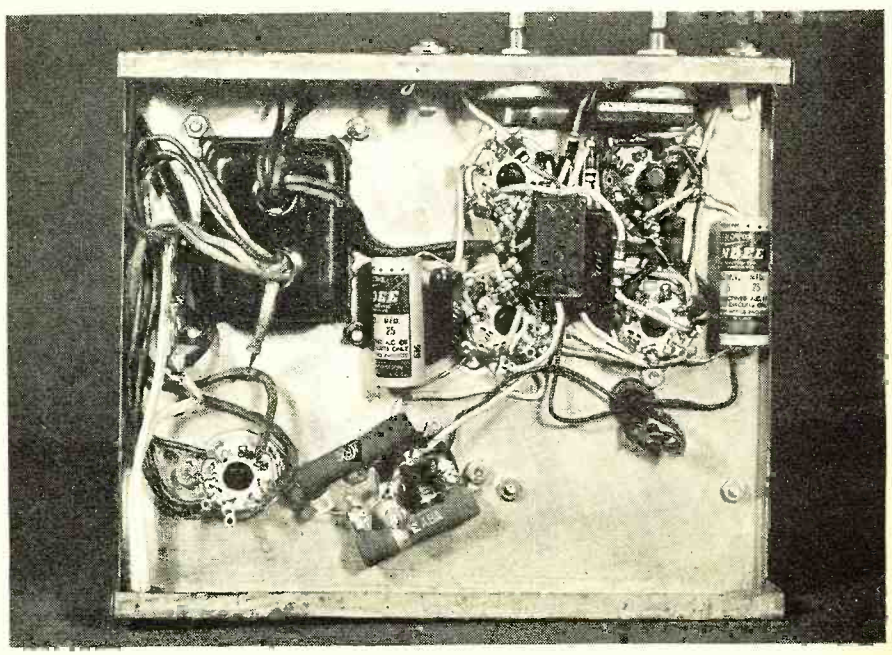


R_1—1 megohm, ½ w. res.
R_2, R_7—500,000 ohm pot. (audio taper)
R_3—2700 ohm, ½ w. res.
R_4, R_8, R_9, R_{13}, R_{15}, R_{16}—250,000 ohm, ½ w. res.
R_5—100,000 ohm, ½ w. res.
R_6—30,000 ohm, ½ w. res.
R_{10}—900 ohm, 1 w. res.
R_{12}, R_{12}—60,000 ohm, ½ w. res.
R_{14}, R_{17}—500,000 ohm, ½ w. res.
R_{18}—200 ohm, 10 w. for "class A" or 360 ohm, 10 w. for "class AB_1"
R_{19}—1800 ohm, 5 w. res.
R_{20}—20,000 ohm, 1 w. res.
C_1, C_5—20 μfd., 25 v. elec. cond.
C_2, C_3, C_4—.02 μfd., 400 v. cond.
C_6—16 μfd., 450 v. elec. cond.
C_7, C_8—8 μfd., 450 v. elec. cond.
C_x—8 μfd., 450 v. elec. cond. (To be used only if resistance type filter circuit is used)

CH_1—1000 to 1200 ohm speaker field or 15 hy., 90 ma. filter choke
S_1—S.p.s.t. sw. on either R_2 or R_7
T_1—Output trans. P.P. 6V6 to v.c. (See text)
T_2—Power trans. (See text)
2—6V6 tubes
1—6SJ7 tube
1—5Z4 tube
1—6N7 tube

Fig. 3. Complete schematic diagram of a.c. operated audio amplifier. The filter choke (CH_1) may be replaced by the field coil of the speaker. Should a PM type speaker be used, a resistance type filter system may be employed. This system is shown in the separate circuit diagram.

Fig. 4. Under chassis view of amplifier. In constructing this unit a dynamic type speaker was used. Its field coil replaces filter choke, CH_1. The output transformer is mounted on the top of the chassis. (See Fig. 1.)



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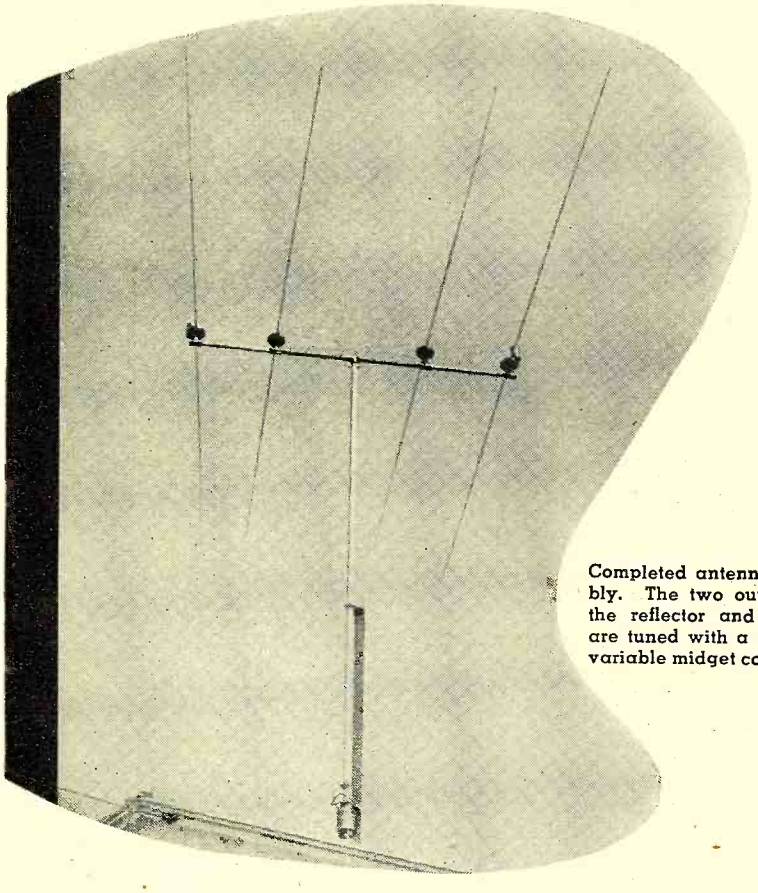
Modified W8JK end-fire array for 10 meter operation, with reflector and director, which can be built in your spare time.



Completed antenna assembly. The two outer arms, the reflector and director, are tuned with a 100 $\mu\mu$fd. variable midget condenser.

By C. V. HAYS, W6RTP

IN COMMON with most hams, the author has spent not an inconsiderable amount of time in thinking about the problem of effective antenna systems. While practically all types of commonly used beam antennas have their good points, it is a common occurrence to get one built up, mounted at a reasonably decent height, and then discover that the cussed thing is very hard to tune, doesn't take a load, tunes too sharply, etc., etc., necessitating further work in really getting impedances matched and the whole system perking.

While all the foregoing is just part of being a member of the genus "ham," all of us can definitely forego all but a minimum of labor in building and tuning the unearthly contraptions necessary to this business of working DX. After all, time spent in working the boys across the ponds is much more productive of the coveted WAC, etc., than interminable fiddling and climbing hither and yon to get an antenna working, so we decided to see if some simple, easy gadget couldn't be contrived to do the trick.

First and foremost, we wanted a system that wouldn't require a sixty foot elevation to work out. To fit the majority of ham needs on ten meters, something about sixteen feet high was made a "must"—naturally heights greater than this, up to about forty feet, will work even better, but sixteen will do. This height of sixteen feet, attainable by anyone, has resulted in S9 reports from practically all the United States area, S8 and S9 from Canada, S9 from Kwajalein, S7 from Japan, and S7 from Germany, all on ten meter fone, of course.

Second, we wanted an all metal support, easily procured and inexpensive. Third on the list was ease of feed. We figured that some of the boys would want to use 300 ohm line, some 50 or 75 ohm, etc., so all were counted in the final design. Fourth, the antenna must not be one for a narrow range of frequency only. Fifth, and last, were the items of a broad nosed pattern in a horizontal plane so that the thing wouldn't have to be smack on a station to raise him or hear him, and, that all important matter, a vertical radiation pattern that concentrates as much energy as possible at the lowest practicable angle.

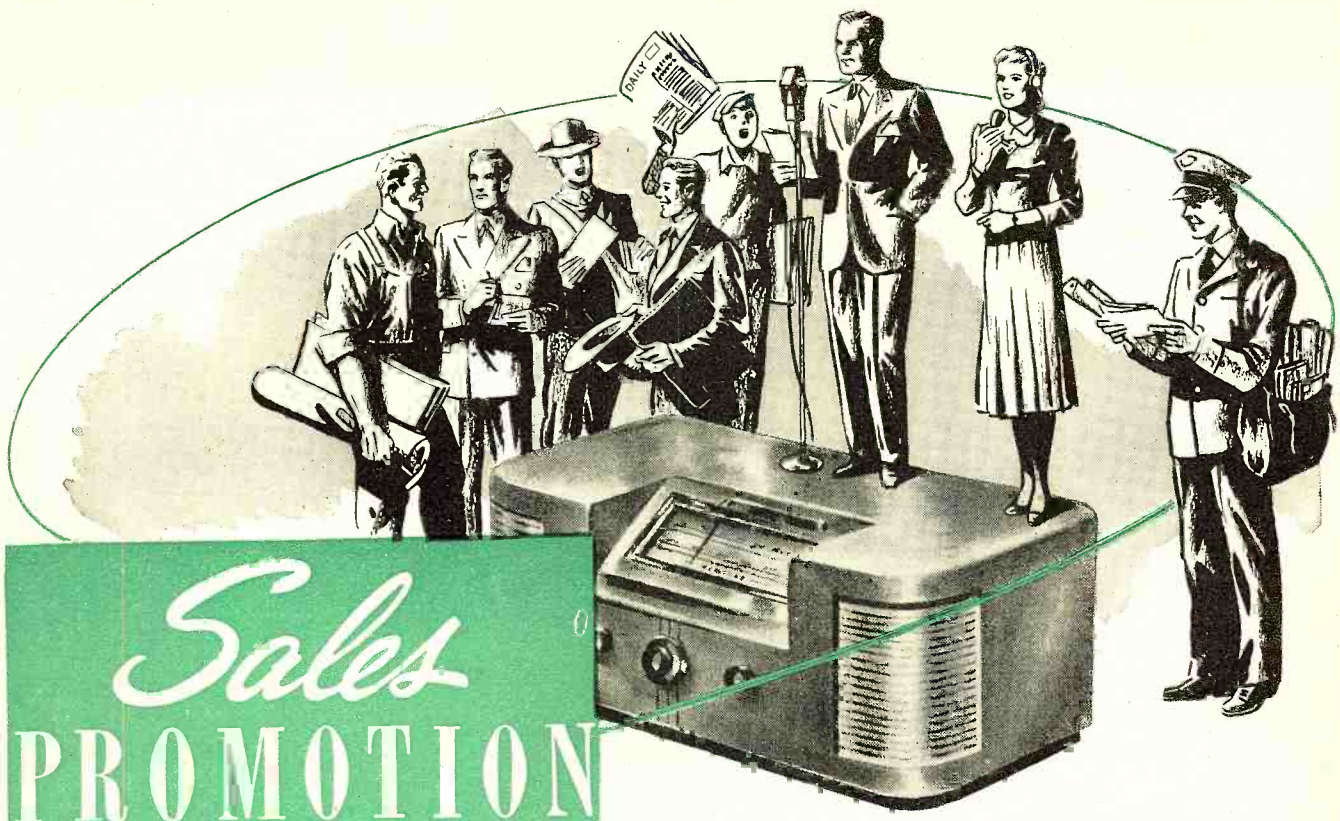
Once we figured what we wanted, the next question was just how to get all that imposing list of features. Out came the library on antennas, and finally the choice was made—a modified W8JK end-fire array, with reflector and director. The so-called Kraus Beam has, to our mind, one fault, and several very good points in its favor. The fault, as we see it, is its bi-directional pattern—we wanted attenuation to the rear, especially for receiving. The points in favor are its compactness, ease of tuning and matching, broad-nose pattern (horizontally) tolerance to element length, and most important its property of having the lowest vertical angle of radiation of any comparable system presently available using horizontal elements. This last property was the real clincher—that decided us, then and there.

We had, then, an "ideal" basic antenna system, with the one drawback of bi-directivity. Further reading revealed a disconcerting lack of information on the use of reflectors with such a system, to achieve uni-directivity, so we started from scratch and figured out what seemed a reasonable remedial solution, which was simply to place a reflector a tenth wave from the antenna proper, and then, for good measure and to balance things up, we decided to place a director on the other side, likewise spaced a tenth wave.

From experience in tuning other systems, we were averse, on the score of general laziness mainly, to tuning the thing by sliding the outer ends of telescoping elements; that system of tuning also is liable to lead to some unbalance, unless great care is taken to see that both sides are exactly the same length. An over-the-air conversation with W6DAX brought out his use of 100 $\mu\mu$fd. condensers in series with each parasitic for tuning, and accordingly we adopted the idea. It has worked beautifully, it being necessary only to set up a field strength meter (or a remotely located receiver with S meter), aim the beam at it, turn the condensers for peak forward and minimum backward response, and the beam is tuned, once and for all. The antenna proper needs *no* tuning, if cut for the center of the band or thereabouts.

The system shown in the drawing and the picture uses elements and

(*Continued on page* 156)



Sales PROMOTION Means More BUSINESS

By DR. LOUIS BADER
Assoc. Prof. of Marketing, School of Commerce, N. Y. U.

Carefully planned promotions and well-thought-out publicity are keystones to a successful radio business. Try these tested ideas.

A GREAT many of the men who have established themselves in a radio service business have done so as a way of living. They are individualists who want to do the kind of work that suits them and who want to be free to work as they wish. If such men have a wide knowledge of radio and good mechanical ability, there is no reason why they shouldn't be able to show the first requisite for success in the business—the ability to repair radios properly, to make the machines perform again to the satisfaction of their customers.

In a great many cases this is all the radio serviceman has—the ability to repair,—*and in turn* he makes a living out of that ability. It takes time because his knowledge or ability to make good repairs is passed around by word of mouth and more and more people get to know about the good mechanic. This type of advertising seems to work better in small towns and villages. In such places the radio serviceman was born, grew up and, therefore, is known to many of the local people. In the larger cities it probably takes longer to become known. The radio serviceman may be a stranger in the community; people do not know each other so well, and they do not readily converse with one another and talk about their radio troubles. Word of mouth advertising is not so important an aid. The radio serviceman, under such conditions, may use up his capital and patience waiting for enough trade to come his way to make a living. He closes down his business, looks for a job and, apparently, that's that. For him it is a tragedy which quite possibly might have been avoided.

There are over 60,000,000 radio sets in use in the United States. In the course of several years millions more will come into use and just as soon as price and incomes permit, millions of television sets will be bought. Sooner or later all of these must be serviced. In fact it would pay owners of radios to have them checked once a year to get the greatest satisfaction from them, and television sets may need checking even more frequently. There is no question that there ought to be a great deal of business for servicemen year in and year out and almost more in depressions and war periods than at other times. Yet too many servicemen have to wait too long to build a business and all too many make only a meagre living. There is no need for this.

There are available to the radio serviceman all the tools of sales promotion just as there are to any other business man. Our most successful enterprises have made use of them and the future competitive situation is going to force business men to use sales promotion tools more intensively and extensively than ever before. So why not, Mr. Radio Serviceman, look into some of the possibilities of these devices. A business man may make the best mouse trap but unless he lets people know about it he is going to wait a long time to build up a good paying business. But let him shout about it from the house tops and before long he will be making mouse traps for the whole world.

There is your problem, Mr. Radio Serviceman—how to let the largest number of people know, continuously and at the lowest cost to you, that you are the best radio serviceman in your community.

Put first things first, and the first

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DYNAMIC Noise Suppression CIRCUITS

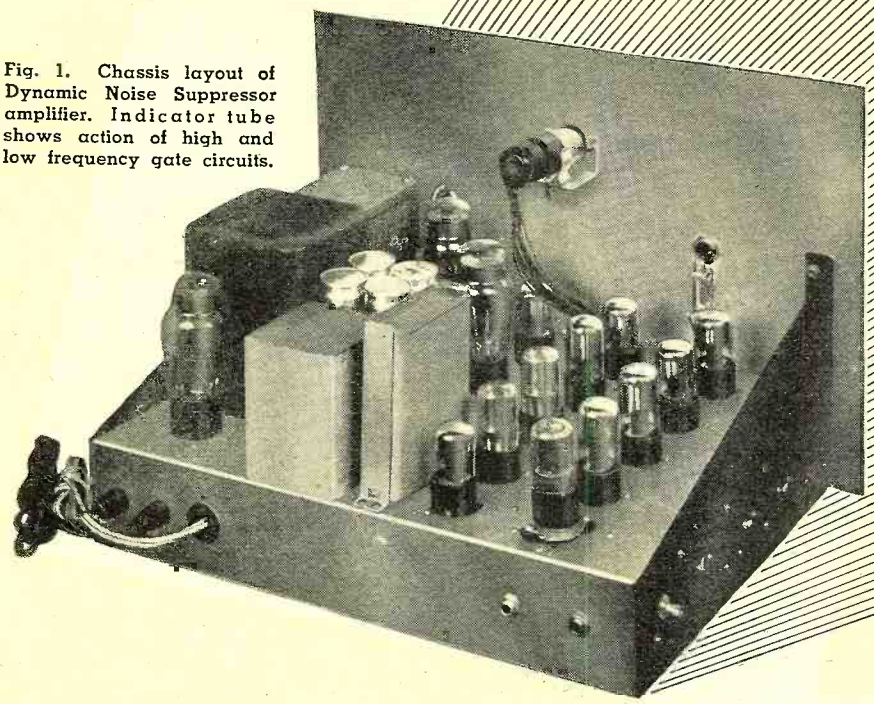


Fig. 1. Chassis layout of Dynamic Noise Suppressor amplifier. Indicator tube shows action of high and low frequency gate circuits.

By
JOHN D. GOODELL
The Minnesota Elec. Corp.
St. Paul, Minn.

Circuit analysis of the Hermon Hosmer Scott Dynamic Noise Suppressor unit which has received industry-wide acceptance.

UNTIL very recently it was generally believed that wide range record reproduction required acceptance of objectionable noise. Many people whose enjoyment of music was dependent on tonal quality managed to develop the ability to dull their perception of needle scratch. Others, less fortunate, simply gritted their teeth and put up with it for the sake of being able to appreciate the full harmonic structure of the music. A large portion of the public rotated the tone control, bought cactus needles, and developed a preference for limited range reproduction.

With well designed sharp cut-off filters, very lightweight pickups, and elaborate precautions in protecting records, some owners of high quality equipment were able to effect a reasonable compromise. At various times it was believed that volume expanders, plastic pressings, pre-emphasis, and similar methods would bring about satisfactory listening conditions. The volume expanders turned out to be easier to design and operate in the laboratory than in practical applications. Furthermore, they failed notably to reduce sharp clicks and abrupt transient noises, and were limited in other respects to be discussed later. Plastic pressings eliminated the usual steady hiss typical of abrasive filled shellacs, but in addition to other troubles they developed electrostatic charges that attracted dust and dirt to produce a crackling background often more irritating than the steady hiss. Pre-emphasis is practiced by almost all record manufacturers, but to achieve optimum results considerable more coordination is required between recording and playback curves than has been possible except in radio broadcast applications. Even then the noises introduced by the accumulation of dust and by various factors of wear and handling are not lowered sufficiently during quiet musical passages.

The signal-to-noise ratio from recorded music varies almost continuously. Most of the noise, both from low frequency rumbles and from high frequency needle scratch, is approximately constant in magnitude. The music signal may vary from actual zero to very high levels. During full orchestral passages the signal-to-noise ratio is very large and the noise is effectively masked by the music. At any instant during the playing of a record, there is a specific bandwidth that will provide optimum signal-to-noise ratio. In general, it would be desirable to pass everything flat within that band and attenuate all other frequencies abruptly. The low frequency spectrum is not as critical with regard to sharp cut-off as the high end.

A noise suppressor that would produce optimum results at all times would have the following principal characteristics:

1. It would continuously and automatically adjust the bandwidth to produce optimum signal-to-noise ratios at all times.

2. The bandwidth should be controlled only by the music signal and should not be broadened by strong noise signals.

3. The high and low frequency cut-offs should be controlled independently in terms of the requirements of the music.

4. Aural balance should be maintained.

5. The bandwidth should open rapidly enough to pass abrupt musical transients with full brilliance. It should close rapidly enough to eliminate noise during the following passage, but not so quickly as to damage the shimmer of reverberation.

6. The high frequency cut-off should be steep, and the low frequency cut-off sharper than is possible with conventional *RC* circuits.

7. It should be adjustable with regard to minimum and maximum bandwidth so that no portion of the extreme spectrums is ever permitted to pass under conditions where the signal contains no components in those regions. It is also desirable to be able to adjust for a minimum bandwidth with considerable attenuation of the upper fundamentals when the gates are closed during passages where no signal is present in that region and the record surface is unusually poor.

8. Harmonic and intermodulation distortion introduced by the noise suppression circuits should be negligible.

9. The operation of the dynamic control should introduce no audible thumps or other observable evidence of its action.

The *Dynamic Noise Suppressor* circuits developed by Hermon Hosmer

Scott represent the only known method by means of which all of these requirements may be fulfilled.

The basic principles involve the use of controlled reactance tubes as components of correctly designed high and low pass filter sections. A capacitive-reactance tube circuit is shown in Fig. 3A. The shape of the I_pE_g curve is largely controlled by the screen grid voltage which is set by the voltage divider R_3/R_5. The operating point for a given screen voltage is set by the cathode potentiometer R_2 and the negative voltage applied to the grid. Thus, the effective mutual conductance of the tube may be controlled by varying either of these values. C_1 is a blocking condenser. C_3 and R_1 form a frequency sensitive phase shifting voltage divider connected so that the percentage of the signal voltage passing through the circuit that is applied to the signal grid will vary directly with frequency and will cause the tube current to lead the voltage signal on the plate approximately 90 degrees. The tube now affects the circuit operation as a capacitive reactance. The capacitive shunting effect of the tube on the system with respect to frequency varies with the tuning of C_3. It also varies with mutual conductance and is therefore controlled by screen voltage, cathode bias, and grid voltage.

A similar circuit is shown in Fig. 3B, except that the phase shifting voltage divider in the plate-to-grid circuit causes the tube current to *lag* the plate signal voltage by 90 degrees. This causes the tube to appear as an inductive reactance with a corresponding high pass filter effect on the system.

Fig. 4 shows a relatively simple version of the Dynamic Noise Suppressor applicable to moderately priced radio-phonographs. The effective Q of the filter circuits is controlled by the value of fixed cathode resistance in the reactance tube circuits, and will vary with the type of tube used and the results desired.

The input signal is amplified by V_1 and a portion of it applied to the filtered rectifier circuits operated with the diodes in the same tube envelope. A portion of this voltage is filtered so as to contain only components of the signal from the upper middle section of the fundamental musical scale. The d.c. voltage resulting from this rectified portion of the signal is applied to the grid of the capacitive reactance tube. This voltage tends to decrease the mutual conductance of the tube, thus effectively tuning it to a higher frequency.

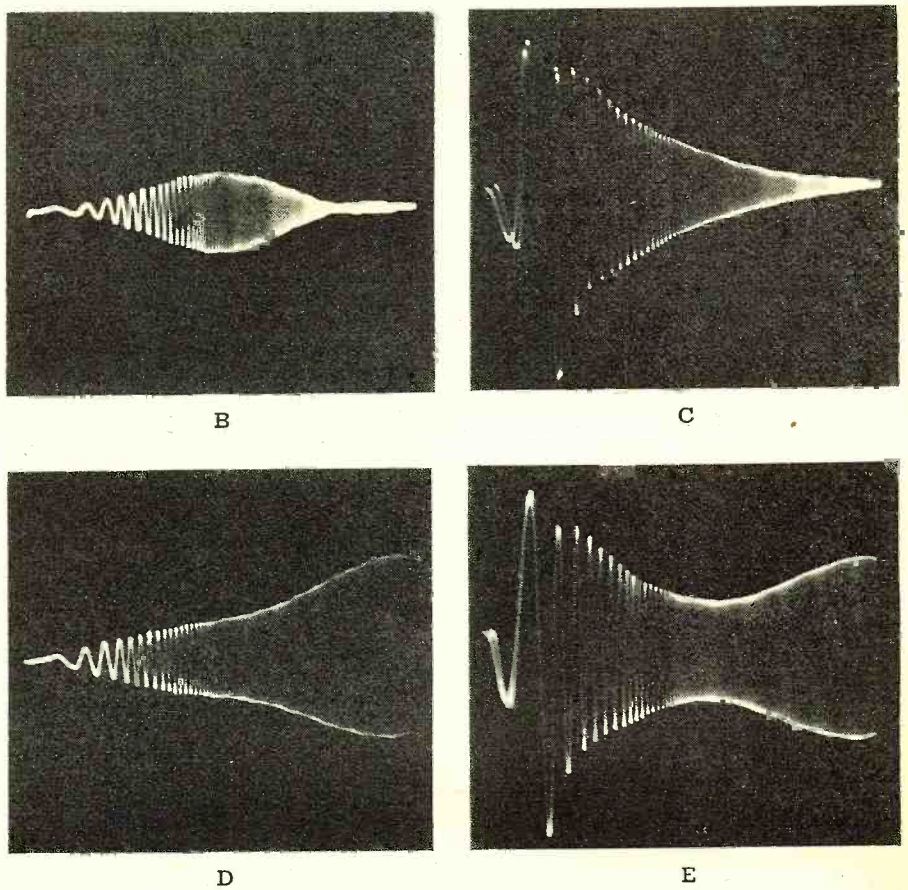
The portion of the spectrum which contains the largest amount of irritating high frequency noise is above the highest fundamental note in the musical scale. Any musical energy in this high frequency spectrum must be a portion of the harmonic structure of a fundamental in the middle high range. Thus the filter circuits for the control voltage are designed so that whenever fundamentals are present containing high frequency harmonic structures, the reactance tube is driven toward cut-off. On the other hand, noise energy in the harmonic spectrum is filtered out of the control circuits and cannot affect the reactance tube. Furthermore, these bandpass control circuit filters eliminate low frequency signals that do not contain appreciable harmonics in the range above 4000 or 5000 cycles per second. Thus the high frequency reactance tube cannot be "driven open" unless there is music present to mask the noise and increase the effective reproduction range.

This capacitive reactance tube is designed as a portion of the series LC circuit so that a very sharp cut-off filter is achieved.

The filters that apply d.c. control voltage for the low frequency inductive reactance tube are designed to obtain their energy from a region just above the attenuated section. This tube is controlled by the harmonic structure of the fundamentals in the low frequency region. Most low frequency rumbles do not contain appreciable harmonic structures and cannot "drive open" the low frequency gate. A bass drum, however, has the broadest harmonic structure of any instrument in the orchestra, and other low frequency music signals contain appreciable energy in the control bandwidth. High frequency energy is eliminated so that upper fundamentals will not drive the low frequency reactance tube when no music energy is present in the bass region.

This principle of design, where the bandwidth is determined by sections of the spectrum outside of the controlled portions, is of basic importance in successful operation. This is one of the reasons why the selective volume expander circuits for noise suppression (even though both high and low frequencies are controlled) are unsatisfactory and will not suppress transient clicks and pops such as those occurring with plastic record surfaces.

Noise suppressors may be divided into two broad categories. One type varies the amplitude of the total signal in the entire spectrum or in a



A

B

C

D

E

Fig. 2. Actual photographs of oscilloscope patterns show operation of the Scott noise suppressor. A 50-15,000 cycle sweep generator was used. (A) Gates partially closed. (B) Maximum suppression, gates fully closed, plus roll-off. (C) Maximum high frequency attenuation and maximum low frequency boost. (D) Maximum high frequency boost and maximum low frequency attenuation. (E) Maximum high and low frequency boost. Note gates inoperative in C, D, and E.

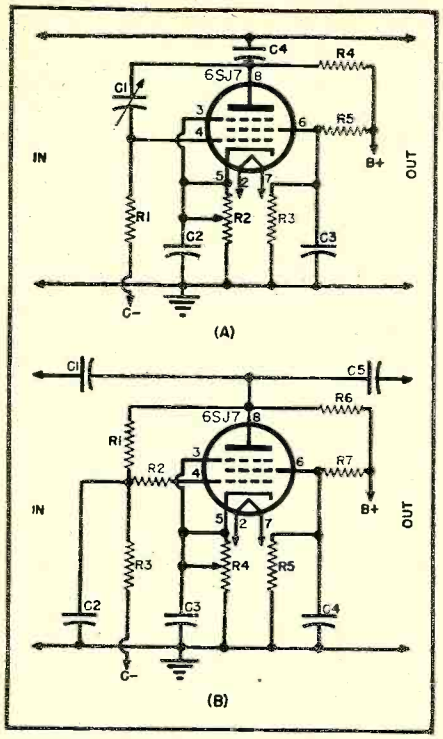


Fig. 3. (A) Capacitive-reactance tube circuit. (B) Inductive-reactance tube circuit.

large block of the upper or lower ranges. The Dynamic Noise Suppressor under discussion is of the "horizontal" type, functioning to vary the bandwidth rather than the amplitude of the signal. There are many advantages of this method over any other.

It is important to realize that the so-called high and low frequency "gates" are continuously varying in the Dynamic Noise Suppressor. In actual operation the cut-off frequency at each end of the spectrum is constantly changing to adapt the bandwidth to the requirements of the signal. In maximum conditions of suppression the minimum bandwidth may be limited to as little as approximately two octaves of the musical scale.

In the circuit shown in Fig. 4, a fixed filter consisting of a parallel *LC* circuit is shown in series with the high side of the system. This filter eliminates response from the very high frequency regions where no signal is available from disc recordings. It may be tuned in versions, such as the one illustrated, to 10 kc. and thus serve a dual purpose by eliminating heterodyne whistles when the suppressor is used in a radio receiver channel. In the very wide range systems it is tuned to 15 kc. or higher.

In elaborate versions of these circuits it is sometimes desirable to provide great flexibility of control. Each designer of equipment incorporating Dynamic Noise Suppression circuits must determine this in terms of the application. It is possible to introduce a great many variables in special switching arrangements to vary the speed with which the gate circuits open and close, the portion of the input signal applied to the control voltage sections, the tuning of the fixed high frequency filter, and innumerable other facilities. As a practical matter, a maximum of two panel controls are adequate to adjust the circuits for satisfactory results from almost any type of program material. For purposes of the average user it is desirable to keep controls at a minimum. Most people want to own machines that simply produce high quality music. They are often frightened, rather than impressed, by equipment with control panels comparable to the cockpit of a B-29.

In table model sets where the low frequency response is sufficiently attenuated in the inherent design of the circuits and acoustic limitations, it is sometimes possible to use only one reactance tube of the capacitive type to reduce needle scratch and still obtain reasonably satisfactory results. In high quality equipment it is essential to use at least one high and one low frequency gate. This is partially true because the presence of low frequency noises becomes more objectionable when the high frequency noise is removed. It is also imperative because the aural balance will be impaired under conditions of high frequency suppression if the low frequencies are not attenuated. It has become an accepted principle that the ear recognizes a correct aural balance as being more satisfactory than extreme extension of one end of the frequency spectrum without the other.

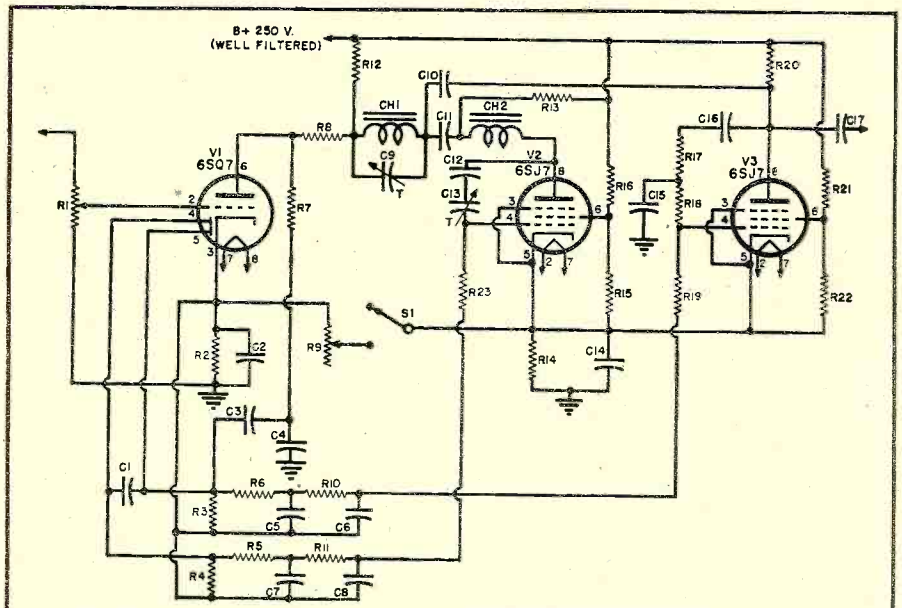
It is not possible to control a single reactance tube in such a manner as to tune it over the entire range it may be desirable to reproduce. For this reason the more elaborate versions use two high frequency reactance gate circuits. One of these is tuned to handle the upper fundamental and lower harmonic range, and the other designed to operate in the range of upper harmonics.

It is possible to obtain excellent results with the Dynamic Noise Suppressor in equipment containing no other frequency response controls. The suppression of noise is not the only function of tone controls, and it is desirable to have such facilities available in addition to the noise suppressing circuits. In the design of the amplifier shown in Fig. 1, circuits have been included to provide continuously variable attenuation or emphasis of the high and low ends of the frequency spectrum. Many circuits may be used for this purpose, but well designed *RC* networks have a number of advantages. Fig. 2 shows several oscilloscope patterns of frequency response made under various conditions of operation. The input signal is obtained from a *Clough Brengle* Audiomatic Oscillator with a 50 to 15,000 c.p.s. sweep. The gate circuits can be shown only under static conditions, which is not an adequate indication of the results obtained in actual operation.

There are a number of secondary advantages obtained with horizontal

(*Continued on page* 162)

Fig. 4. Simplified circuit of dynamic noise suppressor. Values given are typical for tubes used. Tubes, such as the 6SK7 and others, require adjusted values for optimum results. More elaborate switching is often used in units of this type.



R_1—500,000 ohm pot.
R_2—220 ohm, ½ w. res.
R_3—4 megohm, ½ w. res.
R_4—2.2 megohm, ½ w. res.
R_5, R_{13}, R_{20}—470,000 ohm, ½ w. res.
R_6, R_{10}, R_{11}, R_{17}, R_{18}—1 megohm, ½ w. res.
R_7, R_8, R_{16}, R_{21}—100,000 ohm, ½ w. res.
R_9—500 ohm rheostat
R_{12}—33,000 ohm, ½ w. res.
R_{14}—2000 ohm, ½ w. res.
R_{15}, R_{22}—10,000 ohm, ½ w. res.
R_{19}—220,000 ohm, ½ w. res.
R_{23}—47,000 ohm, ½ w. res.

C_1, C_4—500 μμfd. mica cond.
C_2—20 μfd., 25 v. elec. cond.
C_3—.001 μfd., 400 v. cond.
C_5, C_6—.05 μfd., 400 v. cond.
C_7, C_{10}, C_{11}, C_{17}—.01 μfd., 400 v. cond.
C_8, C_{12}, C_{15}, C_{16}—.005 μfd., 400 v. cond.
C_9—50 μμfd. trimmer
C_{13}—100 μμfd. trimmer
C_{14}—100 μfd., 25 v. elec. cond.
CH_1—2.4 hy. choke
CH_2—.8 hy. choke
S_1—S.p.s.t. sw.
V_1—6SQ7 tube
V_2, V_3—6SJ7 tube

THERMISTORS— A New Electronic Component

Being extremely sensitive to temperature variation, these resistors will find many applications in the electronic industry.

By FRANK E. BUTLER

A group of Western Electric Thermistor units enclosed in metal cans. In some applications, such as automatic gain control in amplifiers for the K-2 telephone carrier system, it is necessary to compensate for variations in ambient temperature. In such cases, Thermistors are built into networks which are designed in such a way that as the ambient temperature increases, the amount of current sent through the heater of Thermistor tube is reduced by just enough to compensate for any changes in temperature of the bead. These networks are inserted in cans, as shown, which are then filled with sand and sealed with special wax.

HOW efficiently electronics fits into today's requirements of industry and the home depends in large degree on the use of simple and reliable techniques by means of which physical energy can be automatically detected, measured, utilized, and controlled economically.

The progress made in past years in the development of electronic control devices and their continued use, as applied to the broad anticipated requirements of the future may prove both cumbersome and costly. One such means of providing a simplified approach to such problems is a group of sensitive control elements known as "Thermistors"—developed by *The Bell Telephone Laboratories*—which are proving adaptable to a wide range of industrial uses.

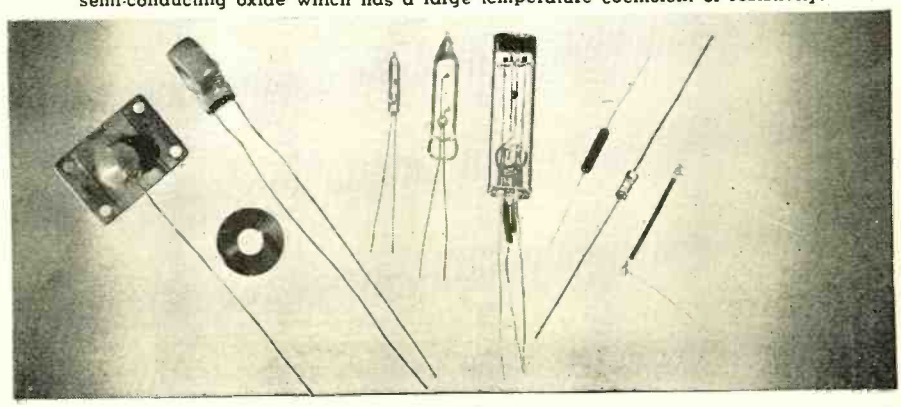
Thermistors, in comparison with devices they are designed to replace, are small, inexpensive, flexible in application, require little servicing, have long life and are suitable for use with either a.c. or d.c. current.

Thermistors—or *thermally* sensitive resistors—are a new type of circuit element in which electrical resistance varies widely with changes in temperature. They are made of a class of materials known as semi-conductors, that is, materials whose conductivity lies between that of conductors and insulators, a basic distinction of which lies in their extreme sensitivity to relatively minute thermal manifestations. Some of these uses are as time delay devices, protective items, voltage regulators, volume limiters, test equipment for ultra high frequency power, and detecting elements for very small radiant power. Because of these and other desirable properties Thermistors promise to become new circuit elements which will be used extensively in fields of communication, radio, electrical and thermal instrumentation, research in physics, chemistry and biology.

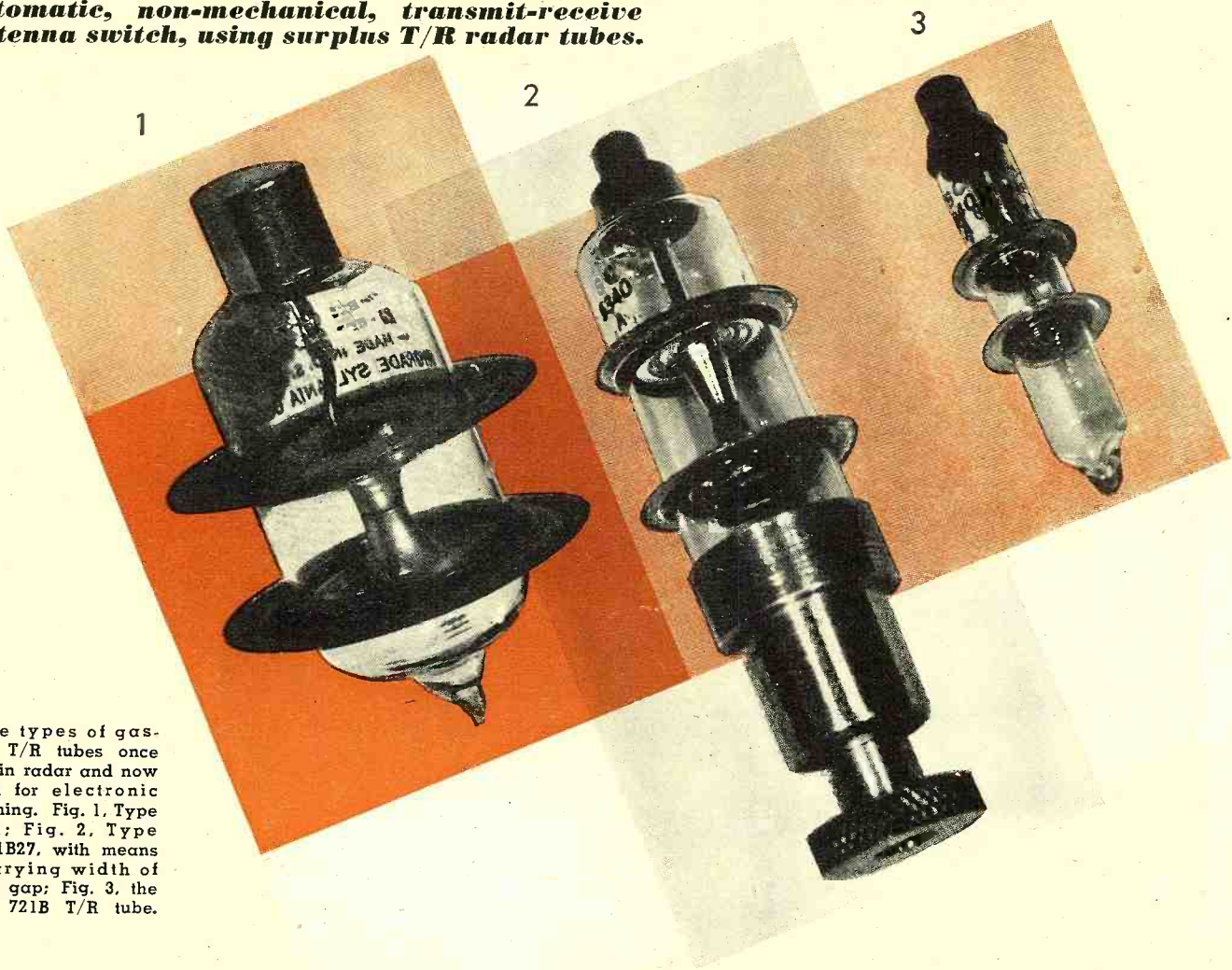
Thermistors are made in three main types—discs, rods and beads, all with the same basic methods. The materials of which they are composed, manganese, nickel, cobalt, copper, uranium and other oxides, are milled and mixed in various proportions to provide specific resistance vs. temperature and other characteristics desired for particular applications, then formed into the shape wanted and lead wires attached thereto. Firing under accurately controlled temperature and atmosphere conditions results in a hard ceramic product which may be mounted in a variety of housings depending upon mechanical, electrical, and thermal requirements. Tests on numerous types extending to more

(*Continued on page* 154)

Different types of W.E. Thermistor units of which over thirty variations of the prototype are now being manufactured. The photograph shows the pressed disc type, the bead type, and the extruded rod type. The essential component is a semi-conducting oxide which has a large temperature coefficient of resistivity.



Within the reach of every amateur—a fully automatic, non-mechanical, transmit-receive antenna switch, using surplus T/R radar tubes.



Three types of gas-filled T/R tubes once used in radar and now useful for electronic switching. Fig. 1, Type 724A; Fig. 2, Type 1B24-1B27, with means of varying width of spark gap; Fig. 3, the Type 721B T/R tube.

ELECTRONIC SWITCHING for the Ham Antenna

By TOM GOOTÉE

USE of a single antenna for both transmitting and receiving requires some sort of switching device which connects the transmitter to the antenna during actual transmission and connects the receiver to the antenna at all other times.

The simplest method is a mechanical or manually operated switch, but this too often proves unsatisfactory for rapid operation. Even so-called "automatic" relays fail to work on occasion, particularly for bug operation. Poor relays may create interference due to contact "chattering"; good relays are expensive, and even then not always free from trouble.

A method of economical and efficient switching, however, is by means of one or two gas-filled diodes with certain sections of transmission line—all of which constitutes an *electronic switching circuit*.

This new field of investigation is based on the same war-developed switching principles used in radar equipment. In fact, ham switching circuits can be constructed using the same precision radar tubes. These T/R tubes have only recently been made available as war-surplus items.

Basic Circuit

A gas-filled diode or T/R tube is essentially a spark gap. It constitutes an open circuit until application of a sufficiently high voltage—known as the *strking voltage*—produces an arc, due to ionization, and thus becomes an effective short circuit. Removal of voltage from the two electrodes stops current conduction and eliminates the short circuit.

When used in the basic switching circuit (Fig. 4A), the tube is placed across the receiver branch of the output transmission line, one-quarter wavelength from the junction point.

This is only true when open wire line is used. In the event that coax line or the popular twin lead is used, it will be necessary to multiply the calculated length by the velocity propagation constant of the line used. For coax line with polyethylene insulation the factor is 0.65. The factor for the twinlead lines are 0.82, 0.77, and 0.68 respectively, for 300, 150, and 75 ohm types.

During operation of the transmitter, the output voltage sustains an arc between the two electrodes of the diode. This short-circuits the receiver input. Since the diode is placed one-quarter wave length from the junction point, the short circuit appears as an open

circuit (or very high impedance) at that point.

When the transmitter is not in operation, there is not sufficient voltage in the circuit to sustain an arc and the diode becomes an open circuit. Received signals from the antenna approach the junction point and have a choice of two paths; to the receiver, and to the transmitter. In most cases, where the output of the transmitter is properly matched to the antenna system, the output impedance of a quiescent transmitter is considerably greater than its impedance during operation. Thus, the signal passes to the input of the receiver.

For the above reason, the distance *d* (Fig. 4A) is only approximately one-half wavelength, since it must be adjusted for each installation so that the relatively high impedance of the quiescent transmitter appears at the junction point. In order to provide optimum receiving conditions, the distance *d* must also be re-adjusted after any change in the tuning of the transmitter.

The resistance of a switching tube *during conduction* will depend upon the type of tube used in the circuit, and often the resistance of two tubes of the same type may be different. For this reason, re-adjustment of the tube position along the feeder line may be in order.

During conduction there may be some leakage around the switching tube, particularly when used in high-power circuits. Ordinarily this leakage is infinitesimal and incapable of damaging the receiver, but it can usually be eliminated by adjusting the length of transmission line between switching tube and receiver to a more critical, resonant value.

Another Circuit

The output impedance of some transmitters may not always increase sufficiently *during quiescent periods* to make the resonant line (distance, *d*) effective in blocking received signals. Also physical limitations of the ham shack may prevent or make difficult such a long installation. In either case, a variation of the previous circuit can be employed (Fig. 4B) using *two* gas-filled diodes of the same type. Addition of the second tube *A* provides greater economy of input power from the antenna *during reception only*. Diode *B* operates in the same manner as previously described.

During transmitter operation, voltage in the output circuit strikes both gaps simultaneously. The short circuit caused by diode *A* is reflected back as a high impedance. Since this very high impedance is in parallel with the low impedance of the main transmission line, diode *A* takes very little power for operation and serves no particular function during transmitting periods.

When the transmitter is *not* in operation, however, this tube represents an open circuit. A shorting bar placed one-quarter wavelength beyond diode *A* is reflected as a short

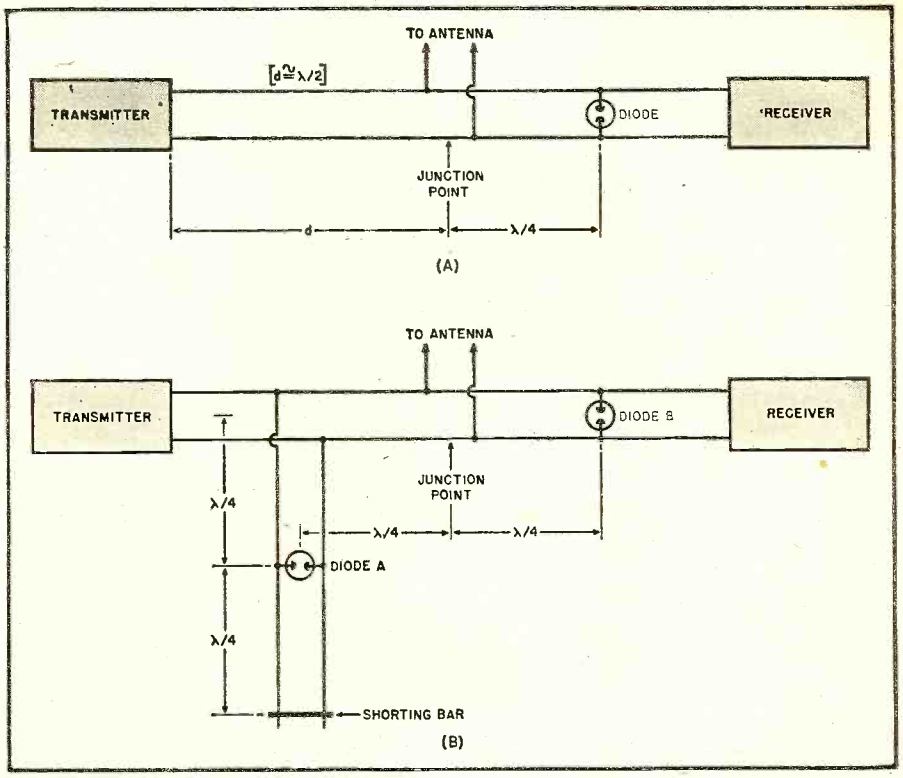


Fig. 4. (A) Basic one-tube T/R switching circuit. (B) improved circuit using two tubes.

circuit across the main line from transmitter to antenna. This short circuit, in turn, is reflected as a very high impedance at the junction point. This effectively blocks the entry of received energy (from the antenna), and the entire signal reaches the receiver.

Although the transmitter and the diode-*A*-branch are in parallel, there is no undesirable reaction present because the transmitter is across an apparent short circuit. The need for any special matching stubs, or a line stretcher, is eliminated, since any changes made in the transmitter affect only the impedance in parallel

(*Continued on page* 112)

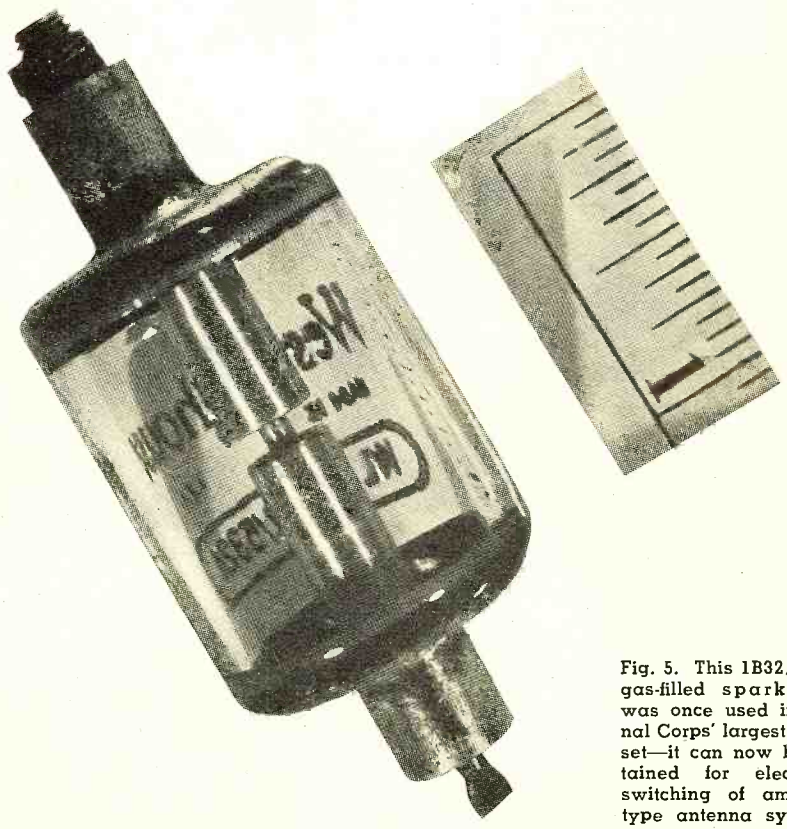


Fig. 5. This 1B32/532A gas-filled spark gap was once used in Signal Corps' largest radar set—it can now be obtained for electronic switching of amateur-type antenna systems.

A TEN-METER CONVERTER

Side view of home-built converter. Antenna input terminals are shown mounted on the chassis flange.

By GEORGE F. MASIN

Ideal for use with war-surplus receivers—this converter features novel input and output circuits.

ALTHOUGH there have been many converters described for the ten-meter band, many of these have been difficult to adjust, or have used parts not readily available. The converter to be described, has several features which to the writer's knowledge have not previously been published. Some of these features have been described in various engineering texts, but have not been covered in terms of practical application.

Among the innovations to be described are:

1. A "grounded grid" regenerative *triode* r.f. amplifier, which gives a gain of 4 to 5 over the entire band, yet does not require an additional tuned circuit or tuning controls, such as an extra condenser in the tuning gang.

2. A balanced input circuit which reduces r.f. and noise pickup from the lead-in to a minimum.

3. The use of a *triode* r.f. amplifier and triode first detector results in the best possible signal-to-noise ratio that may be obtained at these frequencies.

4. A high gain stage of i.f. amplification (6AC7) which assures ample signal input into the most mediocre broadcast-band receiver, and provides the additional selectivity of *two* tuned circuits ahead of the broadcast receiver's antenna input circuit.

5. The relatively simple tuning circuits which necessitate no particular care in regard to either stage shielding or bypass condensers, since no two circuits operate at signal frequency.

The antenna for which the converter is designed is a folded dipole which covers a relatively broad band and comprises the *input* system of the converter. As can be seen from the diagram, this antenna consists of a section of 300-ohm line cut to 14½ ft. with shorted ends. The 300-ohm lead-in is taken from the broken center of either one of the twin leads comprising the antenna.

Normally the grid of a grounded grid amplifier, which in this case is a 6C4 triode, would be grounded directly, resulting in more complete isolation and screening of the input circuit from the output circuit. However, it can be shown (1) that this type of amplifier can be made somewhat regenerative and the gain can be increased, theoretically, two times over the plain grounded grid amplifier by feeding the grid out of phase with the cathode.

This is accomplished by feeding one side of the balanced 300-ohm line into the grid, the opposite leg of the line being fed directly to the cathode of the 6C4. The grid and cathode circuits are closed, as far as d.c. is concerned to ground, through the 750 ohm resistors.

It can be seen that any noise picked up by the line will actuate both grid and cathode in phase, resulting in no amplification. However, for signal inputs from the antenna, the r.f. grid voltage is 180° opposite in phase to that fed into the cathode, resulting in maximum amplification of the desired r.f. signal.

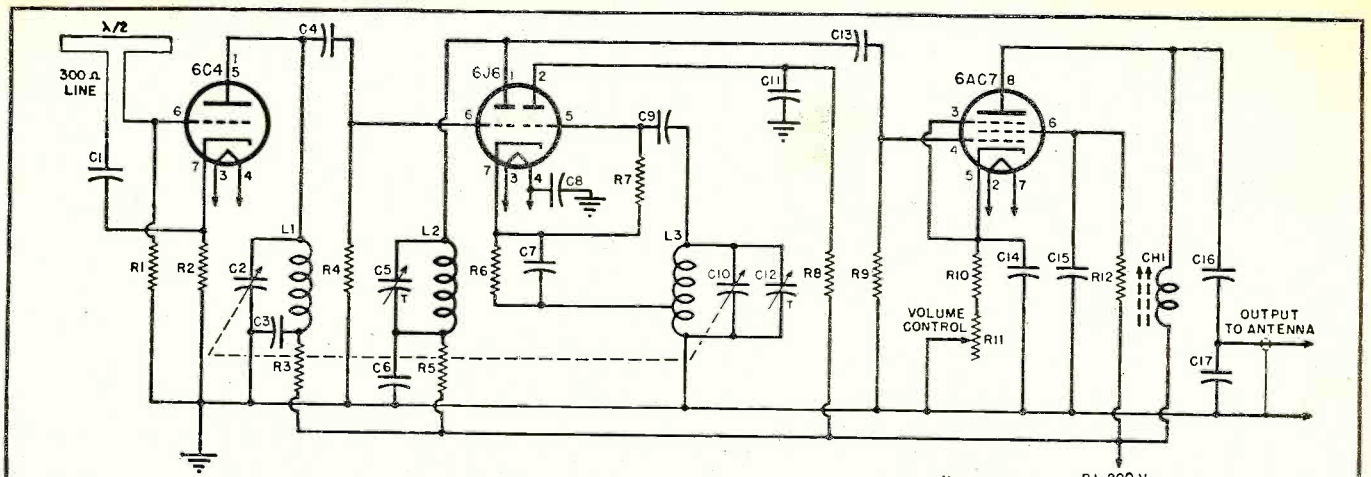
The plate circuit of the 6C4 is tuned to signal frequency by one section of the variable condenser and coil L_1. The r.f. voltage developed across this circuit is capacity-resistance coupled to the grid of the first detector section of the 6J6 twin triode, the plate of which is tuned to 1500 kc.

The 1500 kc. i.f. transformer was constructed by removing approximately ⅔ of the turns off one winding of a discarded dual-tuned 465 kc. i.f. unit. As an experimental check on the frequency of this transformer, it may be connected in series with the antenna connection of a standard broadcast-band receiver, tuning the receiver to a 1500 kc. station and noting if, when the modified i.f. unit is adjusted, the 1500 kc. station can be attenuated. If this condition is obtained, the unit will be satisfactory. If the constructor has the facilities of an inductance bridge available, he can adjust the i.f. coil to an inductance of 120 to 130 microhenries.

The output circuit of the i.f. amplifier is tuned to 1500 kc. by a parallel resonant circuit comprised of an adjustable iron-core r.f. choke coil, CH_1, which is shunted by a 100 micromicrofarad condenser in series with a 200 micromicrofarad condenser. This series combination comprises, with the tuned output circuit, a pi-matching section which matches the plate circuit of the 6AC7 to the average broadcast-band receiver input, and tends to reduce the amplitude of harmonics which might be generated in the converter.

Actually, if a three foot or longer piece of low loss shielded cable is used for the output connecting cable, the 200 micromicrofarad condenser may be omitted. This is true *only* if the shielded cable is used.

The oscillator circuit is the conventional grounded plate Hartley or electron coupled oscillator. It may be noted that the grid bias resistor re-



R_1, R_2—750 ohm, ½ w. res.
R_3, R_5—5000 ohm, 1 w. res.
R_4, R_9—500,000 ohm, ½ w. res.
R_6—4000 ohm, ½ w. res.
R_7—50,000 ohm, ½ w. res.
R_8, R_{12}—50,000 ohm, 1 w. res.
R_{10}—100 ohm, ½ w. res.
R_{11}—25,000 ohm rheostat
C_1, C_3, C_6, C_7, C_{11}, C_{14}, C_{15}—.01 μfd. mica cond.
C_2, C_{10}—50/50 μμfd. var. gang cond.
C_4—20 μμfd. mica cond.
C_5—i.f. trimmer (on i.f. assembly)
C_8—.001 μfd. mica cond.
C_9, C_{13}, C_{16}—100 μμfd. mica cond.
C_{12}—3-30 μμfd. ceramicon cond.
C_{17}—200 μμfd. mica cond.
L_1—4 t. #18 p.e. on 1" form, spaced wire diam.
L_2—1500 k.c. i.f. trans. (a 465 k.c. stock item with turns removed)
L_3—5 t. #18 p.e. on 1" form, spaced wire diam., tap at 2 t.
CH_1—75 to 100 μh. adjustable iron core r.f. choke
1—6C4 tube
1—6J6 tube
1—6AC7 tube

Schematic diagram of 10-meter converter. Power for operation may be obtained from receiver.

turns to *cathode;* thus the only bias voltage obtained on the oscillator grid is that supplied by its own grid current.

Plate current for this section will be approximately 1.5 ma. if the oscillator is functioning and can be measured by the drop across R_8, without upsetting the circuit. Normal drop across this resistor will be 75 volts.

Bias for the first detector is obtained through the resistor R_6, which is bypassed for signal and i.f. frequencies by condenser C_7. This resistor and condenser connect to the tap on the oscillator coil, obtaining feedback voltage for the oscillator section of this tube and injection voltage for the mixer or first detector section, since the cathode is common to both triode sections. Bias on the first detector is near the cut-off value, with the oscillator not functioning. To obtain this condition 4000 ohms was chosen as cathode bias resistor.

It can be shown (2) that the output of the first detector will be greatest if the tube is operated so that the oscillator signal will drive the tube beyond cut-off on the oscillator voltage negative half-cycle and drive the plate current up to maximum during the positive oscillator half-cycle.

The oscillator signal must not actually drive the grid of the first detector positive, however, for this would result in a low input grid impedance, which would, in effect, be shunted around the r.f. tuned plate circuit.

The i.f. amplifier is conventional, though capacity-resistance coupled. Care should be exercised to return all grounds from the cathode, screen, and plate bypass to one common point. The cathode gain control keeps this stage from overloading and adjusts the input into the receiver.

The total plate current consumed is approximately 20 ma. at 200 volts. The current requirements of the 6.3 volt heater supply is 1.05 ampere.

The average better house radio or auto radio can usually be counted upon to supply the additional drain for short periods of time without unduly overloading the power transformer or high voltage supply.

The procedure for adjusting this converter is standard for a superheterodyne. The output terminals should be connected to the receiver to be used, and the receiver tuned to a clear spot between 1500 and 1600 kc. Condenser C_5 in the i.f. can, and the iron slug in CH_1 should then be peaked for maximum noise in the receiver.

With the converter tuned near the high frequency end of the ten meter band, the trimmer condenser, C_{12}, should be adjusted until signals are heard. The over-all range of the converter should then be checked, and should be approximately 24 to 32 mc.

In the event that the converter is used in conjunction with an auto radio for mobile operation, it will be necessary to employ the input circuit shown on this page, if the usual quarter-wave antenna is used.

This permits the use of an unbalanced input antenna. It would probably be good insurance to place a .002 μfd. condenser between the antenna lead and R_2, to prevent the loss of bias on the 6C4 in the event of the antenna shorting.

A word concerning results. Using a standard six tube table model "jallopy" here in Long Beach, Calif., on numerous occasions all districts have been heard in as little as five minutes' time. In addition, many V. E. Canadian stations have been heard at QSA-5R-9 plus.

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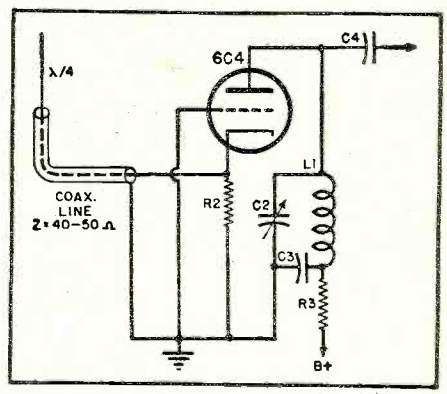
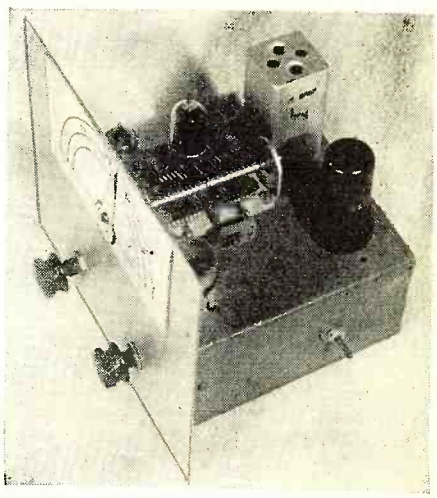


Schematic diagram shows input circuit of 6C4 r.f. amplifier as it should be wired when converter is used for mobile operation. This same type of input circuit should be used with any type of unbalanced antenna circuit.

★ ★

Photograph shows relative position of top-of-chassis components. Adjustment screw for r.f. choke (CH_1) may be seen protruding from the side of the chassis.



The RECORDING and REPRODUCTION of SOUND

Part 11. Design details for building a high quality record-reproduce amplifier

By
OLIVER READ
Editor, RADIO NEWS

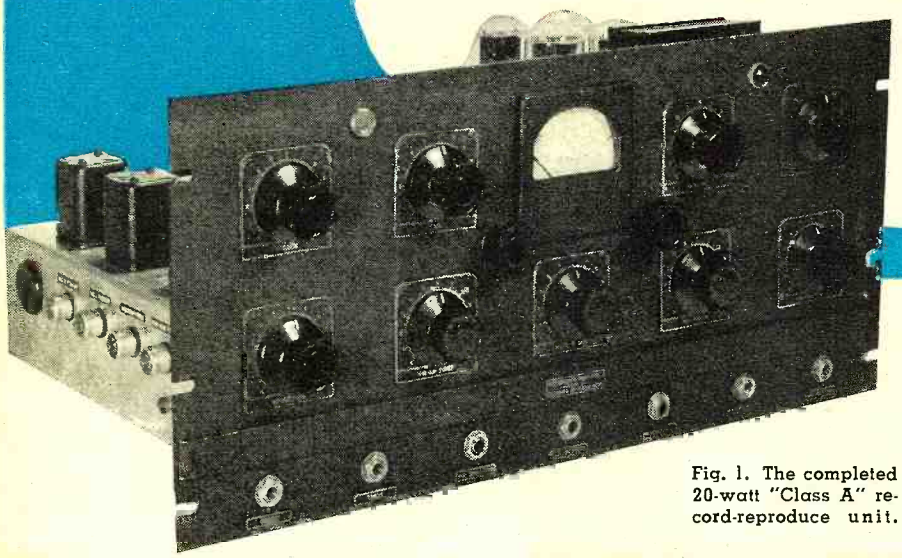


Fig. 1. The completed 20-watt "Class A" record-reproduce unit.

OPINIONS vary among engineers as to the desirability of employing beam power amplifiers instead of triode amplifiers such as the 2A3, 6A3, 6B4, etc., for high quality recording in the output stage of a power amplifier. It is not the purpose of this article to debate pro or con on this controversial subject but rather to point out the advantages and disadvantages of both amplifiers. It is the writer's personal opinion, based on actual experience, that a properly designed output stage employing the type 2A3 triode is a bit superior to the 6L6 even when the latter employs feedback in its output channel. When more than one triode is used, the system becomes even more flexible. Push-pull 2A3's, for example, in self bias operation are capable of approximately 10 watts output at low distortion. The power may be doubled by employing push-pull parallel 2A3's. There is more than one advantage to be gained from this latter arrangement as the plate impedance presented at the primary of the output transformer is reduced to a very low value. When connected to a 500 ohm cutter at the output of the transformer, a near perfect match may be realized due to the extremely low plate impedance of the primary.

Reproducing systems, too, are critical as to their loading. If a 500 ohm speaker is used at the output for reproduction, then the 500 ohm load reflected to the low impedance primary becomes more or less non-critical. Impedance changes with frequency. The closer the match between the primary and secondary, the more non-critical becomes the loading effect. Therefore, high fidelity may be achieved at very low distortion in the output channel.

This is extremely important when driving a 500 ohm magnetic cutter.

First we will discuss a more or less conventional amplifier design which has achieved considerable popularity and is almost the unanimous choice of sound equipment designers. Beam power tubes, as was previously pointed out, are considered desirable for general purpose amplifiers but their high effective generator impedance results in relatively critical requirements with regard to load impedance. The development of degenerative feedback networks indicates a solution to this problem. If a careful choice is made in the output transformer, then it is possible to design amplifiers using push-pull 6L6's in carefully designed circuits which possess negligible intermodulation distortion. The simple amplifier illustrated in Fig. 2 employs such a design. The power output section of the circuit includes two 6L6's in push-pull.

Most manufacturers operate these tubes in Class AB_1 rather than in Class A. The reason for this is that the power supply may be made smaller inasmuch as less static plate current flows. The tubes may be driven harder and more output power obtained at reasonably low harmonic distortion. There is a disadvantage, however. The tubes must be carefully balanced for optimum results. Intermodulation distortion results from non-linearity and it is to be expected that any departure from Class A operation will be undesirable from this standpoint. In Class A, variations in replacement tubes are not as serious as in Class AB_1 operation.

It is very important that the output transformers have adequate inductance. If insufficient, this appears as a shunt reactive load. A reactive load line is elliptical and will combine with the resistive load line to produce an elliptical departure from the linearity. This reduces the undistorted power output. If required, however, a reduced primary inductance may be employed to aid in lowering the bass resonant peak characteristic of beam power tubes fed into a loudspeaker load. Under these conditions there will also be a high frequency rise. This will tend to increase the harmonic distortion percentage. As the impedance rises with frequency, it produces a greater output at harmonic frequencies than at the fundamental frequency. Feedback circuits, therefore, will aid somewhat by providing superior fidelity at the higher frequencies.

There are many types of phase inverters that provide reasonably satisfactory results. The one employed in this circuit is perhaps the most popular. The principal disadvantage in such

a circuit is that the tube stage offers very little gain. This must be compensated for by additional gain in other stages. The difference between the plate circuit-to-ground and the cathode circuit-to-ground shunt capacitance is not the same. This will introduce some unbalance at frequencies above 6000 cycles. However, phase shift problems are greatly minimized and the stability of this circuit is excellent.

A disadvantage of this circuit is that the high cathode-to-filament voltage may introduce some problems that preclude the use of this phase inverter in stages preceding the driver. It is recommended that a resistor of approximately 50,000 ohms for the plate and cathode loading resistors be used. The lower values keep the cathode-to-filament voltage low. The resistors shown in series with the two grids of the 6L6's are not found, as a rule, in commercial amplifiers. They do, however, aid in decreasing tendencies toward oscillation and provide a slight cushioning effect when the 6L6's are driven close to the grid current region.

There is no bypass condenser used across the cathode resistor of the 6J5 phase inverter. The usual bypass should be omitted in order that no hum be introduced in the stage.

It is desirable to use a feedback voltage from one of the plates of the 6L6 or from one of the taps on the winding of the output transformer, if a single-ended amplifier is to be used. It should be pointed out that in such applications feedback in this section of the amplifier should never be used for frequency compensation or for the elimination of hum or distortion which usually results from careless design. Any amplifier should always be constructed without any feedback and adjusted for lowest possible hum and proper performance before any additional circuits are added to introduce any form of feedback. The principal advantage in such a stage is to help to adjust the impedance actually presented by the loudspeaker. Feedback in such circuits will tend to clear up whatever distortion and inherent noise remains. This, however, should be accepted as a secondary advantage and not as a principal design factor.

It is far better to run the feedback from one of the taps on the secondary of the output transformer. Excessive feedback is a bad condition and can only be corrected by cut-and-try by moving the feedback connection to a point of lower output voltage. For the initial adjustment, for choice of feedback components, the amplifier should be run in its normal condition for some time and carefully studied. Then an input voltage from a signal generator should be applied to produce a sufficient signal output for convenient measurement. The secondary remains opened during this test. The voltage is measured directly across the open leads of the secondary of the output transformer. Later a resistance corresponding to half of the correct

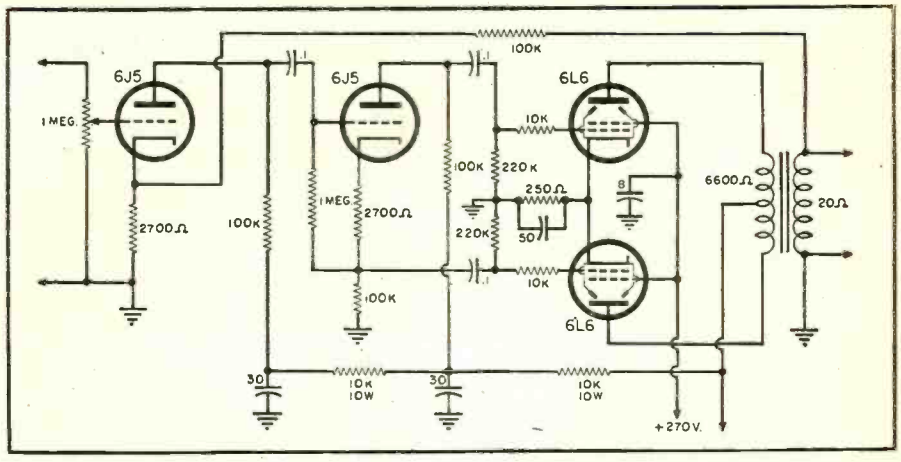


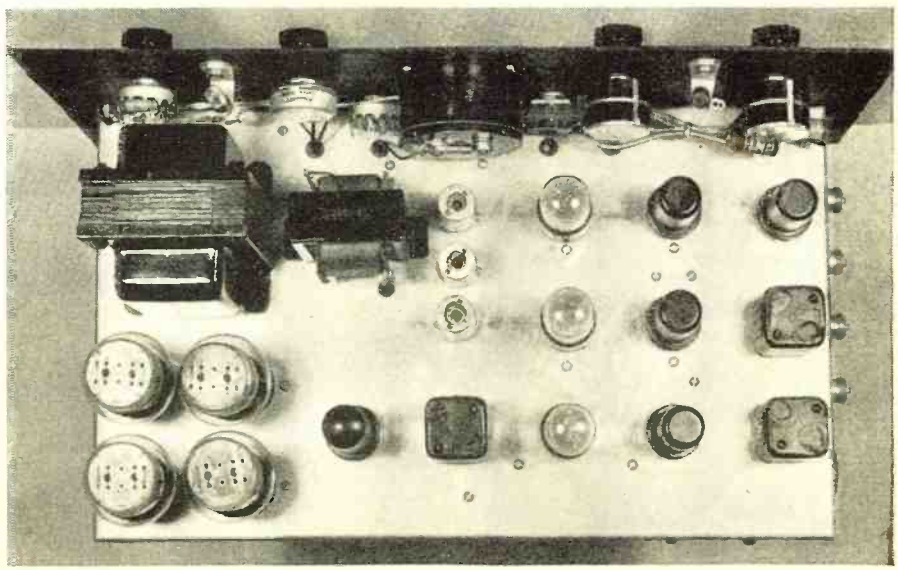
Fig. 2. The 6L6 push-pull amplifier of proven value and good design.

speaker load is applied across the output terminals without changing the input signal. The resulting reduced output is measured on the meter. Usually the voltage will be approximately one-fourth or even less when the resistive load is added. The next step is to take a resistor of approximately 50,000 ohms and insert this in the circuit. By cut-and-try the point will be found where not only is the volume reduced but distortion and other inherent noises will be found to clear up considerably. The ear is the best judge of the correct tap or value of series resistance to be used. When properly adjusted, the actual effective impedance as seen by the speaker will be half of the speaker's nominal impedance. Inasmuch as the turns ratio is a fixed value, the load reflected into the primary of the transformer remains at the desired value.

Note that the use of feedback as a frequency equalizing media is entirely satisfactory in voltage gain stages. However, in the power output stage, the primary purpose of feedback is to stabilize the circuit with regard to variations in speaker or cutter impedance with frequency. We may also take the feedback from the 500 ohm tap of the secondary of the transformer. As mentioned previously, the only rule of thumb for satisfactory operation is to select a tap or voltage point where results are most pleasing to the ear. If too much voltage is taken from an output circuit, oscillations will occur and serious distortion will result. The only solution is to find a point where a lower voltage is present.

We have described briefly a simple circuit employing beam power tubes in the output. It has been the author's experience that when designing an amplifier specifically as a combined record-reproduce unit that an advantage is had by employing triodes in the output stage. Many engineers will argue against this choice but we herein present a design which we feel meets all of the necessary requirements of a good high fidelity recording system. It is foolproof in operation and, while a bit costly to produce, it is capable of performing in continuous duty and offers extremely low distortion, excellent regulation, and a flexibility that is of prime importance in any recording-playback system.

Fig. 3. Top view showing placement of principal components. The three miniatures are employed in a noise suppression circuit. See text.



The amplifier to be discussed is the result of many months of research and affords the maximum in flexibility for sound-on-disc or magnetic recording and playback.

A reserve of audio power is always needed in order to handle excessive audio peaks found in symphonic music. Lacking a reserve, no amplifier can reproduce these peaks without serious distortion being introduced.

Hum-free operation is a prime requisite in a recording system, hence the use of d.c. for the filaments of the preamp, mixer, and tone control tubes. The filaments are wired in series as shown and each is bypassed with a 20 μfd. electrolytic. It is advisable to wire the tubes in the sequence shown for lowest possible hum. There is no audible hum whatsoever in this amplifier with the gain controls wide open.

The complete amplifier (less power supplies) is assembled and wired on a standard 10" x 17" x 3" steel chassis. The power supply is assembled as a separate unit and is located approximately 4 feet from the amplifier to further reduce hum pickup that might be induced by stray magnetic fields. Heavy cables and connectors provide a link for the necessary voltages.

Four separate inputs are provided. One of these is a combined pre-amp and equalizer for the *G-E* variable reluctance pickup, now widely used for high quality reproduction. Two low impedance inputs, one of 50 ohms and the other of 500 ohms, are provided. The former furnishes sufficient gain for the two *Fairchild* dynamic pickups used in this system—the latter for *Pickerings*.

A jack, J_2 (mounted on the patch panel beneath the amplifier), permits a standard phone plug to be inserted if other than the pickups are to be used in this channel. The author uses this position when feeding a 50 ohm *Turner* 999 dynamic microphone into the channel.

The 500 ohm input is used for two *Pickering* pickups and J_4 is used for feeding in a 500 ohm line, when required.

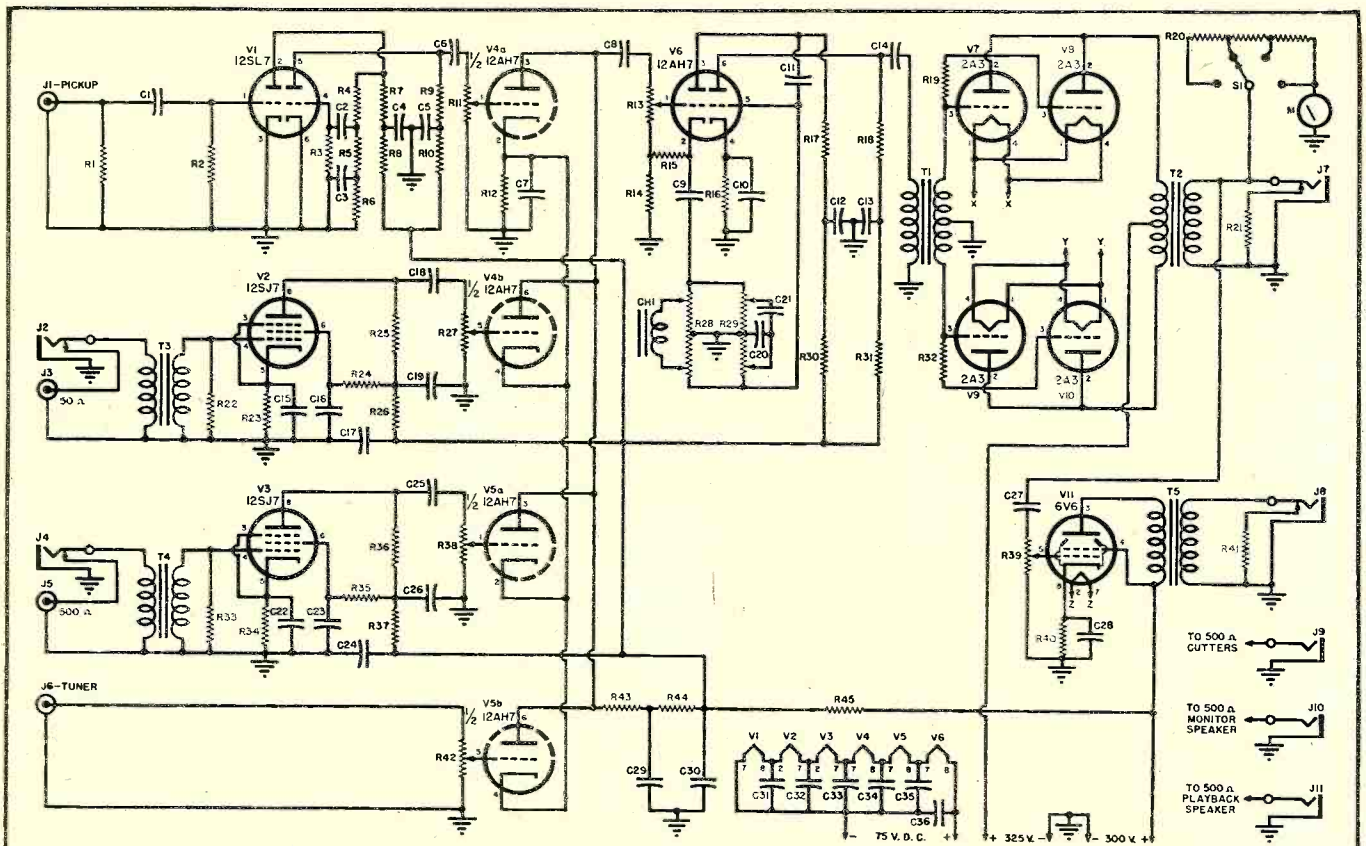
The fourth input is of lower gain and terminates in a *Browning* FM-AM tuner for off-the-air recording. Conventional crystal pickups may also be used in this channel but proper *RC* networks must be added to obtain constant velocity characteristics as described in previous chapters.

Mixing is accomplished within the four halves of two duo-triode 12AH-7's. There is no cross-talk between channels inasmuch as individual grid circuits are employed. All of the plates may be tied together and fed from a common plate load and isolating resistor network, as shown in Fig. 4.

Operation of the equalizer is based on degeneration in the cathode circuit of the first section of the 12AH7. If resistance is introduced in the cathode

(*Continued on page* 166)

Fig. 4. Diagram of amplifier, less dynamic noise suppressor. Power supply is built on separate chassis to offset hum pickup.



R_1—6800 ohm, ½ w. res.
R_2, R_3—3.3 megohm, ½ w. res.
R_4—220,000 ohm, ½ w. res.
R_5, R_{28}, R_{37}—27,000 ohm, ½ w. res.
R_6—180,000 ohm, ½ w. res.
R_7, R_8—68,000 ohm, ½ w. res.
R_9, R_{10}—33,000 ohm, ½ w. res.
R_{11}, R_{13}, R_{27}, R_{38}, R_{39}, R_{42}—.5 megohm pot.
R_{12}—470 ohm, 1 w. res.
R_{14}—22,000 ohm, ½ w. res.
R_{15}, R_{16}—820 ohm, ½ w. res.
R_{17}, R_{18}—47,000 ohm, ½ w. res.
R_{19}, R_{32}—100 ohm, ½ w. res.
R_{20}—Multiplier res. (See text)
R_{21}—500 ohm, 20 w. wirewound res.
R_{22}, R_{24}, R_{33}, R_{35}—1 megohm, ½ w. res.
R_{23}, R_{34}—1000 ohm, ½ w. res.
R_{25}, R_{36}—470,000 ohm, ½ w. res.
R_{26}, R_{29}—Tone control (Thordarson R-1068)
R_{30}, R_{31}—10,000 ohm, ½ w. res.
R_{40}—500 ohm, 1 w. res.
R_{41}—500 ohm, 5 w. wirewound res.
R_{43}—10,000 ohm, 2 w. res.
R_{44}—5000 ohm, 1 w. res.
R_{45}—4700 ohm, 2 w. res.
C_1, C_2, C_{11}, C_{14}—.05 μfd., 400 v. cond.
C_3, C_{20}—.01 μfd., 400 v. cond.
C_4, C_5—15 μfd., 450 v. elec. cond.
C_6, C_8, C_{18}, C_{25}—.05 μfd., 400 v. cond. (in metal can)
C_7, C_{10}—10 μfd., 25 v. elec. cond.
C_9, C_{28}—10 μfd., 50 v. elec. cond.
C_{12}, C_{13}, C_{17}, C_{19}, C_{24}, C_{26}, C_{29}, C_{30}—20 μfd., 450 v. elec. cond.
C_{15}, C_{22}—5 μfd., 25 v. elec. cond.
C_{16}, C_{23}—.1 μfd., 400 v. cond.
C_{21}—.04 μfd., 400 v. cond.
C_{27}—.01 μfd., 600 v. cond.
C_{31}, C_{32}, C_{33}, C_{34}, C_{35}—20 μfd., 150 v. elec. cond.
C_{36}—40 μfd., 150 v. elec. cond.
T_1—Single plate to push-pull grids (UTC A-18 or equivalent)
T_2—Push-pull parallel 2A3's to 500 ohms self bias
T_3—50 ohm to grid (UTC A-10 or equivalent)
T_4—500 ohm to grid (UTC A-10 or equivalent)
T_5—6V6 plate to 500 ohm line
CH_1—Audio choke (Thordarson T-20C74 or T-1C69)
J_2, J_4, J_7, J_8—Single closed circuit jack
J_1, J_6, J_8—Shielded input terminal jack
J_9, J_{10}, J_{11}—Open circuit jack
S_1—S.p. 4-pos. rotary sw.
M—−10 +6 db. meter (See text)
1—12SL7GT tube
1—6V6 tube
2—12SJ7 tubes
3—12AH7GT tubes
4—2A3 tubes

TELEVISION INSTALLATION

Fig. 1. (Left) White streaks appearing in image are due to faulty ignition systems of cars and trucks passing near antenna site. Fig. 2. (Above) Effect indicates overloading of receiver input, loss of sync control, and some leakage into the video output circuit. Curvature of lines suggest that part of interference may be due to powerful nearby FM stations.

By
W. W. WAYE

Part 5. Covering the elimination of noise, or picture distortion, due to local electrical interference.

THERE are two principal types of interference likely to be encountered during a television installation, both of which influence the quality or fidelity of the received picture and *also* tax the patience and ingenuity of the serviceman or technician.

Multiple or ghost images, previously described, are due to the arrival *at different* times of identical signals from one transmitter. When present, these ghost effects differ for each television channel. They are eliminated by adjusting or reorienting the existing antenna, *or* by substituting a more highly directional antenna.

More of a problem, however, is a second type of picture interference—popularly known as "noise"—which consists of erratic streaking or distortion of received images *on all channels,* and is caused by various kinds of electrical apparatus, appliances, and similar equipment. These "noise" disturbances enter the television receiver via the antenna, lead-in, or power cord, and the result is a television picture which is flecked, spotted, or streaked—partially or wholly distorted—or scrambled into a maze beyond recognition.

Because of the many types and varieties of "noise" encountered in metropolitan and industrial locations, such installations invariably prove more troublesome than those in remote or residential districts. However, even roadside taverns and suburban buildings may prove to be "noisy" locations. A good television installation must solve the individual problems of every location.

Confronted with the problem of "noise" interference, too many inexperienced persons are inclined to blame the location, the receiver, the antenna, or possibly all three. They should blame themselves. If the antenna, lead-in, and receiver are installed properly and otherwise operating normally, it is possible to suppress or entirely eliminate this type of interference by use of a few special techniques.

In some "noisy" locations of large cities, the work is difficult and time-consuming. But adequate television reception—free of ghosts and free of "noise"—*can* be accomplished with a good installation! Once again, a good installation means a personalized and *individual* installation—according to the type and nature of the interference problems of a particular location.

Cause and Effect

There are many sources of electrical interference, each producing different *visual* effects which streak, distort, or otherwise alter the television picture. Many of these effects are occasional and erratic, some are continuous and somewhat stationary, and a few have distortion "designs" that are distinctly characteristic.

As viewed on the screen, these effects may be simple (Fig. 1) or, in "noisy" locations, they may be complex (Fig. 2) due to *combinations* of several types of electrical interference.

Some kinds of "noise" are closely associated with their source and thus have some directivity; these, somewhat like ghost interference, can be minimized or entirely eliminated by means of a highly directional receiving antenna. Other "noise" disturbances, however, affect a wide area, some of them originating from a large number of similar sources; these are the most difficult types of "noise" to suppress effectively.

Some kinds of interference can be heard on the loudspeaker, as well as seen on the picture screen. However, the sound part of a television set is relatively unaffected by many kinds of "noise," and it is much easier to observe the effect of interference on the picture screen of the receiver.

It is important for the television serviceman or technician to become familiar with a few of the most common picture effects in order to properly *and easily* identify the source of many "noise" disturbances.

Random, sporadic streaks or spots (Fig. 1) are indications of faulty or "noisy" ignition systems in cars or trucks passing nearby. Similar but brighter, flashing spots or streaks—with loss of picture frame—are caused by the ignition systems of airplanes; but ordinarily this effect is brief and infrequent. This is one of the few types of "noise" interference that cannot be suppressed at its source. The best

method of elimination is to install a much higher and more directional antenna, sited as far as possible from highways and streets with heavy traffic.

Severe distortion of the television picture—usually with loss of sync control—is caused by nearby motors, generators, or other large electro-mechanical devices. Elevator motors are probably the most frequent offenders. This type of electrical interference can best be suppressed at its source.

Filters

In one typical installation (Fig. 3), merely connecting a simple filter to the a.c. input terminals of a "noisy" elevator motor permitted adequate "noise"-free reception *which would not otherwise have been possible* from a *Philco* dipole-and-reflector antenna mounted within only a few feet of the actual motor housing. An inexpensive

Table 1. Methods of eliminating common types of interference appearing on TV receivers.

SOURCE OF INTERFERENCE	METHODS OF ELIMINATION OR SUPPRESSION "What To Do About It"		
	AT THE SOURCE	AT RECEIVER OR ANTENNA SITE	OTHER METHODS
Ignition systems cars, trucks.	(Nothing)	Elevate antenna; use more directive antenna; resite.	
Ignition systems fixed engines, lighting plants.	Install (replace) commercial disbributor suppressors or, encase spark plug with sheet-metal screen grounded to engine block.	Elevate antenna; use more directive antenna; resite.	
Electric Doorbells	Connect .02 microfarad condenser across two bell terminals.	Use a.c. line filter in series with receiver power cord.	
Dial Telephone "clicks"	(Nothing)	(Nothing)	Report trouble to local telephone company.
Household Appliances washing machines, vacuum cleaners, floor polishers, sewing machines, electric razors, electric fans, vibrators, mixers, etc.	Install low-power appliance filter in series with cord or, connect .02 microfarad condenser across a.c. input terminals of appliance, and tape to prevent shock.	Use a.c. line filter in series with receiver power cord.	Turn off the appliances.
Oscillators in radio receivers.	(Nothing)	Resite antenna; use more directive antenna.	Report trouble to owner of receiver.
Refrigerators electric.	Install C or C-L filter across motor terminals also, install C or C-L-C filter in a.c. input cord.	Use a.c. line filter in series with receiver power cord.	
Industrial equipment cash registers, adding machines, accounting machines, electric typewriters, annunciators, dictaphones, duplicators, etc.	Install low-power appliance filter in series with cord or, connect .02 microfarad condenser across sparking or contact points of equipment or, connect C-L-C filter across contact points of equipment.	Use a.c. line filter in series with receiver power cord; also, elevate antenna; or use more directive antenna; resite, if necessary.	
Induction and dielectric heating apparatus (See Diathermy Machines)			
Motors and Generators including converters, elevator motors, crane hoists, dynamos, etc.	Install C, C-L, or C-L-C filters across a.c. input of motors, and across a.c. output of generators. Ground chassis of machinery.	Install C-L-C filter in a.c. input lead; also, elevate antenna; resite, if necessary.	When applicable report trouble to local power or utility company.
Lighting plants (See Ignition Systems)			
Air Conditioning Equipment	Install C-L or C-L-C filter across motor terminals also, install C-L-C or C-L-C-L-C filter in a.c. input lead.	Use a.c. line filter in series with receiver power cord	
Traffic Signals	(Nothing)	(Nothing)	Notify local municipal government.
Power Lines overhead and underground.	(Nothing)	Use a.c. line filter in series with receiver power cord; also, resite and elevate antenna; use more directive antenna.	Report trouble to local power or utility company.
Telephone Lines overhead open wires.	(Nothing)	(Nothing)	Report trouble to local telephone company.
Electric Light Bulbs	Replace bulbs at fault.		
Electric Signs non-flashing.	Install C or C-L-C filter in a.c. input lead.	Use a.c. line filter in series with receiver power cord; also, elevate antenna; or resite, if necessary.	
Electric Signs multi-contact or on/off flashing.	Install commercial flashing sign suppressors in input lead, or, install L-C or L-C-L-C filter in a.c. input lead, but close to switch contacts also, provide additional shielding of switch contacts with sheet-metal screen grounded to frame and to building.	Use a.c. line filter in series with receiver power cord; also, resite and elevate antenna remote from source of "noise."	
Neon Signs all types.	Install special commercial types of neon chokes, neon filters, or neon noise suppressors—all with high- and low-frequency chokes—in a.c. input lead to sign also, reground frame of sign.	Install C-L-C or C-L-C-L-C filter in a.c. input lead to receiver; also, resite and elevate antenna; or, use more directive antenna at high elevation.	
Electrical Gear used by barbers, dentists, hairdressers, etc.	Install C-L or C-L-C filter in a.c. input lead.	Use a.c. line filter in series with receiver power cord.	
Diathermy Machines x-ray machines, violet ray machines, and other types of electro-medical apparatus, also induction and dielectric heating equipment.	Equipment plus room in which equipment is used must be adequately screened, with bonding and direct ground connections also, double heavy duty L or L-C-L filters must be installed in the a.c. power lead (for the equipment) at the point of entry into room, and at the point of entry into equipment rack or cabinet also, separate heavy duty L or L-C filters must be installed in each secondary power circuit, lighting circuit, and wire-communication circuit at the point of entry into room.	Elevate and resite antenna; or, use more directive antenna at high elevation.	Report consistent or flagrant interference to Federal Communications Commission, at nearest office, or Washington, D. C.

Principal Types of Filters:
A.C. Line Filter,
Low-power Appliance Filter,
Distributor Suppressor,
Neon Chokes and Filters.

For Special Filters:
C = Condenser.
L = R.f. Choke.

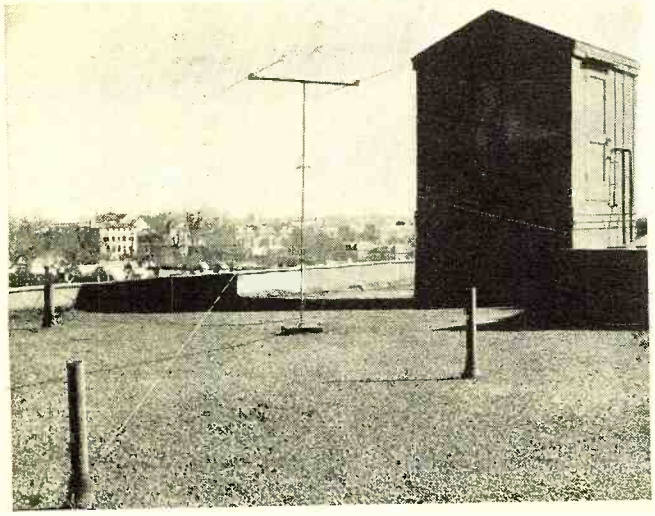


Fig. 3. Siting of this directional antenna in the vicinity of an elevator motor proved a "noisy" location, until a suitable filter was attached to the motor to eliminate the sparking.

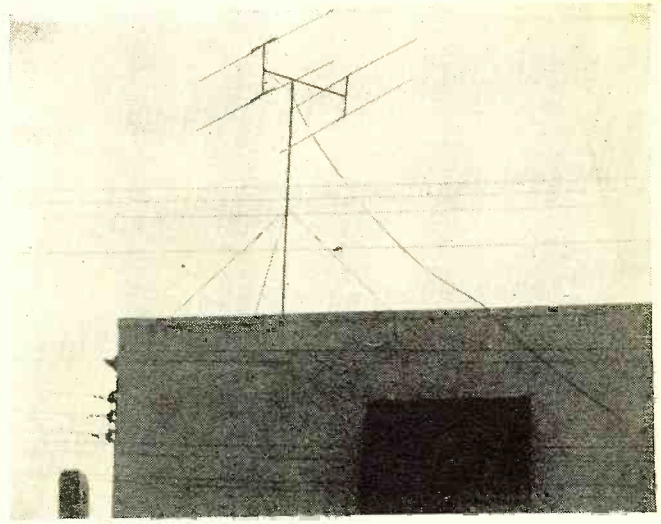


Fig. 4. By increasing the elevation of this duo-dipole and reflector antenna objectionable "noise" pickup from the nearby power lines was effectively eliminated from television screen.

filter, in this case, cancelled the need for a more expensive, highly directional antenna.

Filters, or "suppressors," are small, simple devices consisting of either condensers, r.f. choke coils, or both, arranged in certain "networks" or combinations to provide almost any specified filtering action. Those used in television tend to "block" or choke off any sudden bursts of high-frequency "noise" disturbances created by many types of electrical devices when in operation. Each type of interfering device usually requires an individual filter.

Appropriate filters for specific purposes are available commercially, but any of them can be constructed easily by obtaining and assembling the necessary components. As indicated in Table 1, some methods of "noise" suppression require certain types of filters. The r.f. choke coils (indicated by *L*) are always connected *in series* with the line being filtered; condensers (indicated by *C*) are either connected *across* the line, or between one side of the line and ground. The basic arrangement of such components is given in terms of letters; thus, *L-C-L* indicates a choke input, followed by a condenser, and a choke at the output of the filter. This is a convenient method of stating the basic arrangement of filters for special purposes.

Some types of filters are similar to those used for suppressing radio interference, and have been made commercially for many years. However, most filters used for television installations are designed to suppress "noise" over a much wider range of frequencies. Filters are connected *only* to power circuits and devices. Never connect a filter to any part of the antenna or lead-in, or to the r.f. input circuit of a television receiver.

Diathermy

Particularly bothersome to television reception are diathermy machines and other electro-medical apparatus, which produce either a fixed or slowly moving "herringbone" pattern of interference. When viewed on the television picture screen, this distinctive pattern appears to be superimposed on the normally received picture image. The brightness of the interference pattern indicates both the strength and nearness of the offending medical equipment.

The principal cure for this type of interference is at its *source*—usually a hospital, doctor's office, etc.—where adequate screening of the equipment and other measures are required.

The best method of determining the exact location of such apparatus is by means of a small, portable radio receiver capable of tuning anywhere within the range 50 to 200 megacycles. Inexpensive sets can be constructed which will be entirely satisfactory for this particular type of duty as "detectives." There will be no difficulty in hearing and identifying the characteristic "hum" radiated by diathermy machines and other electro-medical devices. Once this is heard, the direction—and thus the location—of the offending equipment can be determined, merely by noting increase in "hum" volume as the portable receiver is moved in various directions.

Operators of such machines are seldom aware of its picture-damaging radiations. When the matter is handled diplomatically, the hospital or institution will cooperate in efforts to shield and restrict such radiations from diathermy, x-ray, violet-ray, and other electro-medical apparatus. The room or rooms housing such equipment should be completely enclosed with screening material—preferably copper, either in thin-sheet or wire-gauze form—with proper bonding and direct, well-soldered connections to ground at several points. Suitable filters must be installed in all wires leading in or out of the room. (See Table 1.)

Similar interference—but at brief, more-or-less irregular intervals—is caused by induction or dielectric heating apparatus, used in commercial manufacture. Again, the source of interference can be detected and located by use of a small, portable receiver. Again, with the cooperation of the owner or operator, the method of eliminating such interference is by means of a properly grounded shield around the offending instrument.

In cases where non-cooperation is encountered, the continued use of diathermy, x-ray, and violet-ray machines, or of high-frequency heating apparatus, which causes interference on any television channel, should be reported directly to the Federal Communications Commission for suitable action.

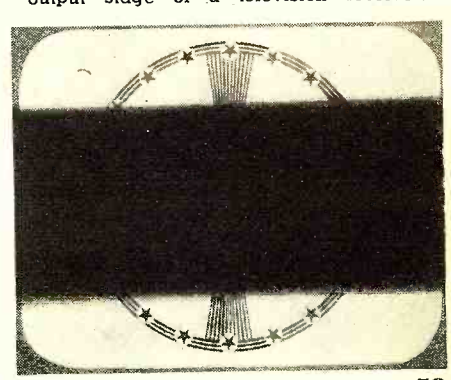
Other Sources

A similar interference pattern of "tweed cloth," or any distortion effect consisting mostly of long, sweeping lines (Fig. 2), is caused by the reception of signals from a radar station or harmonic signals from a radio station. These signals usually have a directional characteristic, however, and the interference can be eliminated by using a more directional receiving antenna. A new site and reorientation may also prove helpful.

Antenna locations near power lines are often "noisy." The resulting effects on the television screen are va-

(*Continued on page* 135)

Fig. 5. The "blanket" effect caused by 60-cycle a.c. power interference in the video output stage of a television receiver.



FLEAPOWER HAM PORTABLE

By
C. C. ERHARDT, W2HNJ

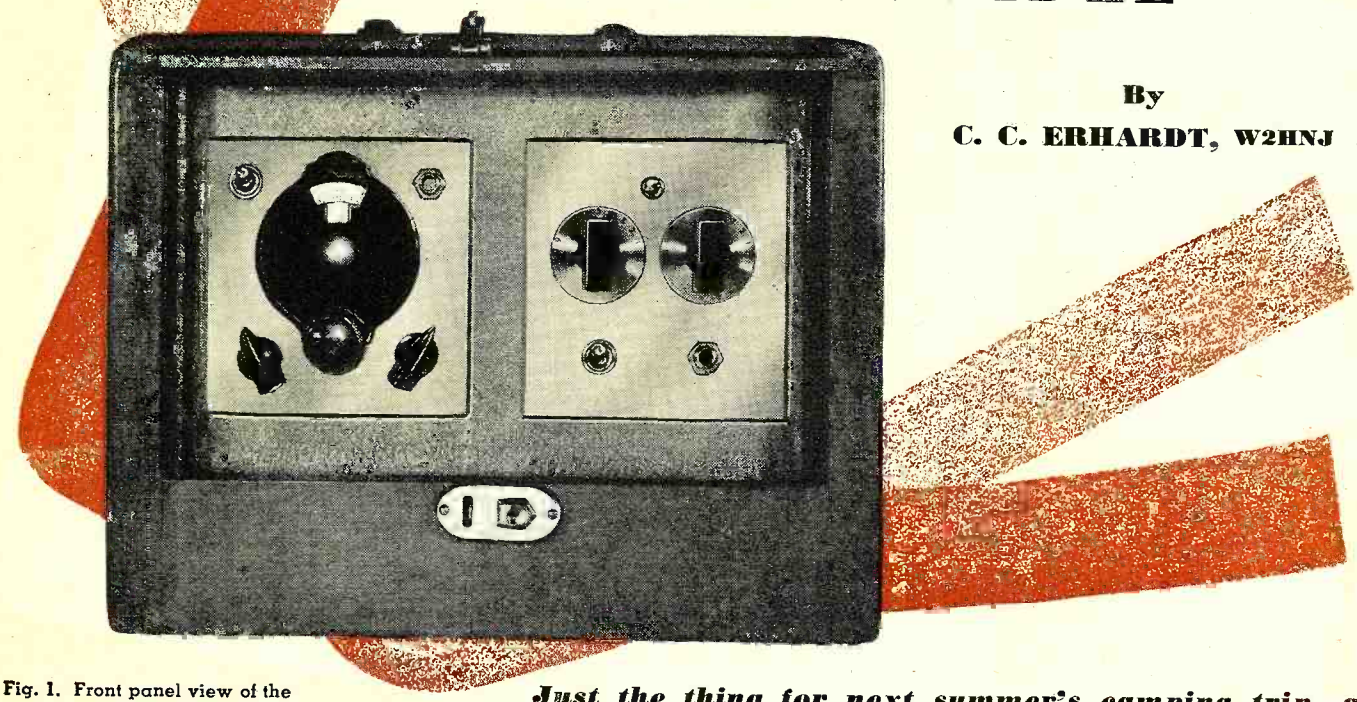


Fig. 1. Front panel view of the completed ham portable. The receiver section is to the left and the transmitter to right.

Just the thing for next summer's camping trip—a complete amateur station operated entirely from dry batteries for use on the 80, 40, and 20 meter bands.

MANY excellent articles have been written on portable amateur equipment, however, almost without exception they require that the operator carry a storage battery under one arm and a vibrator pack under the other. In order to avoid this pitfall it was decided to exploit the possibilities of operating a small transmitter and receiver entirely from dry batteries. To meet the demands of field service a portable rig must be compact, light in weight, and capable of operating on the main amateur bands. The little outfit described here fulfills the above requirements and, considering the low power, has given an excellent account of itself.

The entire unit is housed in a replacement type cabinet that was originally intended for a broadcast band portable. These cabinets are easily obtainable in a variety of sizes and are very reasonable in cost. The one shown here sells for $3.95 and measures 13 inches long, 9¾ inches high, and 7 inches deep. It was given a couple of coats of clear shellac and then rubbed down with steel wool. This not only improves the appearance but makes it more resistant to dirt and grease. For an extra 50 cents you may be able to get a ready made chassis to fit, but if not you can "roll your own" without much trouble. For our chassis we used a sheet of 1/32 aluminum cut to size and bent at the front and back to give a depth of two inches. Exact dimensions have been purposely omitted as they will vary with the type of carrying case the constructor uses. A piece of the same metal was used for the panel and is fastened to the chassis by two small machine screws. As seen in Fig. 4, the panel extends below the bottom line of the chassis in order to adequately cover the two cabinet "windows." A bottom plate (not shown in the photograph) is attached to the chassis as a protective measure. This bottom plate may or may not be necessary depending on how securely the batteries are held in place. When completely assembled, the chassis rests on the two wooden runners with which the cabinet is equipped, while the panel is held snugly against the windows by a small wood screw in each corner. The only necessity for removing the unit would be a major repair job—coils, crystals, batteries, etc., are easily accessible when the hinged cover in the rear is lowered. A ⅜ inch hole, drilled on each side of the cabinet and fitted with porcelain bushings provide access for the antenna wires.

Table 1. Details for coil construction.

RECEIVER	
80 m.	L_1—17 t. #32 d.c.c. closewound
	L_2—6 t. #32 d.c.c. closewound
40 m.	L_1—9 t. #24 d.c.c., spaced to cover ⅜". Tap 5 t. from end
	L_2—6 t. # 32 d.c.c. closewound
20 m.	L_1 5 t. #24 d.c.c., spaced to cover ⅜". Tap 2½ t. from end.
	L_2—5 t. #32 d.c.c. closewound
⅛" spacing between L_1 and L_2. Bandspread taps counted from gnd. end of coil.	
TRANSMITTER (L_3)	
80 m.	30 t. #18 en. closewound
40 m.	17 t. #18 en., spaced to cover 1½"
20 m.	9 t. #18 en., spaced to cover 1½"

A great deal of time was spent on the selection of tubes. The small size and low current drain of the 1T4-1S4 miniatures make them a natural for the receiver. The loktal 1LB4's lend themselves very nicely for a transmitter as they combine low filament drain together with good power output. The number of parts in both circuits was kept to an absolute minimum and wherever possible lightweight, midget parts were used. Bulky components such as audio chokes, output transformers, and loudspeakers were, of course, out of the question.

Fig. 1 shows the front panel controls—receiver to the left, transmitter on the right. Taking the receiver controls first, we find the standby toggle switch and earphone jack on top, the bandspread vernier dial in the center, regeneration control to the lower left and volume control to the right. On the transmitter panel from

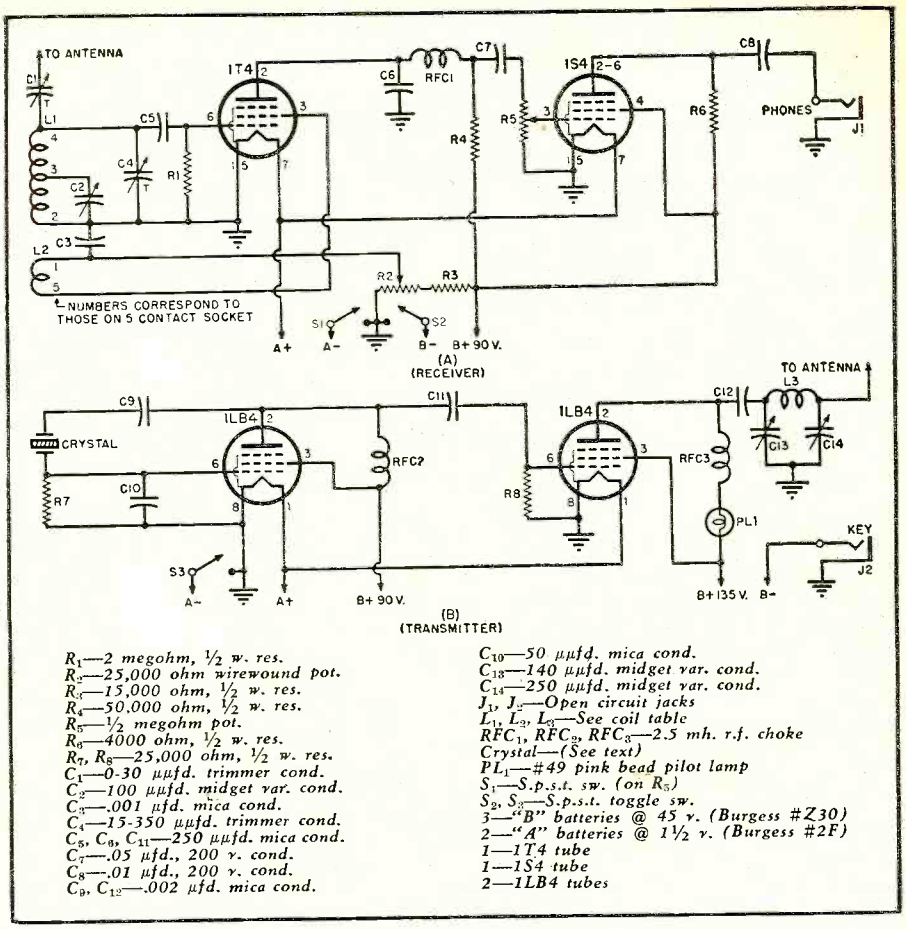
left to right we find the tank tuning condenser, plate current bulb, and antenna loading condenser. The filament switch and keying jack complete the picture.

Receiver

As seen in the diagram we have a 1T4 regenerative detector resistance coupled to a 1S4 audio amplifier. The tickler winding, L_2, is placed in series with the screen grid and regeneration is accomplished by varying the screen voltage through potentiometer R_2. In choosing the value of plate load resistor R_4 some compromise must be made between proper impedance match and having sufficient plate voltage on the detector tube to permit oscillation. 50,000 ohms is a satisfactory value. In place of the usual output transformer in the plate circuit of the 1S4 a 4000 ohm resistor is used. The earphones are at ground potential when connected as shown and the phone jack need not be insulated from the panel. Although a mica condenser was used for C_8, paper will do the trick just as well. Volume is more than ample and is controlled by varying the grid bias on the 1S4 with potentiometer R_5.

Looking at Fig. 4 will give you a good idea of the mechanical layout. Separate antennas are used for the receiver and transmitter in order to permit break-in operation. Button type feed-through insulators are used for this purpose. Immediately to the right of the receiver antenna feed-through (the left hand one in Fig. 4) will be found a three lug mounting strip which is used for mounting the antenna coupling condenser. This condenser, a 0-30 $\mu\mu$fd. trimmer, is soldered directly across the two outside lugs and is adjusted with an insulated screwdriver through a hole in the rear of the chassis. A rubber grommet prevents the trimmer plate from touching the chassis when set at minimum capacity. On the same line with the antenna condenser is a five lug mounting strip which forms an anchorage for the battery wires. The detector tube socket is at the lower left with the r.f. choke between it and the regeneration control. The remainder of the receiver parts will be obvious. Two switches are used for the receiver—S_1, which is actually part of the volume control, turns on the filaments, while S_2 cuts off the "B—" during extended transmitting periods.

The plug-in coils are wound on old 5-prong tube bases of 1⅛ inch diameter. After a coil has been wound and found to be operating satisfactorily a coat of coil dope will help to keep the windings in place. Good bandspread is secured by tapping down on the secondary with bandspread condenser C_2. However, for the 80 meter band this condenser can be connected directly across the secondary. The bandset condenser, C_4, is a 350 $\mu\mu$fd. trimmer which is made a permanent part of each coil. It is supported within each coil form by two pieces of No.

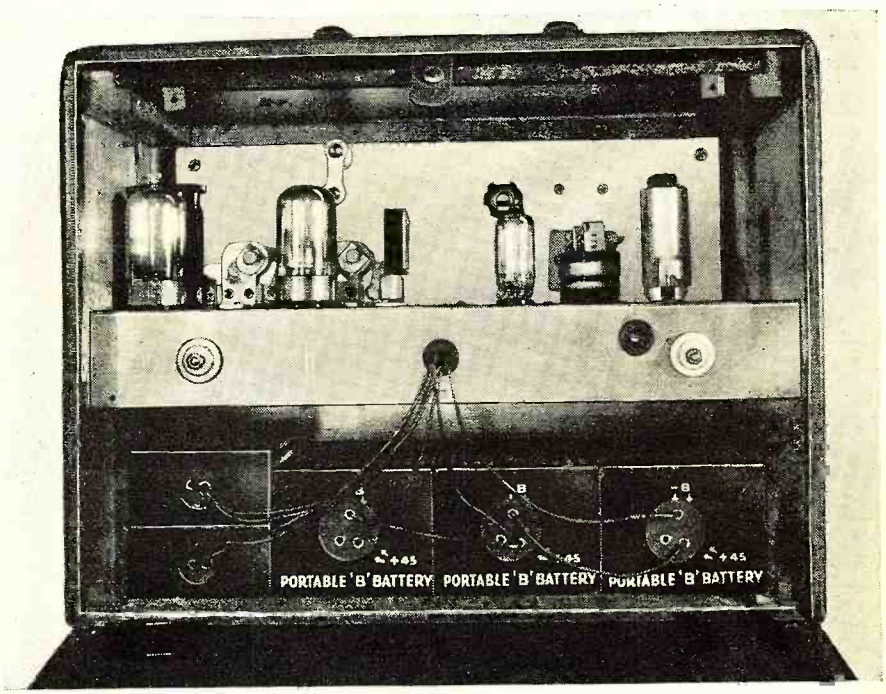


R_1—2 megohm, ½ w. res.
R_2—25,000 ohm wirewound pot.
R_3—15,000 ohm, ½ w. res.
R_4—50,000 ohm, ½ w. res.
R_5—½ megohm pot.
R_6—4000 ohm, ½ w. res.
R_7, R_8—25,000 ohm, ½ w. res.
C_1—0-30 $\mu\mu$fd. trimmer cond.
C_2—100 $\mu\mu$fd. midget var. cond.
C_3—.001 μfd. mica cond.
C_4—15-350 $\mu\mu$fd. trimmer cond.
C_5, C_6, C_{11}—250 $\mu\mu$fd. mica cond.
C_7—.05 μfd., 200 v. cond.
C_8—.01 μfd., 200 v. cond.
C_9, C_{12}—.002 μfd. mica cond.
C_{10}—50 $\mu\mu$fd. mica cond.
C_{13}—140 $\mu\mu$fd. midget var. cond.
C_{14}—250 $\mu\mu$fd. midget var. cond.
J_1, J_2—Open circuit jacks
L_1, L_2, L_3—See coil table
RFC_1, RFC_2, RFC_3—2.5 mh. r.f. choke
Crystal—(See text)
PL_1—#49 pink bead pilot lamp
S_1—S.p.s.t. sw. (on R_5)
S_2, S_3—S.p.s.t. toggle sw.
3—"B" batteries @ 45 v. (Burgess #Z30)
2—"A" batteries @ 1½ v. (Burgess #2F)
1—1T4 tube
1—1S4 tube
2—1LB4 tubes

Fig. 2. Schematic diagram. Plug-in coils are used to cover 80, 40, and 20 meter bands.

18 wire which are soldered into pins 2 and 4. This saves an extra tuning control as once set for each amateur band this condenser requires no further attention. Some departure from the coil data given in the table may be made on the 80 and 40 meter bands without noticeable effect, however, the 20 meter coil will be more critical. If the receiver goes out of oscillation easily or does not oscillate at all, then add a turn at a time to the tickler winding. If on the other hand, oscillation cannot be controlled, then remove

Fig. 3. Rear view of home-built transmitter-receiver. The cabinet is a standard replacement type unit used extensively for broadcast band portable receivers.



turns. In any case, be sure that both windings are in the same direction. It must also be remembered that the antenna has a definite loading effect upon the tuning circuit, therefore no calibrating or other adjustments should be attempted with the antenna removed. A short length of wire will usually work OK on the higher frequencies. The antenna coupling condenser will need to be adjusted whenever changing bands—it should be set for minimum capacity consistent with smooth regeneration over the entire band.

In calibrating the coils for each band it is best to use another receiver of known calibration in order to secure the necessary check points. This is how it's done: Tune the known receiver to the low frequency end of the 80 meter band. Now, placing our newly constructed set in an oscillating condition, turn the bandspread condenser to almost maximum capacity, and then with an insulated screwdriver turn the bandset trimmer until a whistle is heard in the calibrated receiver. Next, set the latter at the high frequency end of the band. Tune the bandspread condenser of the new receiver until another whistle is heard and we will have a rough calibration of the band. Repeat for each band. The calibration will vary somewhat, of course, each time the antenna condenser is adjusted.

Transmitter

Referring to the diagram, we find a 1LB4 *Pierce* oscillator capacitively coupled to a 1LB4 "class C" amplifier. One side of the filament ($A-$) forms the common cathode return. It will be noted that the usual screen dropping resistors and associated bypass condensers have been omitted as they were found unnecessary. Keying is very simple—the keying jack is placed in the "B—" lead. This also eliminates the need for a separate "B" supply switch for the transmitter. A 60 ma. pilot light is used as a plate current indicator. If you can get hold of a pilot light with a lower current rating than 60 ma., so much the better. When fully loaded the amplifier tube plate current never exceeds 25 ma., therefore the bulb will only light dimly. The best indicator, of course, would be an 0-25 milliammeter. Plug-in coils, wound on standard 1¼ inch, four prong forms are used for the tank circuit. Ready made coils may also be used, if desired, providing that tuning condenser C_{13} is changed to the proper value as specified by the manufacturer. Parallel plate feed is used in the amplifier stage. This has the advantage of allowing the two tank condensers to be mounted directly on the chassis. Doubling may also be accomplished in the amplifier stage, but it is not recommended. Not only would the power output be materially reduced, but the keying characteristics may also be impaired.

Figs. 3 and 4 show clearly the layout of the parts. The two *Bud* variable condensers are provided with threaded mounting lugs which are secured to the chassis with ¼ inch machine screws. Be sure that the condensers are lined up perfectly straight otherwise the tuning knobs will be crooked. A small tri-square will be handy for this purpose and also for lining up the mounting holes on the tube sockets. Directly above the two variables you will find the plate current bulb. The bulb socket is supported by a porcelain standoff which in turn is secured to the panel. The amplifier tank coil may be seen hiding behind its respective tube on the left hand side of Fig. 3. No. 18 enameled wire, covered with spaghetti, is used for wiring the r.f. amplifier tank circuit. It is run through rubber grommets to the two tuning condensers. A piece of the same wire is used to make connection to the antenna post. An important point to bear in mind is that the leads on coupling condenser C_{11} must be kept short—one inch at the most. A short length of bare wire is used on each tube socket to connect the tube shield and $A-$ directly to the chassis. A soldering lug placed under one of the mounting screws provides a convenient ground. Short, direct leads in the plate and grid circuits provide for maximum efficiency. As in the case of the receiver, a rugged system of construction is followed. Liberal use is made of lockwashers and soldering lugs—and in addition, all parts weighing more than a germ's eyelash are supported by mounting lugs. Once again, a 5 lug terminal strip is used to anchor the battery wires.

Although separate filament batteries are used for the transmitter and receiver, the same "B" batteries are used for both. This works out better than you might expect as normally the receiver "B—" is turned off while sending. A jumper is run from the "B+" post on the receiver to the "B+ 90" post on the transmitter. Another jumper is run between the common "B—" terminals. With the batteries placed as shown in Fig. 3 they just fit in snugly. If any unused space is left over it is a good idea to fill it with rolled up paper in order to keep the batteries stationary. In some cases it may also be necessary to stuff paper between the batteries and chassis.

Tuning

The transmitter is designed for operation on a "long wire" antenna. This simply means a wire that is run in as straight a line as possible—measured from the antenna post to the furthermost insulator. Although the rig will tune up to almost any length of wire, for best results the antenna should have a resonant frequency which falls within the desired band—133 ft. for 80 meters, 66 ft. for 40 meters, and 33 ft. for 20 meters.

In testing the transmitter the following procedure is recommended:

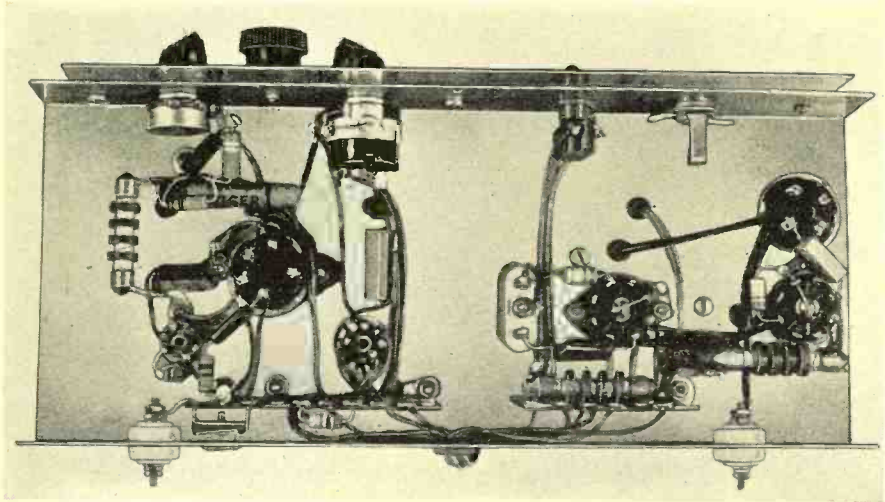
1. Plug in the crystal and the oscillator tube, allow the tube to heat up, then close the keying circuit. If a one watt neon bulb lights up when touched to the grid post of the amplifier tube socket then your oscillator stage is perking. If no soap, then you can suspect a dirty crystal (clean with carbon-tet), or possibly insufficient feedback, which can be remedied by increasing C_{10} to 100 or 150 $\mu\mu$fd.

2. Next, plug in your amplifier tube and the proper tank coil. Set loading condenser C_{14} with the plates completely meshed. With the keying circuit closed the plate current lamp should glow dimly, and as tuning condenser C_{13} is tuned to resonance a point will be reached where the lamp goes out. As a second check, touch your neon bulb to the stator of the tuning condenser and rotate again until maximum brilliance is secured.

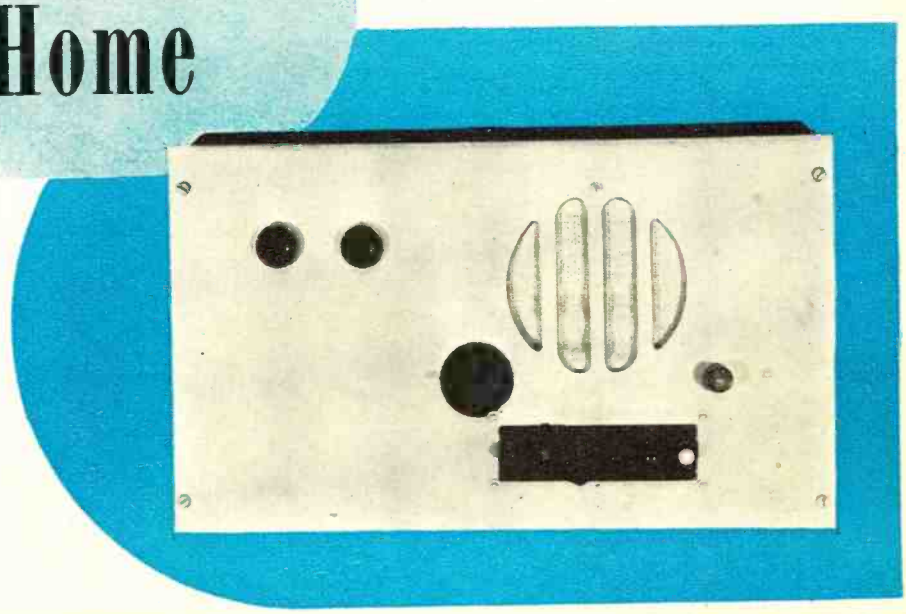
3. Connect the antenna and set the loading condenser at a slightly lower capacity (unmesh plates). Retune C_{13} to resonance. Keep advancing C_{14} and retuning C_{13} until that point is reached where the plate current bulb will only dim slightly. If the bulb will not dim at all then you are overloading and C_{14} must now be returned

(*Continued on page* 181)

Fig. 4. Under chassis view of fleapower ham portable.



INTERCOM for Modern Home



The central control unit is placed in the most accessible location in the home. On the front panel are mounted the keyboard assembly, speaker grille, pilot light, volume control-"on-off" switch, and the push-to-talk button.

By
FRANK A. BRAMLEY

Operate your home in the modern way. Eliminate the unnecessary steps in your home—install an intercom.

AMONG the dreams of the returning serviceman, that of a truly modern home with all conveniences, probably stands out from all the rest. As a result of service training, many thousands of young men are thoroughly grounded in the principles of electronics, but even the tremendous expansion which is unquestionably ahead may not provide enough jobs for all those competent to work in the field. Many will adopt radio as a hobby and there is no more desirable hobby than one capable of producing a useful device.

Since before the war when his home was built, the author has had a dream that some day his home would have a complete and versatile intercommunication system. The end of the war has brought a more normal amount of spare time, with the result that this dream project has now been completed.

The need for intercommunication does not stem from the size of the house as the author's home is a simple, six room cottage of Cape Cod design. Such a system is a real step-saver for busy homemakers and is also likely to be fun for Dad to construct.

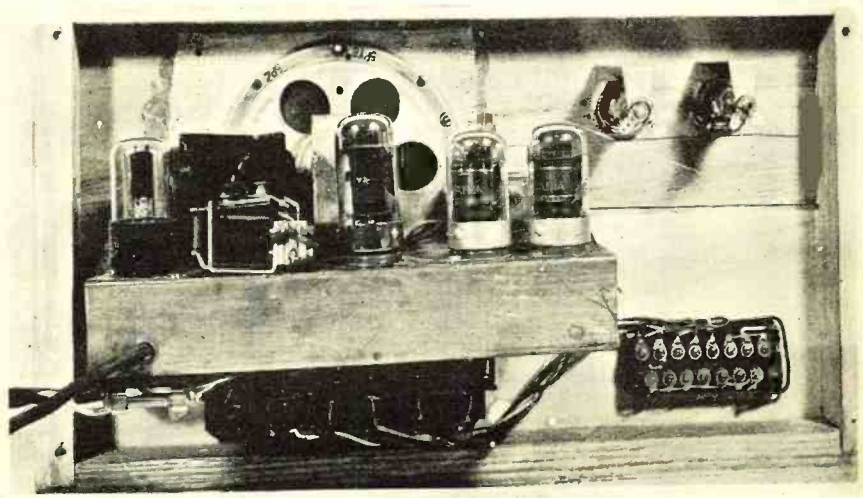
The communicator about to be described is of unusual design and is intended to fulfill every conceivable need in the modern home and yet retain its inherent simplicity. The system incorporates only one amplifier and main control point which will usually be placed in the kitchen, although any other convenient central point may be selected. From this point wires radiate to every room in the house, including one or more to the cellar, and perhaps the garage. By this time the reader may have decided the device is too expensive for his pocketbook, but this need not be the case, as will be disclosed.

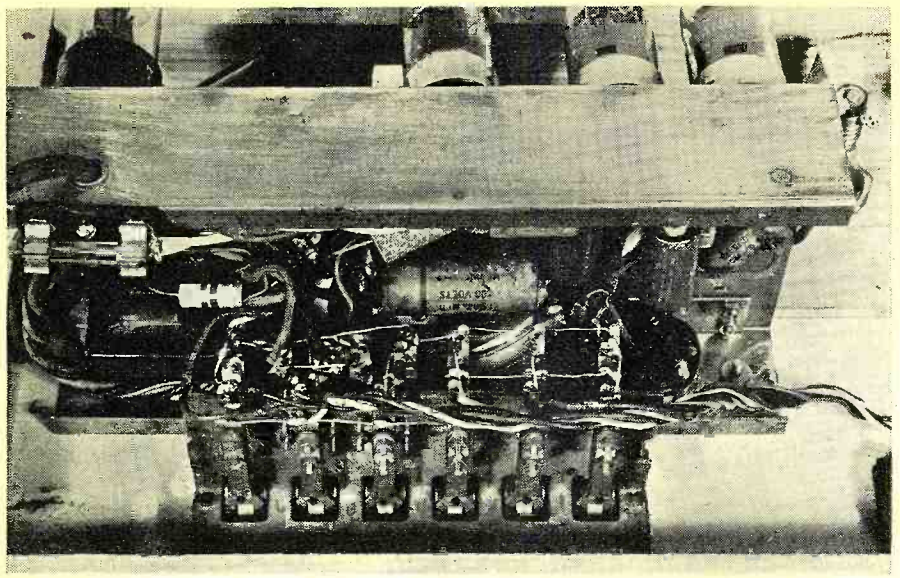
If ½ inch, thin wall, electrical tubing is run to every room while the house is being built, the wires may be easily installed later. The author installed the conduit himself one Saturday afternoon while his house was in the 2 x 4 stage. Several pieces of tubing were run vertically from the cellar and terminated in boxes on the first and second floors. The piping to connect these risers together in the cellar may be installed after the house is finished, or they need not be so connected at all unless the cellar is finished off.

This piping arrangement has other uses. Telephone extensions may be neatly and quickly installed in any room. A riser may also be extended to the attic with boxes on each floor. This will provide a channel for transmission lines from various aerials that may be used and then discarded as the field progresses. In this electronic age, even a low cost home for a radio-minded owner should contain these conveniences. Numerous other uses will suggest themselves.

The central equipment consists of a 3-stage amplifier, a key box, a pilot light, and volume control. It is the wiring of the key box that makes possible this very versatile instrument. Each station selector key has three positions. The center position is "off," the "up" position connects the remote speaker to the output of the amplifier and the "down" position connects the remote speaker to the input of the amplifier. The key is constructed so that it locks in any of

Rear view of control unit. While two pilot light assemblies are shown, only one is used.



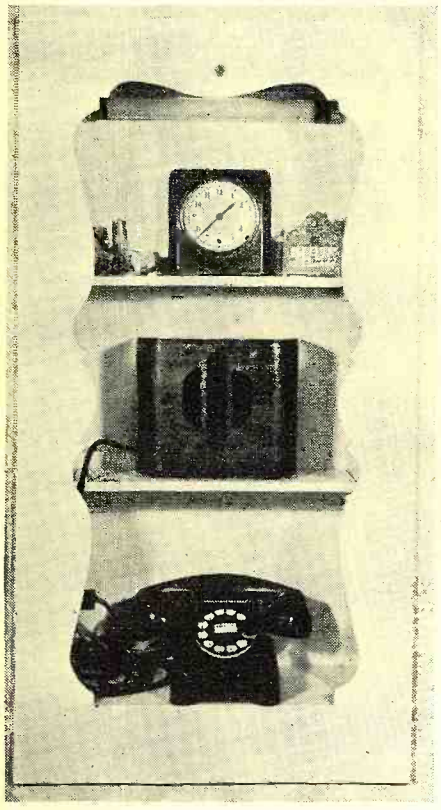


Under chassis view of intercom. The keyboard unit shown is assembled separately.

the three positions. Since there will be a similar key for the wiring running to each room, it becomes possible to hook up any room to any other room and also monitor the proceedings at the central control point. Another key switch reverses the amplifier for talk-back from the central control point, or by means of a relay, the amplifier may be reversed for talk-back from the remote point. By throwing the proper keys any conceivable combination may be achieved.

One of the most common and effective uses of this device will be to listen in on the children's activities when they are supposed to be in bed. Mother can, while doing the dishes in the kitchen, readily hear what they are up to and suitably admonish them without leaving her work. Orders given over a loudspeaker seem to be more than usually effective. The unit may also be used to monitor the sickroom. If children or older people are sick, it may be very difficult for the nurse to hear their calls from another room. If the key in the sickroom or nursery is placed in the "up" position, connecting it to the amplifier input, and the key for the speaker in the nurse's or mother's sleeping room is in the "down" position, connecting it to the output, sounds originating in the sickroom may be continually monitored, and, if desired, two-way contact may also be maintained. In fact several rooms may be monitored at once or the sounds picked up may be reproduced in several places. Dad may work in the cellar or garage and overhear the children's cries while mother goes downtown. It is also possible to install a waterproof speaker near the front or back door so that a sick person, when left alone, could "answer" the door. Other uses will suggest themselves—such as getting Dad or the children up for breakfast.

One of the remote speaker assemblies. This unit can, in many cases, be made to fit in with the decorative scheme in the home.



It is not necessary to install a complete and extensive system at one time. With open conduit and wall boxes installed at the time of construction, wires and speakers may be added as the need arises and as time permits.

The central amplifier will, of course, have a built-in speaker, but plug-in speaker connections in each of the rooms plus two or three portable speakers will fill the needs of most small homes. When Dad wants to work in his photographic darkroom and Mother goes downtown while the children have their nap, speakers plugged into sockets in the rooms concerned will allow Dad to be sure he is not neglecting his children while pursuing his hobby.

Technical Description

An amplifier for use in sleeping chambers must be hum free and it is difficult to make the usual a.c.-d.c. amplifier really hum free and to expect it to give trouble-free service for long periods. For this reason it is suggested that an a.c. type of amplifier be used, as shown in the circuit diagram. This circuit uses a filament transformer but no plate transformer, which increases the reliability over a straight a.c.-d.c. circuit.

As in a.c.-d.c. sets the plate supply is taken directly from the a.c. line. The sizes of the condensers in the amplifier, while not critical, are selected to give good voice quality as the device is not intended for the reproduction of music, although use of the amplifier for that purpose has been considered.

One of the keys on the amplifier is a "push-to-talk" switch that reverses the amplifier to permit two-way conversation from the central control point. As is usual with communicators, the operator must "push-to-talk" and "release-to-listen."

For "talk-back" control from a remote point a relay is required. When a spring-return type of switch at the remote point is closed, current flows through the relay from the power supply and reverses the amplifier. This switch must be operated just like a "push-to-talk" switch.

Remote points cannot call in unless the key attached to their circuit on the central control unit is suitably thrown. Remote speakers, as well as the built-in monitor speaker, must be of the permanent magnet type. All of the speakers should be of the same impedance and be carefully matched to the output transformer. If several speakers are connected at once, a reduction in volume must be expected. Some speakers built for communicator purposes have an impedance of 50 ohms and will not work when associated with standard speakers having an impedance of about 4 ohms. As many key switches as are desired, plus one for "talk-back," are mounted together on the front panel of the amplifier, as well as a pilot light and volume control with switch.

The wires leading to the remote speakers require special consideration. If the remote units need not originate calls only two wires will be required, but if Dad wishes to admonish the children from a monitor speaker in the cellar, for instance, there must be a third wire to complete the relay circuit to reverse the amplifier while he talks.

The very best installation would involve the use of a shielded two-wire cable with a third external wire for relay operation. One of the shielded wires would be common, although not grounded, and the remote control "talk-back" switch would be completed through it. Ordinary twisted

pair or "twisted three" wires may be used quite successfully although there will be some tendency to hum and oscillation. Such an installation has proved satisfactory in the author's home.

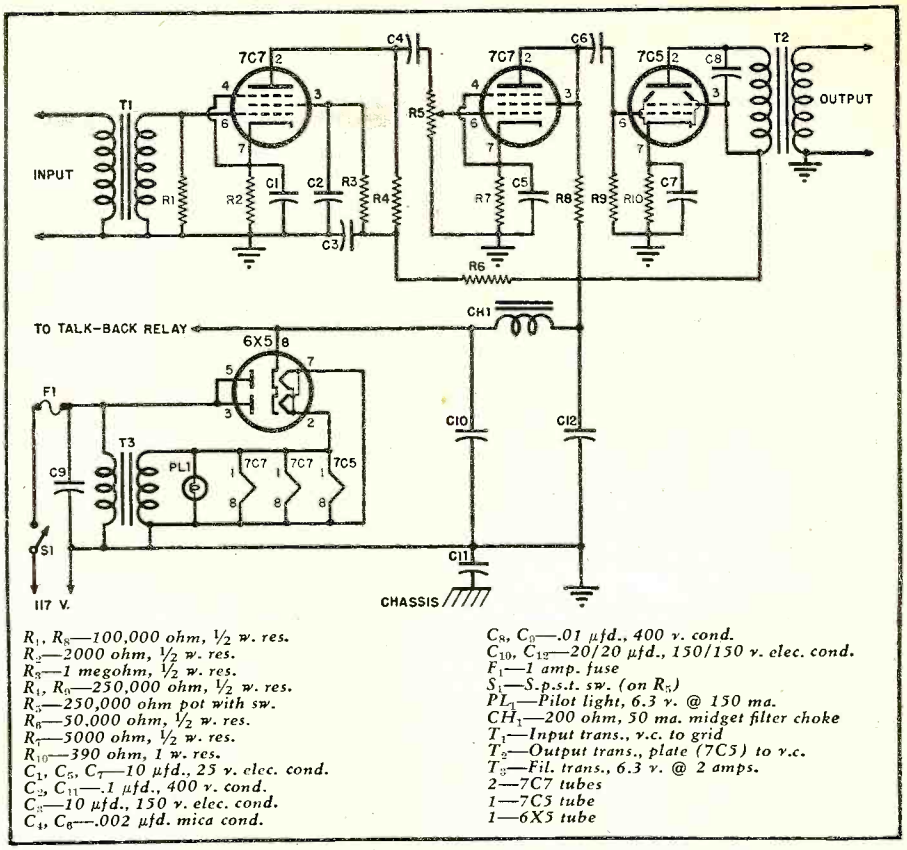
A slightly better amplifier might be constructed using quick heating tubes d.c. operated from the rectifier circuit. This would enable instantaneous operation and give the unit slightly greater usefulness under some circumstances.

In the author's home the amplifier and key box are mounted together on the wall of the kitchen. A hole was cut in the wall and the equipment was placed in the recess between the walls. The panel is made of wood with openings for the speaker and keyboard. The chassis is attached to this panel and projects into the partition. All wires are attached to the rear of the chassis as they emerge from a conduit from the cellar. It is advisable to enclose the whole chassis in a metal box to reduce the possibility of fire hazard. Space may be left on the panel to mount indicators for equipment located in the cellar which may be left on accidentally. The photograph shows this feature.

The connections for the "talk-back" switches need some additional explanation. If it is not necessary for the remote points to *originate* "talk-back," no relay will be needed. In other words, if while Dad is working in the cellar and listening to the children while they nap and need not talk to them from his monitoring speaker, the wiring can be slightly simplified. In place of the relay at the central control point, a double-pole, double-throw switch may be used. When the relay is used the "talk-back" switch at the central control point becomes a single-pole, spring-return switch and the relay contacts take the place of those that otherwise would have been on the manual switch. The "talk-back" switches at the remote speakers are always of the single-pole, spring-return type.

The relay winding must have a high resistance d.c. coil that will operate on 10 mils or less and the contacts must be double-pole, double-throw. A 10,000 ohm coil is best, but a coil having less resistance may be used providing enough resistance is connected in series with the winding to limit the current to a reasonable value. A 5000 ohm coil with a 5000 ohm resistor in series would probably work all right.

The lines running to the remote speakers should be shielded from each other in spite of the fact that they may be inside of pipe. The pipe is merely used to provide an easy method of installation after the house is built. The pipe should be grounded as should the shielding, but the wires should not be grounded because they would then connect to one side of the power line. As shown in the circuit diagram, one side of the line is connected to the common side of the wiring in the chassis and to one side of the power line. Note that the metal chassis of the amplifier is not directly connected to the common side of the wiring of the unit or to ground. This is now standard practice in a.c.-d.c. circuits and it is the safest way to build a.c.-d.c. equipment.



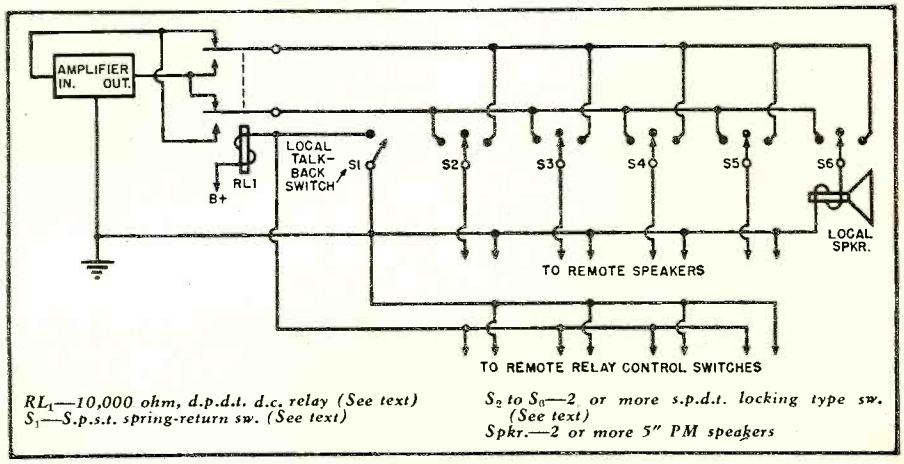
R_1, R_8—100,000 ohm, ½ w. res.
R_2—2000 ohm, ½ w. res.
R_3—1 megohm, ½ w. res.
R_4, R_9—250,000 ohm, ½ w. res.
R_5—250,000 ohm pot with sw.
R_6—50,000 ohm, ½ w. res.
R_7—5000 ohm, ½ w. res.
R_{10}—390 ohm, 1 w. res.
C_1, C_5, C_7—10 μfd., 25 v. elec. cond.
C_2, C_{11}—.1 μfd., 400 v. cond.
C_3—10 μfd., 150 v. elec. cond.
C_4, C_6—.002 μfd. mica cond.
C_8, C_9—.01 μfd., 400 v. cond.
C_{10}, C_{12}—20/20 μfd., 150/150 v. elec. cond.
F_1—1 amp. fuse
S_1—S.p.s.t. sw. (on R_5)
PL_1—Pilot light, 6.3 v. @ 150 ma.
CH_1—200 ohm, 50 ma. midget filter choke
T_1—Input trans., v.c. to grid
T_2—Output trans., plate (7C5) to v.c.
T_3—Fil. trans., 6.3 v. @ 2 amps.
2—7C7 tubes
1—7C5 tube
1—6X5 tube

Diagram of amplifier unit. Circuit is conventional, using three stages of amplification.

After construction has been completed there will be only one thing in the nature of an adjustment to be made; the input and output transformers should be phased for best operation. With all connections made and the local and remote speakers connected, try reversing the polarity of either the input or the output transformers. Either the primary or the secondary may be changed, whichever is most convenient. It may be somewhat easier to make the test if a resistor of the proper size is substituted for the remote speaker voice coil, since the test must be conducted with the local speaker connected to the output of the amplifier while the remote speaker is connected to the input and there will be a tendency for howling to occur due to acoustical feedback. The purpose of the test is to determine the polarity of the transformer windings that will give the least electrical feedback from input to output of the amplifier—acoustical feedback must be prevented during the test. With this completed there should be no other adjustments required other than routine adjustment of the volume control to suit conditions in the home.

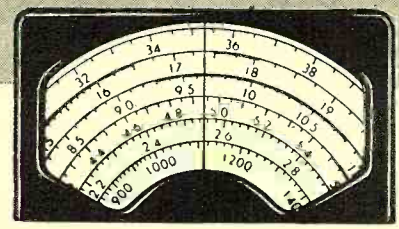
—30—

Schematic diagram of keyboard assembly. Relay can be omitted if the talk-back feature is eliminated. A d.p.d.t. switch may then be substituted for the relay.



RL_1—10,000 ohm, d.p.d.t. d.c. relay (See text)
S_1—S.p.s.t. spring-return sw. (See text)
S_2 to S_6—2 or more s.p.d.t. locking type sw. (See text)
Spkr.—2 or more 5" PM speakers

International SHORT-WAVE



Compiled by **KENNETH R. BOORD**

For Beginning SWL'S

IT IS a pleasure this month to dedicate the *ISW Department* to the "beginning" SWL (short-wave listener). We are grateful to the Amalgamated Short Wave Press, Ltd., London; August Balbi, California; Lee Neidow, Jr., Chicago; Paul Kary, Pennsylvania; DXSA, Australia, and others for some of the following suggestions to the "beginning" SWL.

International broadcasting stations (and amateur transmitters) are usually found within certain small ranges on the dial of your receiver. There are a number of so-called broadcasting "bands"; for example, the 11, 13, 16, 19, 25, 31, 41, and 49 meter bands; and the amateur stations normally operate on the 2½, 5, 10, 20, 40, 80, and 160 meter bands.

In some countries, listeners think of stations as transmitting on a certain wavelength (meters), but at international radio conventions of the past, it was decided that channels be allocated according to frequency (in kilocycles), that is in multiples of one-thousand cycles, specified in "kilocycles-per-second." Nowadays, frequencies are often given in megacycles-per-second where one megacycle (mc.) equals one-thousand kilocycles (kcs.)

Channels are usually allocated to stations in intervals of 5 kcs. over the range, 1500 to 30,000 kcs., though quite a number of stations are now operating on frequencies that are not multiples of 5 kcs. The object of allocating channels at 5 kcs. intervals as often as possible is to attempt to cut down interference between adjacent stations, but in the case of broadcasting stations in particular, this interval is usually not sufficient to ensure complete freedom from interference.

Some stations give their call-sign in frequencies (kcs. or mcs.) while others use wavelength (meters); still others announce both. Some receivers, likewise, are calibrated in kilocycles (or megacycles) while others use meters for that purpose. These are merely two different ways of measuring sound waves, remember. One (frequency) is the number of times each wave rises and falls in a second; the other (wavelength) is simply the length of that wave in meters. (Overseas, "meter" is usually spelled "metre.")

Here is an easy formula which you can use if you want to convert frequencies to wavelengths, and vice-versa:

The frequency in kcs. =

$$\frac{300{,}000}{\text{wavelength in meters}}$$

And the wavelength in meters =

$$\frac{300{,}000}{\text{frequency in kcs.}}$$

As an example, the frequency of WWV, 10,000 kcs. (or 10 mcs.), the Bureau of Standards station in Washington, D. C., may be converted to its equivalent wavelength in this manner:

The wavelength (in meters) =

$$\frac{300{,}000}{10{,}000 \text{ kcs.}} = 30 \text{ meters}$$

Conversely, let's take the wavelength of ZFY, 50.00 meters, Georgetown, Guiana:

The frequency (in kcs.) equals

$$\frac{300{,}000}{50 \text{ meters}} = 6000 \text{ kcs. (or 6 mcs.)}$$

The short-wave bands do get more complicated—so here is a list compiled by engineers of *Radio Malaya* Singapore, to cover normal listening requirements:

The 61 meter band (63.00 to 60.00 meters) = 4.762 to 5.000 mcs.

The 49 meter band (50.00 to 48.39 meters) = 6.000 to 6.200 mcs.

The 41 meter band (41.67 to 41.10 meters) = 7.200 to 7.300 mcs.

The 31 meter band (31.58 to 30.93 meters) = 9.500 to 9.700 mcs.

The 25 meter band (25.63 to 25.21 meters) = 11.700 to 11.900 mcs.

The 19 meter band (19.87 to 19.54 meters) = 15.100 to 15.350 mcs.

The 16 meter band (16.90 to 16.81 meters) = 17.750 to 17.850 mcs.

Call-Signs

All countries are allocated blocks of letters from the alphabet from which they can choose their call-signs. International prefixes are as follows:

B—Great Britain (temporary); CA-CE—Chile; CF-CK—Canada; CL-CM—Cuba; CN—French Morocco; CO—Cuba; CP—Bolivia; CQ-CR—Portuguese Colonies; CS-CU—Portugal; CV-CX—Uruguay; CY-CZ—Canada; D—Germany; EA-EH—Spain; EI-EJ—Eire (Ireland); EK—Japan; EL—Liberia; EM-EO—Japan; EP-EQ—Iran; ER—Japan; ES—Estonian S.S.R.; ET—Ethiopia; EU-EY—Japan; EZ—Germany; F—France and Colonies; G—Great Britain; HA—Hungary; HB—Switzerland; HC-HD—Ecuador; HE—Switzerland; HF—Poland; HG—Japan; HH—Haiti; HI—Dominican Republic; HJ-HK—Colombia; HL-HM—Japan; HN—Iraq; HO-HP—Panama; HQ-HR—Honduras; HS—Siam; HT—Nicaragua; HU—El Salvador; HV—Vatican; HW-HY—France and Colonies; HZ—Saudi Arabia; I—Italy; J—Japan; J—Allied Military (temporary); K—United States; K—Philippines (temporary); LA-LN—Norway; LO-LW—Argentina; LX—Luxemburg; LY—Lithuanian S.S.R.; LZ—Bulgaria; M—Great Britain; N—United States; OA-OC—Peru; OD—Lebanon and Syria; OE—Austria; OF-OJ—Finland; OK-OM—Czechoslovakia; ON-OT—Belgium and Colonies; OU-OZ—Denmark; PA-PI—Netherlands; PJ—Curacao; PK-PO—Netherlands East Indies; PP-PY—Brazil; PZ—Surinan (Dutch Guiana); Q—Reserved for coded signals *only;* R—U.S.S.R.; SA-SM—Sweden; SN-SR—Poland; SS-SU—Egypt and Sudan; SV-SZ—Greece; TA-TC—Turkey; TD—Guatemala; TE—Costa Rica; TF—Iceland; TG—Guatemala; TH—France and Colonies; TI—Costa Rica; TJ-TZ—France and Colonies; U—U.S.S.R.; VA-VG—Canada; VH-VN—Australia and New Guinea; VO—Newfoundland; VP-VS—British Colonies; VT-VW—India; VX-VY—Canada; VZ—Australia; W—United States; XA-XF—Mexico; XG-XU—China; XV-XW—France and Colonies; XY-XZ—Burma; YA—Afghanistan; YB-YH—Netherlands East Indies; YI—Iraq; YJ—New Hebrides; YL—Latvian S.S.R.; YM—Formerly Danzig; YN—Nicaragua; YO-YR—Rumania; YS-El Salvador; YT-YU—Yugoslavia; YV-YW—Venezuela; YX-YZ—U.S.S.R.; ZA—Albania; ZB-ZJ—British Colonies; ZK-ZM—New Zealand and South Pacific Islands; ZN-ZO—British Colonies; ZP—Paraguay; ZQ—British Colonies; ZR-ZU—Union of South Africa; ZV-ZZ—Brazil.

Identification

A variety of interval signals are used by short-wave stations of the world and they are important not only as a program "fill-up," but also as a means of identification. This latter aspect is of prime concern to the DX-er whether he be listening to strong or weak signals. How often has Drake's Drum identified a BBC transmitter for a DX-er? Some stations

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announce their call-signs but seldom, often much too infrequently, and even then it may be lost in the QRM/N (interference)—but the inclusion of a familiar interval signal easily seals the identity of a transmitter. Modern broadcasting technique has developed to the place where program planning allows little or no spare time at the conclusion of a half hour's program. Thus, the use of an identifying signal is lessened much to the consternation of the DX-er, who often waits patiently for longer than some folks would think reasonable in the hope that the all-important interval will reveal the location of a transmitter.

The variety of interval signals in use today is only dictated by the number of countries using the ether. A few of the more common identifications which come readily to mind are *Radio Australia's* Kookaburra Laugh and "Waltzing Matilda"; the famous Kremlin Bells of *Radio Moscow;* India's oriental notes; the trumpet fanfare of Paris; and the horn-tones of Czechoslovakia. A host of others could be mentioned which include metronomes, whistles, tin pipes, chimes, and gongs. Also, the use of a national anthem ofttimes aids in the identification of a particular country.

The DX-er owes a debt of gratitude to the prosaic interval signal—for whether it comes from Europe, Asia, South America, or some remote island, it can greatly add to the enjoyment of his hobby.

In general, the two all-important guideposts for the "beginning" SWL are: (1) *When* to tune; and (2) *how* to tune.

To learn "when" to tune, provide yourself with a good, up-to-date SW log, or better yet, join an active radio club that sends out current schedules and tips regularly.

As to "how" to tune, be sure you have the band-changer control set to the correct band. Turn the main tuning knob *slowly* and *carefully.* It is usually wise to turn the volume entirely on (unless noise is very high) until you have correctly dialed the station you want (this prevents passing over a weak signal). When selection has been made, you can then reduce the volume, which will consequently cut down on noise which might hamper enjoyable reception. If your receiver is equipped with a tone control, setting this in the "bass" position will ofttimes tend to reduce noise level.

By following these simple suggestions you can soon learn first-hand how thrilling it is to listen direct to the short-wave "voices" of the universe—*with the whole world literally at your fingertips!*

Reporting

The reporting of short-wave reception is one of the most popular aspects of short-wave listening. Reports should *always* receive adequate preparation. Many DX-ers, although they may consider that the "verification" is

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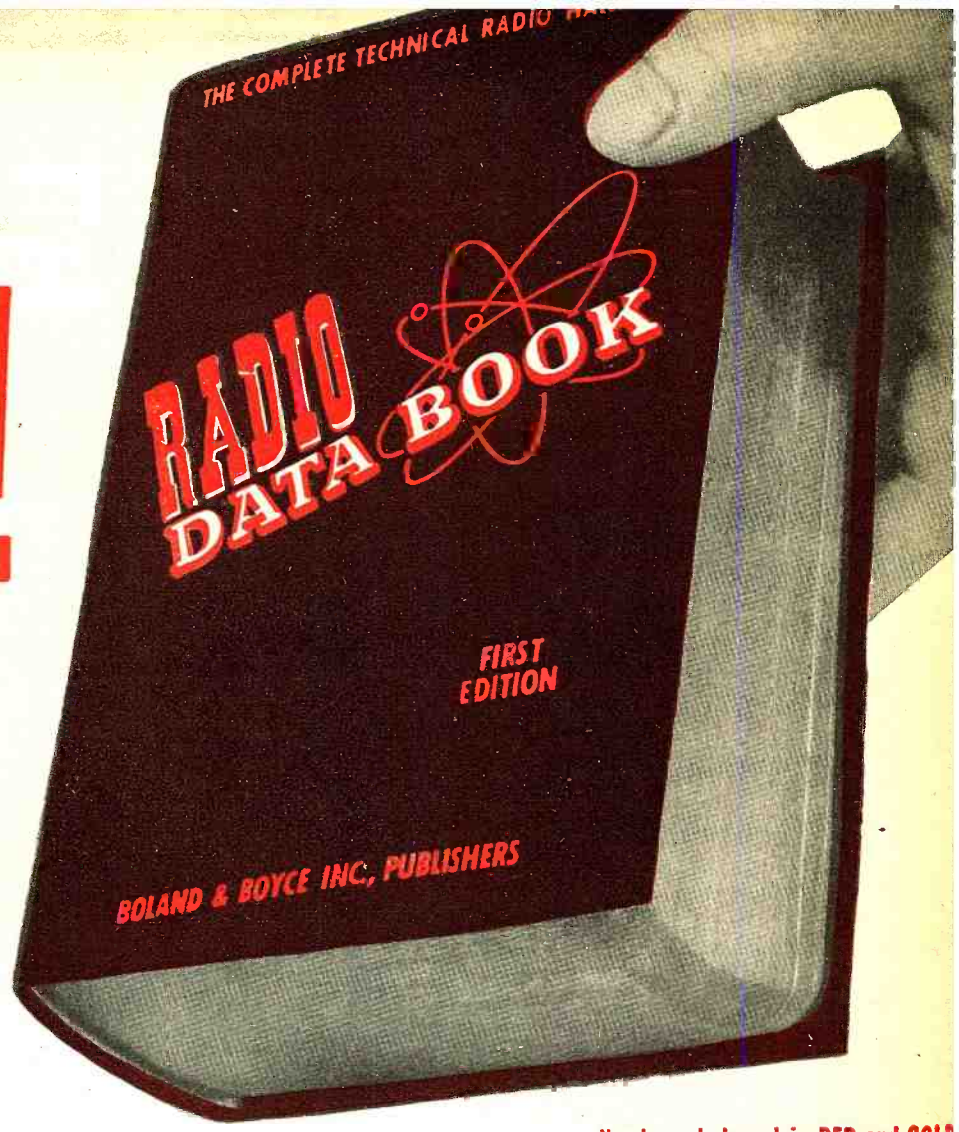

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the "pay-off," yet are careless in reporting. This is most unfortunate for both the stations and the DX-ing fraternity.

It is true that some stations do not verify. On the other hand, some stations will answer almost any report, especially those stations that take the opportunity to send their listeners propaganda literature. However, you should *invariably make your reports of value to the station!* The report that is submitted solely with the intention of securing a verification is usually so obvious in nature that few stations will deem to reply, even if return postage is enclosed. The QSL card (or letter-verie) should be regarded by the conscientious listener as a token of appreciation from a station for services rendered, and reports should be compiled accordingly. With this attitude established, the reporter will stand a much better chance of receiving a reply.

Here are a few hints on reporting and verifying:

1. Be certain you *actually* have the station; listen for *positive* identification.

2. Make *complete* notes, listing what *actually was heard* during *at least* 15 minutes of a particular transmission period, preferably longer. (Make such report on *each* frequency of a particular station that you want verified.)

3. Make your report from what you have set down; be *brief,* but be *specific.* List time of individual items (recordings, identification, type of program, actual speech if you have it down, and the like) in GMT (5 hours *ahead* of EST), which time is used by most stations on their logs. Mention signal strength, fading if any, interference, and so on; tell what kind of receiver was used, type of antenna; state weather conditions at the time you monitored the station. If you can offer *constructive* criticism and suggestions that would be helpful to the station, by all means do so. Ask for a verification of your reception.

4. Send your report *first-class* mail—being certain that sufficient postage is affixed to reach the country of destination. Some stations require return postage and when in doubt be sure to send an International Reply Coupon (IRC), obtainable at your local postoffice (costs 9 cents in the U. S.). Many DX-ers send reports *first-class airmail* with quicker and ofttimes more effective results. (Airletter forms should be used for *only* those stations that do not require return postage.)

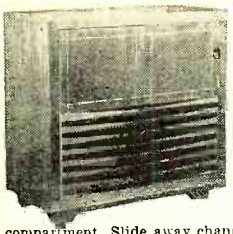
5. Finally, if you know the language of the transmitting country, write in that language; otherwise, use *English.* Be certain you have the correct address on the envelope as well as your own correct address on both the envelope and the report.

Then wait and hope—give the station ample time to reply (ofttimes this requires 3 to 6 months). It is permis-

(*Continued on page* 128)

BUILD THIS 8-TUBE RADIO-AMPLIFIER • COMPLETE KIT—ONLY $29.95

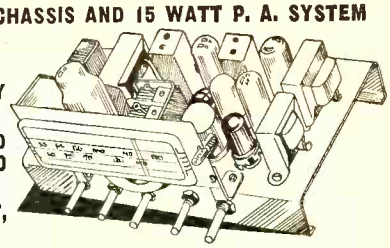
DELUXE CONSOLE CABINET $39.95



- SLIDE AWAY CHANGER COMP.
- RECORD ALBUM COMPARTMENT
- BEAUTIFUL, ALL WALNUT CONSTRUCTION

This is the first time we have been able to offer a beautiful floor model console, RADIO-PHONO cabinet. Finest all walnut construction; hand rubbed finish. 34" long, 32" high, 16" deep. Holds 12" speaker, large record compartment. Slide away changer compartment will accommodate changer of the Webster 56 class and smaller. Receiver compartment is 15x14½x7½ inches. Will accommodate our Model PRK-10 kit; advertised here. Dealers, here is your chance to buy good cabinets at the right price. Convert those low-priced sets into radio-phono combinations. Weight 50 lbs. Net, **$39.95.**
Price with Two Post Oak Changer.....**$56.95**
IF DESIRED, WE CAN FURNISH THIS IN BLOND MAHOGANY AT $10.00 EXTRA.

- **A COMBINED BROADCAST SUPERHET RADIO CHASSIS AND 15 WATT P. A. SYSTEM**
- **HEAVY DUTY 12" P.M. SPEAKER**
- **CROW 8" SLIDE RULE DIAL. 2 GANG COND.**
- **REC. BROAD. 550 TO 1700 KC. HI-FIDELITY PUSH PULL 6V6—TWIN TONE CONTROLS**
- **INPUTS FOR CRYSTAL OR DYN. MIKES AND PHONO-PICKUP. WE FURNISH EVERYTHING TO BUILD THIS DELUXE CHASSIS**
- **WHY NOT ORDER THE CONSOLE ON THE LEFT, WITH YOUR PRK-10**

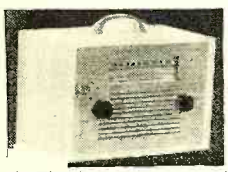


Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6SJ7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs.

PRK-10 Radio-Amp. Kit with 12" P.M. speaker. With tubes .....Net **$29.95**

PRK-10X Radio-Amp. with tubes and full 165 Mill power transformer and $30.00 value 15" Cinnaudagraph speaker .....Net **$34.95**

PERSONAL PORTABLE KIT, $10.95

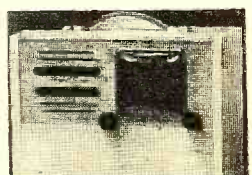


- **4-Tube Broadcast Superhet**
- **Priced Complete with Batteries**
- **Dynamic Speaker • Slide Rule Dial**

PERSONAL PORTABLE KIT MODEL K-PX. Small size leatherette covered case 9x5½x5. Easy to build. Operates on self contained B and A batteries. Rec. Broadcast 550 to 1600 K.C. Incorporates a standard superhet circuit with avc. Has 3 inch Alnico five PM speaker. Priced complete with batteries, pictorial diagram and tubes 1R5, 1S5, 1T4 and 3S4. Not AC DC, but straight battery operated. Has 2 gang cond. Everyone should have one of these personal portables. Everything furnished. Kit K-PN .....Net **$10.95**

3-WAY PORTABLE KIT, $17.95

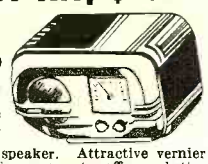
- **4 Tubes Plus Disc Rectifier**
- **300 Hour Battery Pack Included**
- **Beautifully Built Portable Case**



Build this powerful, 4-tube, 3-way portable kit. Operates on 110 volts AC or DC or self contained batteries. Receives broadcast 550 to 1650 K.C. Incorporates a standard superhet circuit with AVC and loop Ant. Has Alnico 5 PM Speaker, 2 gang condenser. All Parts and batteries are furnished including tubes, Disc Rectifier, 1R5, 1T4, 1S5 and 3S4. Has attractive leatherette portable cabinet size 7x9x9. Weight 14 lbs. Kit Model 3-ZA. Net **$17.95**

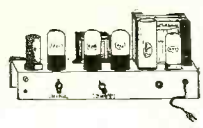
5-Tube AC-DC Broadcast Kit, $9.95

BEAUTIFUL 10" PLASTIC CABINET
LOOP AERIAL • VERNIER DIAL
DYNAMIC SPEAKER • EASY TO BUILD



Kit Model P-85. We have finally been able to achieve our goal. Here it is. A good 5-tube broadcast AC DC superhet radio receiver for less than ten dollars. The beautiful 10 inch plastic cabinet is made of the finest material. The chassis is of the standard accepted superhet design. 456 KC ifs AVC and 5 inch Alnico 5 PM speaker. Attractive vernier dial. Two gang tuning condenser. Loop ant. We defy anyone to offer a better working AC DC receiver kit. Priced complete with diagram, photos and tubes 12BE6, 12BA6, 12AT6, 50B5 and 35W4. Nothing else to buy. You can't go wrong on this value. Kit Model P-85.....Net **$9.95**
SUPERHET. 4-Tube. 1½—90 Volt FARM RADIO KIT complete, less 1000-hour battery; similar cab. to Model P-85. Model PB-48.....Net **$9.95**

12-WATT AMPLIFIER KIT, $10.95



PUSH PULL 6V6 OUTPUT TUBES
GAIN FOR MIKE AND PICK-UP
EVERYTHING FURNISHED. EASY TO WIRE
FINE TONE QUALITY

KIT MODEL AC-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched component parts, ready punched chassis pan. One control fades from phono to microphone. Gain enough for crystal or dynamic microphone, 100 mil power transformer, for 110 volt AC 60 cycle operation. Priced complete with tubes: 2—6V6, 6SN7, 6SH7 and rectifier. Diagrams and photos furnished. Kit AC-12. Net **$10.95.** 12" Alnico 5 PM speaker **$6.95** extra; crystal microphone and desk stand **$4.95** extra.

1948 MODEL—MIKE-BROADCASTER ONLY $7.95

Broadcasts 800 to 1500 KC from either a phonograph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Gives broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model; using 2-35L6, 12SJ7 and 35Z5 tubes. Priced with tubes and connecting instructions. Wired and tested. Works on 110 volts AC-DC. Crystal mike and desk stand $4.95 extra. Model DE-5 truly a de-luxe mike-phono oscillator.

MIKE-OSCILLATOR
800 to 1500 KC

Mike Oscillator model C-4. Not only does the unit work as a phono-osc., but has added gain stage for a crystal mike. Priced complete, wired and tested with 3 tubes and fader control.
Net **$4.95.** Crystal Mike.....**$4.90** extra

3-TUBE PHONO. OSC. ONLY $3.95

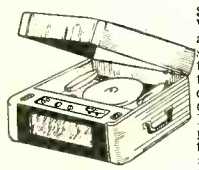
Model DE-4—Phonograph oscillator. Broadcasts from 800 to 1500 KC. Gain for any crystal pick up. A new powerful circuit is used to assure plenty of power. Has variable gain control for proper modulation. Priced with tubes ready to operate, two 50B5 and 34W4. Model DE-4 Net.....**$3.95**

SUPERHET BROADCAST TUNER for connection to phono amp. or P.A. system. Compact chassis 5x3½x3 inches. May be mounted inside the record player cabinet. Requires only three connections to amplifier. Uses 6SA7 or 12SA7; 6SK7 or 12SK7 and crystal diode. Complete with tubes, loop antenna, dial and instructions for connecting to any amplifier. Net **$7.95.** Specify if tuner is to be used with AC or AC-DC type amplifier.

RA-10 RECEIVER $11.95

RA-10 4 bands; 150 to 400 KC, 400 to 1100 KC, 2 to 5 MC, and 5 to 10 MC. 7 tubes of the 6 volt type. Has 28-volt built-in dynamotor. Shipped less remote control. Only a few to sell at $11.95. Case size 10 x 12 x 14 inches. Weight 20 lbs. Price.....**$11.95**

PORTABLE RADIO RECORDER KIT $54.95



$90.00 value for only $54.95. We furnish every part to build a powerful radio and dual speed recorder. The attractive leatherette case houses the sensitive superhet broadcast radio and General Industries R90L 33⅓ and 78 RPM dual speed recorder; play back mechanism. The 6 tube receiver and amplifier is all on one chassis; 12SA7, 12SQ7, 12SK7, 12SL7, mike gain; two 35L6 push-pull output; plus disc rectifier. Has plenty of gain for crystal or dynamic mike. Has 6" heavy duty PM speaker and tone control. Kit G-31, everything complete, with tubes and diagram. **$54.95.** Crystal mike and desk stand **$4.95** extra. This is without a doubt one of the best values in kits we have ever offered. Wt. 40 lbs.

WIRE RECORDER KIT—$79.50

Here is what you get. A Webster 79 wire recorder mechanism, with 15 minute spool of wire, a portable leatherette split case, a 10" PM speaker. Complete kit of parts to build an 18 watt power amplifier, with gain for crystal or dynamic mike. Complete wiring schematic and instructions. Amplifier incorporates 2—6V6, 6V6 erase circuit, 1—6J5, 2—6SN7, and 5Y3, and all circuits and switches necessary to record or play-back on wire. This amplifier may be used as a conventional P.A. system. A real value. Xtal Mike $4.95 extra.
Kit Model WSW-7. Net.....**$79.50**

ARM CHAIR CABINET $29.95

Beautifully made, walnut Armchair cabinet. Outside dimensions, 24 high, 16½ wide and 27 inches deep. Ample room for radio receiver and changers up to 14" square. Will hold 15" speaker. Net. **$29.95.** Receiver compartment size 15 x 10 x 10 inches. Has un-cut receiver and changer panel.

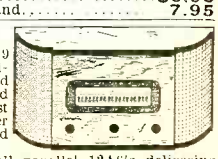
20-WATT UTILITY AMP. KIT. $17.95

Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched aluminum chassis, size 12 x 6 x 2½ inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain, for crystal or dynamic mike. Has bass and treble controls. Designed for use with PM speakers; has 8-16 ohm output transformer. All parts, controls, transformers and easy-to-follow diagram furnished, including tubes: 2-6SN7, 6J5, 2-6L6GA, 5Z3. Kit Model 20-LX. Net.....**$17.95**
12" 12 watt Alnico 5 PM speaker, $6.95 extra. Astatic crystal mike and desk stand, $7.95 extra.

6-110 VOLT UTILITY AMP. KIT, $29.95

Model X-26L 20 watts output. Similar in appearance to the model 20-LX except on slightly larger chassis. Has same tube line up and input circuits. Has power supply that will work on 6 Volt DC, or 110 Volts AC. Equipped with super heavy duty vibrator. Has output voltage to run a reg. AC phono motor when used as a 6 volt unit. All parts tubes and easy to follow diagram furnished.
Model X-26L amp. kit. Net $29.95. Ship. weight 30 lbs. Latest 12 in. P.M. Alnico, V speaker, 12 watt. Net **$6.95**
Crystal mike and desk stand.....**7.95**

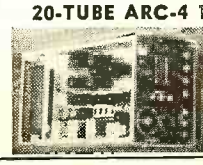
9-TUBE KIT $19.95



AHK-11 Kit. A deluxe 9 tube, twin speaker, high fidelity receiver kit; housed in a beautiful hand rubbed walnut cabinet; of latest design, with dual speaker grills in perforated gold tint plastic.

Circuit employs push-pull parallel 12A6's delivering 10 watts of undistorted power to twin 6" G.E. Alnico V speakers. Other tubes: 12K8, 12SK7, 12H6, 12J5, 12SL7 and two dry disc rectifiers in voltage doubler circuit (equivalent to 11 tubes in all). Has 10" slide rule dial. Complete with instructions; ready to wire. Your Net **$19.95**

20-TUBE ARC-4 140-152 MC. $19.95



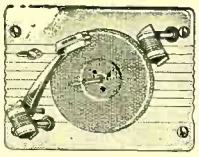
Has 6 Volt Type Tubes for operation on VFH frequencies from 140 to 144 MC. Four channels crystal controlled transmitter and receiver. Designed for 12 or 24 volt DC operation. Scoop Price **$19.95**
Weight 35 lbs.

McGEE RADIO COMPANY

WRITE FOR CATALOG

SEND 25% DEPOSIT — BALANCE C. O. D.
1225 McGEE ST., KANSAS CITY, MISSOURI

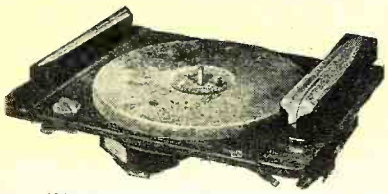
MAGUIRE AUTOMATIC RECORD CHANGER $9.95



Brand new factory cartoned. This changer should sell for three times our price. Latest two-post, quick change type. Has permanent built-in needle, shuts off on the last record. Plays 12 10" or 10 12" records. Fully guaranteed. Base size 16 x 13 inches. Scoop price $9.95. Made to fit walnut base $2.49, extra.

Aero Changer, Base size 12 x 13 inches **$12.95.** Walnut base $2.49 extra.
Vm-800 Changer, Base size 13 x 14 inches **$14.95.**. Walnut base $2.49 extra.
Oak Twin-post Changer, Base size 14 x 14 inches **$17.95**. Walnut base $2.49 extra.
General Instrument Deluxe Changer, Base size 11 x 12 inches, **$17.95**. Walnut base $2.49.
Aviola Changer, Base size 11½ x 12 inches, **$14.95.**. Walnut base $2.49 extra.

G.I. RECORDER MECHANISMS



Latest 1947 General Industries recording assemblies with 4 ohm magnetic cutters and crystal play back.
Model R70-L—78 RPM. Net.....**$24.02**
Model R90-33 and 78 RPM. Net..... **28.37**
Model R130-L—Automatic changer with cutter. 78 RPM. Net..... **39.34**

Webster 79 Wire Recording Mechanism $52.92

WEBSTER 79 WIRE RECORDER, PLAY BACK MECHANISM. Wiring diagram of necessary amplifier included with kit. The entire mechanism is a completely assembled unit. Weight 10 pounds. Includes one fifteen minute spool of recording wire. This is the hottest new item in the electronic field. Webster 79 recording mechanism. Net **$52.92**; Extra recording wire, fifteen minutes $2.40; thirty minutes $3.60; one hour $6.45

OUR LEADER PORTABLE RADIO RECORDER $89.50

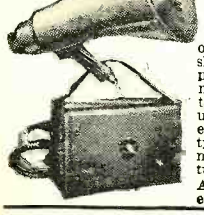
Our leader AC radio and Dual speed recorder. Another leading value in the electronic field. We bought them right and are passing on our buying power to you. This unit has a standard AC, power transformer type, broadcast receiver and recording amplifier. Has General Industries dual speed recorder and playback mechanism, and microphone. A red hot value. Model VT-41 Net **$89.50.**

OUR LEADER FM-AM $29.95

Our greatest AM-FM value. Broadcast and FM band AC-DC, 6 tube plastic radio. Extra sensitive built-in loop. Alnico V 6½ inch oval speaker. Streamline walnut, plastic cabinet, brass grille. Model AM-FM. Net **$29.95.**

SCOOP! SILVER VOMAX $49.95

We have made a lucky purchase, from an over-stocked jobber. The famous Silver Vomax. Vacuum tube volt-ohm-meter. Brand new factory cartoned. Regular net $59.85. A real value at our price. Only **$49.95.**



ELECTRONIC MEGAPHONE SCOOP PRICE $16.95

Only 40 of these to sell. Original cost many times our price. Amplifier straps on shoulder, then just hold megaphone and speak in mike mounted on rear of projector. These units have been used; horns are slightly dented. Amplifier is conventional type. These units may need minor repair. Shipped with tubes. Net **$16.95.** Amplifier is dry battery operated.

"OUR OWN PRIVATE BRAND" OF RADIO TUBES

"HYVAC" .....39c EACH

100 Assorted for $35.00

These tubes are boxed and branded HY VAC. All are guaranteed best quality. Full Replacement.

12SA7GT	6K7GT	6SA7GT	6SJ7	1R5
12SK7GT	6A8GT	1B4	12AT6	1S5
12SQ7GT	5Y3GT	39	12BA6	#3Q4
35L6GT	12A6	6SD7GT	12BE6	3S4
35Z5GT	12SR7	6SK7GT	35W4	70L7GT
12K8	6Q7GT	6SQ7GT	50B5	
12SF7	6K6GT	25L6GT	35B5	
50L6GT	6V6GT	117Z3	1T4	
6SN7GT	6X5GT	117L7GT	1L4	

75% OF ALL THE TUBES YOU USE FOR 49c each

Guaranteed Standard Brands Cartoned and Uncartoned.

5U4G	6SF5	12SG7	14R7	43 78
6C5	6SF7	12SH7	14S7	45 80
6C6	6SG7	12SJ7	25Z6GT	56
6D6	6SH7	12SL7GT	26	76
6F6GT	6SL7GT	14A7/12B7	27	75
6H6	6SR7	14B6	35Z3	77
6J5	12C8	14C7	35Z4GT	
6K6GT	12H6	14H7	41	**49c EACH**
6SC7	12J5GT	14Q7	42	

7A6	7H7	35A5	1LA4	1LE3
7A7	7N7	0Z4	1LA6	1LH4
7A8	7Q7	1H5GT	1LB4	1LN5
7B4	7Y4	6A7	1LC5	
7B5	7Z4	6A8	1LC6	**79c EACH**
7B6	30	1N5GT	1LD5	
7B7	32	1A7GT		
7C6	33	305GT		
7C5	34	50A5		
7E7	35A5	35Y4	6L6	**99c**
7F7	35/51	**69c EACH**		

CATHODE RAY TUBES

Guaranteed. Brand New

3AP1	$2.95	5FP7	$2.95	9LP7	4.95
3BP1	2.95	7FP7	3.95		

"SPEAKERS" WORLD'S LOWEST PRICES

12" PM 7 oz. Alnico V Magnet 18 watts.....**$5.95**
12" PM 5 oz. Alnico V Magnet 15 watts..... **4.95**
12" 1000 ohm field Operadio worth 15.00..... **5.95**
12" PM 20 oz. Alnico 3 Magnet 20 watt Scoop Price **$4.95**. 5 for..... **$22.50**
10" PM 20 oz. Alnico 3 Magnet 20 watt Scoop Price **$4.45**. 5 for..... **20.00**
3½" PM 1.5 oz. Alnico 5 Magnet..... **$ .99**
4 " PM 1. oz. Alnico 5 Magnet..... **.99**
5 " PM 1 oz. Alnico 5 Magnet..... **.99**
5 " PM 1.5 oz. Alnico 5 Magnet..... **1.19**
Square 6" PM 5 oz. Alnico 3 Magnet. Ideal for auto radio replacement. Scoop Price **$1.49**, 10 for... **$13.50**
5½" G. E. PM speaker. Mounts for 6 or 6½". Has single output transformer. A $3.50 value for only **$1.95**. 10 for..... **$17.50**
8" Alnico V 2.15 oz. magnet. Made by one of the largest speaker manufacturers. Special..... **$2.95**
8" Alnico V 3.16 oz. magnet. A high grade speaker. Special..... **$3.75**

6½" 1.5 oz. Alnico V...**$1.95**
6½" 2.15 oz. Alnico V. **2.49**
6½" 3.16 oz. Alnico V. **2.98**
5" 450 ohm Utah. **$1.95**
5" 3000 ohm Utah. **1.95**
6" 450 ohm ... **2.49**
8" 1800 ohm ... **2.98**

MALLORY 4-PRONG VIB $1.29

Heavy duty 4 prong vibrator, 6 volt nonsyn. Has 8 points. Standard base connections fits 70% of all car radios. **$1.29** each, 10 for **$11.95**, 50 for **$55.00**, 100 for **$99.95.**

TUBULAR ELECTROLYTICS

In paper tubes with pig tail leads

Cornell-Dubilier, 8 Mfd. 450 volt **$0.39** each. 100 for..... **$32.50**
Cornell-Dubilier, 16 Mfd. 450 **$0.59** each, 10 for..... **5.25**
Aerovox, 8 x 8 Mfd. 450 volt, **$0.49** each. 10 for **4.50**
Aerovox 20 x 20 Mfd. 150 volt. **$0.39** each. 10 for..... **3.50**
Sprague, 50 x 30 Mfd. 150 volt. **$0.49** each. 10 for..... **4.25**
Solar 50 x 30 Mfd. 20 Mfd. 25 volt **$0.59** each. 10 for..... **4.90**

SPECIALS IN TUBULAR CONDENSERS

Cornell Dubilier .05 Mfd. 600 volt condenser. Scoop Price **$0.09** each. 100 for..... **$7.50**

Solar Sealtites .05 Mfd. 400 volt condensers or .01 400 volt **$0.07** each. 100 for..... **$5.00**

600 VOLT TUBULARS, MANUFACTURERS TYPE

Guaranteed all good brands condensers: .001, .005, .01, .02, .05, all 600 volt. Any size **$0.08** each. 100 assorted for..... **$6.50**

POPULAR F.P. ELECTROLYTICS

In Alum. Cans. Easy Twist. Mounting all small size. All are 1x2 or 1x3 in.

40x20 150V. 39c
40x20 150V. 10x25V.49c
40x20x10 150V. 69c
16x16x450V. 49c
20x450V. 39c
20x350V. 20x20 25V.19c

15" CINNAUDAGRAPH JUKE BOX SPEAKER $9.95

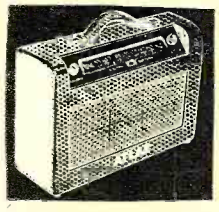
Here is without a doubt the best bargain in the whole U. S.. A Jumbo 15 in. speaker made for the famous Aireon Juke box. Has standard 1½ in. 16 ohm voice coil and 12000 ohm field. The field may be easily excited by hooking to your radio or amplifier as a bleeder. Packed in original cartons. Fully guaranteed. Here is your chance to get a speaker that will bring out those low notes. Our scoop price. $9.95 each, two for only $19.00.

"Best Bargain in America"

20 WATT AMPLIFIER $29.95

This is a beautiful amplifier, fully shielded with cover and radio type indicator knobs. 14 watts average output. 25 watt peak, priced with tubes 6SL7, 2 6SL7, 26V6, 5Y3, 2 mike inputs and phono input. Response 50 to 12000 CPS. Made by Eastern Amplier Co. Model 14A. NET **$29.95.**

LOWEST PRICES ON RADIOS



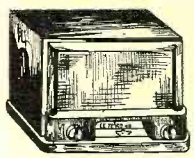
ATLAS 3-WAY PORTABLE 6 TUBES $22.95

Dealers Net $22.95 Each. Three for $66.00. Kit of Batteries, $2.99 Extra.

Here's the hottest buy you ever run onto in a radio set. Many dealers are selling this same radio for $49.50 less batterys, under a very popular standard brand name. We were lucky getting a quantity of these sets but of course had to take them under a private brand. You will probably recognize this set. Has 6 tubes as follows: 2-1N5, 8H5, 1A5, 3Q5, 117Z6VT. Has tuned R.F. stage, very sensitive. No doubt one of the best portables made. This set sells regular for $34.50 less batterys wholesale. Hurry your order, only a few hundred available.

6-TUBE AC-DC MAHOGANY CAB. $17.95

This one is a honey. Sold wholesale in 1947 season for $25.00, $39.50 list. We made a lucky purchase of a quantity of these sets. Many were sold under a very popular label for $25.00 wholesale. You will probably know this set. It's a six tube radio with R F stage, latest AC-DC circuit and is highly sensitive, making it very good for remote locations. Cabinet is high quality mohagany period design. You will like this set. Rush your order. ATLAS 6 TUBE SET NET. $17.95, each THREE FOR..... **$51.00**



ELECTRONIC LAB. 6-TUBE AC-DC $16.95

Compares with any set up to $40.00 list. Has six tubes 2 12SK7 12SA7 12SQ7 35L6 35Z5. Has RF stage. This set is highly popular where stations are hard to get. Has beautiful mahogany cabinet 13 in. long. Slide rule dial. Sold all this season for $23.75 wholesale. Only a few hundred to sell. Choice of Blond or Walnut Cabinet **$16.95** each. Lots of three..... **$15.95**

"HOTTEST PICK ME UP RADIO IN AMERICA"

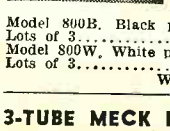
NO TALLER THAN A PEN

NET EACH $22.95

IN LOTS OF 3 $21.95

Model 747—3 way personal radio. Receives broadcast 550 to 1650 KC. Small size only 4x5x8 inches. However, uses full size parts with 2-gang condenser and loop. Priced complete with 4 miniature tubes and disc rectifier. These sets are only slightly larger than the smallest personal radio. Volume and tone like a big set. Kit of batteries $2.05 extra.

MECK PEE WEE SUPER $11.95



Meck, 5 tube superhet; using miniature tubes. Small plastic cabinet (7x4x5"). 2 gang condenser, loop antenna. Alnico 5 PM speaker. This is a red hot value in a small radio receiver; broadcast 550 to 1650 KC. Priced with tubes; ready to play.

Model 800B. Black plastic cabinet.....$11.95
Lots of 3.....**$10.95**
Model 800W. White plastic cabinet.....$12.95
Lots of 3.....**$11.95**
Weight 5 lbs.

3-TUBE MECK FM CONVERTER $14.85

Housed in the same cabinet as the MECK 800B shown above. Converts any table or console radio to receive FM programs (new band 88-108 m.c.). Employs super-regenerative circuit that is nonradiating, yet provides full noise reduction and frequency range of FM broadcast. Converts to audio system of AM set in exactly the same manner as you install crystal pickup of phono player (has plug-in connector to use on sets now having phono jack).

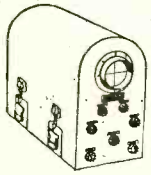
McGEE RADIO COMPANY WRITE FOR CATALOG

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

BC-645 TRANSMITTER RECEIVER BRAND NEW $9.95

2 big units; all in one. A 10 tube superhet receiver for 450 Megacycle, a 5 tube 450 megacycle tunned line transmitter. Both are two channel. 4-7F7, 4-7H7, 2-7E6, 2-6F6, 2-955, 1-WE 316A. The tubes that come with this unit are worth more than our sale price. This unit originally designed for identification "Friend or Foe" Army BC-645. Brand new factory cartoned, weight 25 lbs. Furnished with four page conversion instructions for a CW or MCW or phone transmitter. How to build a 110 volt AC power supply, etc. 12 volt dynamotor, $2.95 extra. WE-316A tube $.99. BC-645.....**$9.95. 2 for $19.00**

BC-412 $49.95



BC-412-612 Oscilloscope. Brand new factory cartoned, weight 200 lbs. This unit is the most ideal war surplus scope. Works on 110v 60 cycle AC. Only simple changes (conversion in many radio magazines) necessary to convert to a laboratory test scope. Has twin heavy duty plate supplies and tubes 5BP4 5" scope tube, 6—6L6, 2X2, 5T4, 2—6SJ7, 6SC7, 6H6, etc. Schematic diagram with each unit. This may be the last time we have a scoop in a scope like this.

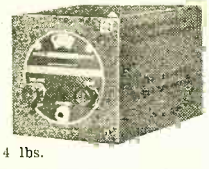
Net **$49.95**

Navy Arb $16.95

You can convert this over easily to a good ham receiver. It's one of the hottest values in surplus receivers. 28 volts DC input. Covers 4 bands. 195 kc to 9 mc. This is a deluxe type superhet receiver, note that the frequency coverage includes the standard broadcast band. Has 4 gang tuning condenser; can be converted to a 110 volt AC receiver. Priced complete with tubes: 12SF7, 12SA7, 3-12SF7 and 12A6. Has dial built on front of chassis. Electric driven or manual band change switch. Weight 28 lbs. Size 6x7x15 inches. ARB Near new condition, with tubes and dynamotor.

Net **$16.95**

NEW BC-1206 $5.95



Designed to receive A-N beam signals, 24-28 vdc. Tube complement: 14H7, 14A7, IF, 14H7, 14H7, 14A7, 14H7, IF amplifier; 14B7, detector and 1st audio; 2SD7, output. 195 to 420 KC. 4" high x 4" wide x 6⅝" long. Weight 4 lbs.

R-89 $6.95

R-89/ARN-5 Glide Path Receiver 11 tube superhet. Formerly used for blind landing. Adaptable for many uses. Receives 326 to 335 MC. Contains six relays. 11 tubes 7—6AJ5, 12SR7, 2—12SN7, 25D7. Size 13x5x6. Weight 12 lbs. A beautiful piece of equipment. Has three crystals. Priced complete with xtals and tubes.

R-89/ARN-5 Near new condition. Net.....**$6.95**

BC-733 D LOCALIZER RECEIVER

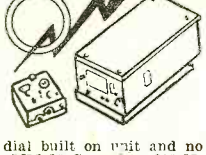
Freq. 108-110 Mc; Tube complement: 10 tubes—1—12SQ7, 2—12SR7, 1—12A6, 1—AH7GT. 2—12SG7, 3—717A. Now only **$6.95**

AM-26 $1.49

AM 26 interphone amplifier. This unit is nice for parts salvage and the aluminum case is usable for receiver building etc. Size 9½x4½x5". Has two transformers, four tube sockets, three mica condensers, three position panel switch, toggle switch, and many small parts. All are in perfect condition.

$1.49; 2 for **$2.49**

RDF RECEIVER $19.95



MM-26-C Compass Receiver. Brand new factory cartoned. This unit covers from 150 to 1500 KC inclusive; in three bands. Complete with eleven tubes of the 6 volt type; 6SA7, 6SK7, 6F6, etc. Has 28 volt built-in dynamotor. There is no dial built on unit and no remote cables are provided. MM-26-C receiver $19.95. Remote control $3.95 extra.

Manually operated loop.....**$6.95**, extra

COMMAND REC. WITH DIAGRAMS

Order your Aircraft command receivers from McGee. We furnish you a schematic of the BC-454 (all are the same except for frequency). Also, a diagram showing how to convert receivers for 110 volt operation.

Brand new BC-453, 200 to 500 K.C., with tubes.....**$6.95**

Brand new BC-454, 3 to 6 M.C., with tubes **$4.95**

Near new BC-454, 3 to 6 M.C., with tubes...**$3.95**

Brand new BC-455, 6 to 9 M.C., with tubes.. **4.95**

Near new BC-455, 6 to 9 M.C., with tubes.. **3.95**

Brand New BC-946 (broadcast), 550 to 1500 K.C., with tubes and inst. **$12.95**

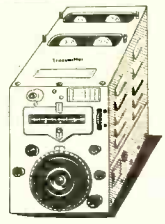
28 Volt Dynamotor for 453, etc.....**$0.95**

Triple remote control head for SCR-274 (BC-453, BC-454, BC-455) **$1.95**

Flexible cable for tuning SCR-274..... **.79**

Mounting Rack for three receivers..... **1.95**

COMMAND TRANSMITTERS $3.95



With each command transmitter, we furnish a schematic of the BC-458 (All command Transmitters are essentially the same; except for frequency.)

Brand new BC-457, 4 to 5.3 M.C., with tubes.....**$5.95**

Near new BC-457, 4 to 5.3 M.C., with tubes.....**$2.95**

Brand new BC-458, 5 to 7 M.C., with tubes.....**$5.95**

Near new BC-458, 5 to 7 M.C., with tubes....**$2.95**

Brand new BC-459, 7 to 9.1 M.C., with tubes.. **5.95**

SWITCH POT SALVAGE 99¢ 3 for $2.50

VIBRATOR SCOOP $1.99

Heavy Duty Vibrator—Made for 6-110 volt amplifiers. Freq. 60 CPS. Scoop price.....**$1.99**

135 ma 6-110 volt conventional power transformer, with all windings; will run phono motor. **$5.95**

(Use with above vibrator.)

VEEDER ROOT METER

Counts number of feet of trailing wire antennae; number turns when winding on coil; applicable for many uses: beautiful bakelite case, jewelled dial-lite, pilot light enclosed, 3 position switch, counts up to 1000.

Each .....**95¢**

NAVY GLIDE PATH SCOOP $3.95

Navy model ZA Glide path receiver. Has 3—6C6 tubes; several controls, transformer and handy case; size 6x7x12 inches. Ideal for salvage, near new condition $3.95; 2 for.....**$6.95**

PACKARD BELL PRE-AMP. $1.99

Housed in a handy aluminum case 5x4x5, priced complete with tubes 6SL7, 2SD7, has many usable parts. Relay and control PL68 plug and patch cord.

G.E. Servo-Amp. Salvage $1.95 EACH

Two for $3.50

G.E. Servo amp Salvage Scoop. This item is ideal to tear up for the pieces. General Electric Servo amplifier has 14 octal tube sockets, 5 small neon lamps. Lots of condensers, resistors and controls. Salvage value more than the purchase price of this unit. Weight 15 lbs. Brand new. Priced less tubes $1.95; 2 for.....**$3.50**

MODULATOR SALVAGE $2.49

Another red hot value in salvage. All kinds of good usable parts in this unit. Con. Res. Relays, Modulation trans. and tubes VR150, 1235 and 1625. Brand new and in factory carton. Originally designed to modulate the BC-457 W.E. Transmitter. You can find many uses for this BC-456 Modulator scoop. Price $2.49; 2 for.....**$4.49**

80 METER XMITTER-REC. $12.95

Two for $25.00

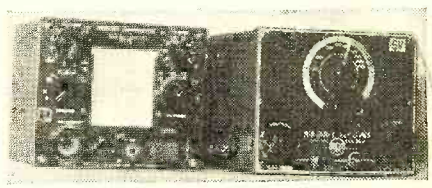
BC-654

Portable voice and CW transmitter and receiver for portable, mobile, and fixed station operation. 7-tube superheterodyne receiver with 3.5 microvolt sensitivity on voice and 0.5 microvolt sensitivity on CW, and 100 milliwatts undistorted power output. 455 KC IF. Uses 3—1N5GT, 1—1A7GT, 2—3Q5GT, 1—1H5GT tubes. 6-tube transmitter, with antenna tuning network, Colpitts thermal compensated oscillator, class C final with 2—807A tubes in parallel, and crystal oscillator for checking frequency every 200 KC. 25 watts output on CW and 11.2 watts output on voice. Frequency range, transmitter and receiver, 3800 to 5800 KC. Ideal for Hams! Comes complete with cover; furnished with all tubes necessary for the operation of the trans. and rec. Less power supplies. These units are used but in good condition. Shipping weight 50 lbs.....**$12.95**; 2 for **$25.00**

654 Vibrator Pack 6 for 12 V.D.C. input **$4.95** extra

SCOOP. BC-654 less all tubes. Net.....**$7.95**

RCA—Aircraft Trans.—Rec.

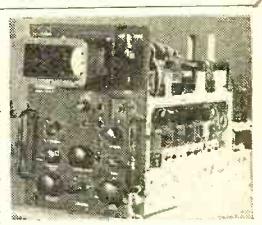


RCA AVT-112 Transmitter; pictured to the left: Brand new RCA aircraft transmitter. Crystal controlled, 2500 to 6500 KC. Designed for 6, 12 and 24 volt DC and 350 volt DC input. 6 tubes: 6AF6 dual tuning indicator, 6V6 Pierce oscillator, 6V6 P.A., 2—6V6 as plate modulators and 6SL7 tuning indicator amplifier. This is the nicest piece of equipment you have ever seen. 6x6x5½ inches and weighs 6 pounds. Every ham or ham to be should have one of these. All brand new with tubes (less crystal) and complete instruction book. This unit covers 80 meters and 3105 and 6210 aircraft bands. Your Net.....**$12.95**

RCA AVR-20A Aircraft Receiver; pictured to the right; small light weight, companion unit to the AVT-12A. A full 3 gang superhet, covering 2300 to 6500 KC, with tubes 6K8, 6S7, 6F7, and 6B8. Brand new, factory cartoned. This is a beautiful, compact piece of receiving equipment. RCA AVR-20A Receiver. Net **$12.95**

RCA AVT-12A Transmitter and RCA AVR-20A Receiver. Both for only.....**$24.95**

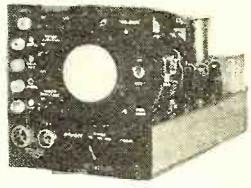
35-TUBE INDICATOR SCOPE $24.95



R-65 APN-9 — Loran Receiver indicator scope. A compact Airborne unit. Priced complete with 35 tubes. 6SK7, 6SN7, 2X2, etc. Has 3 inch scope tube 3BP1. This unit has many possibilities. More parts, coils and controls than you can imagine. Has a 100 KC. General Electric crystal. Pictured with case removed. Size 9x12x16. Weight 35 lbs. These units have been in aircraft but we guarantee them to be in good condition. Net **$24.95**; 2 for.....**$46.95**

You May Make a 3" Test Scope from this BC-9295, $14.95

BC929 RADAR, $14.95

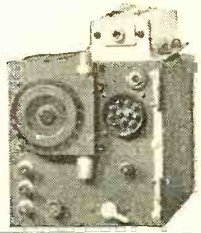


BC-929. A Radar Indicator Scoop. This unit could be rebuilt into a fine test scope. It is an ideal size. 8x9x14 priced with tubes 2—6SN7 2—6H6, 6G5, 6X5 and 2X2. This is a red hot buy. However you will have to change the power trans. for 60 cycle use. Any 50 mil 750 volt radio power trans. will furnish scope H.V. Guaranteed to be in good condition. Scoop Price..**$14.95**

Weight 20 lbs. Has 3 in. Cr. Tube.

We have a few BC-929 Radar Scoops. Brand new in factory cartons at $17.50 each.

2-BAND RECEIVER



ARC-429. 201 to 400 KC and 2500 to 4700 KC. ARC-429A. 201 to 400 KC and 4150 to 7700 KC. Have plenty of either receiver used but in good condition. Priced with 6.6 volt tubes. Scoop price **$2.95**

SELSYN INDICATORS $2.95

Selsyn indicators. 5" diameter. Will operate on from 15 to 24 volts 60 cycle AC. Model 1-82A can be used as either selsyn transmitter or selsyn receiver. Scoop Price, $2.95, 2 for **$5.49**

McGEE RADIO COMPANY

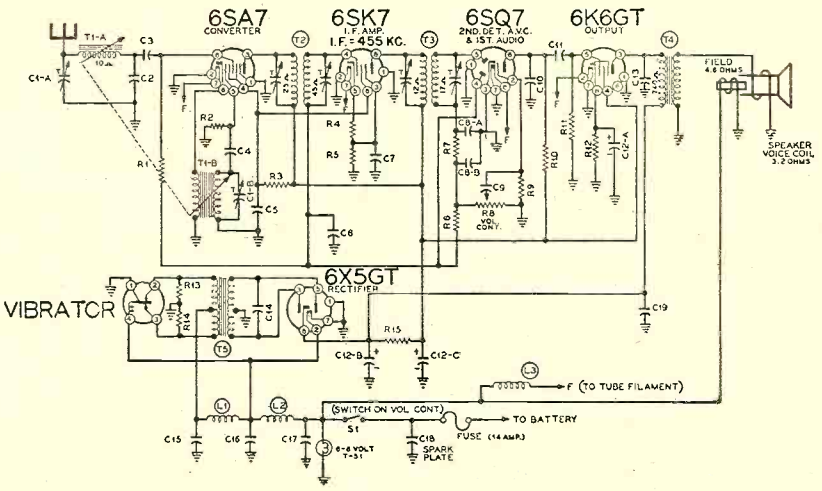
WRITE FOR CATALOG

SEND 25% DEPOSIT—BALANCE C.O.D.
1225 McGEE ST., KANSAS CITY, MISSOURI

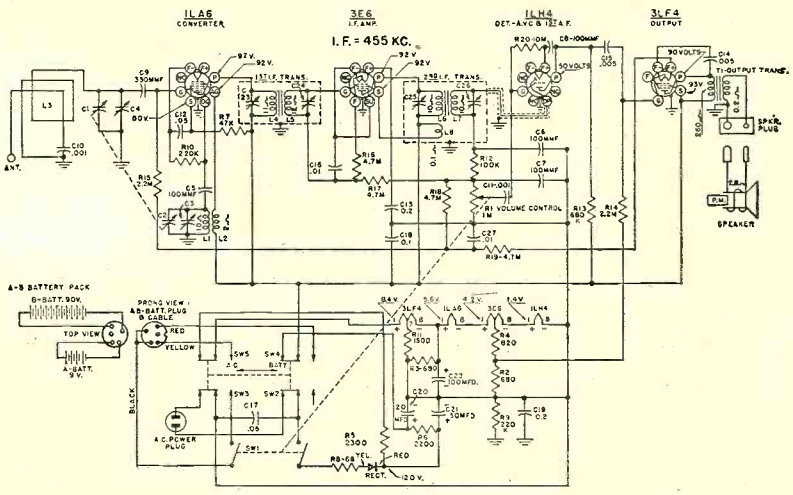
the RN CIRCUIT FILE

(FOR PARTS LIST SEE PAGE 82)

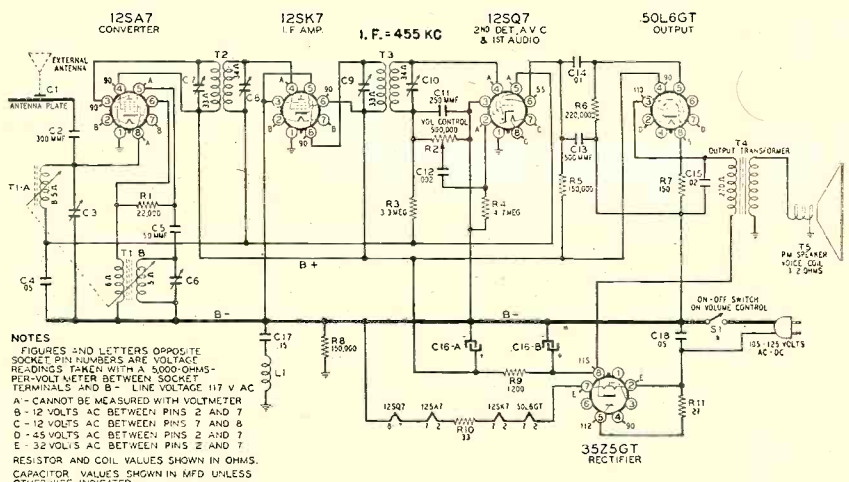
RADIO NEWS, JANUARY, 1948 — **TRUETONE MODEL D4620**



RADIO NEWS, JANUARY, 1948 — **WESTINGHOUSE MODEL H-148**

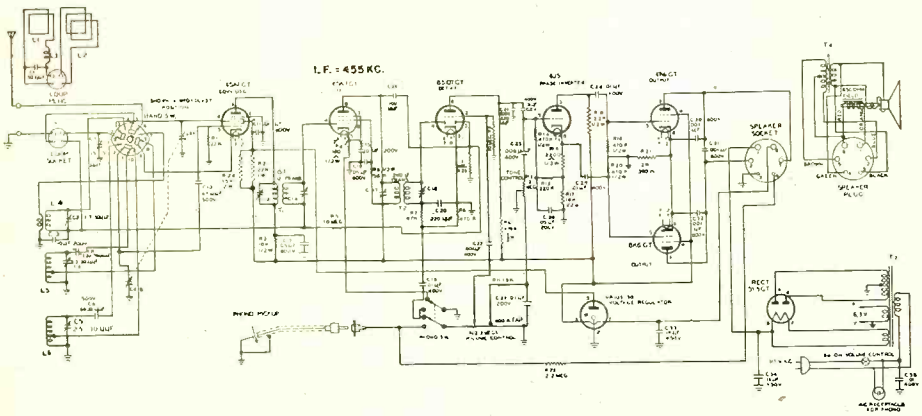


RADIO NEWS, JANUARY, 1948 — **WARDS MODELS 54BR-1501A, 1502A**

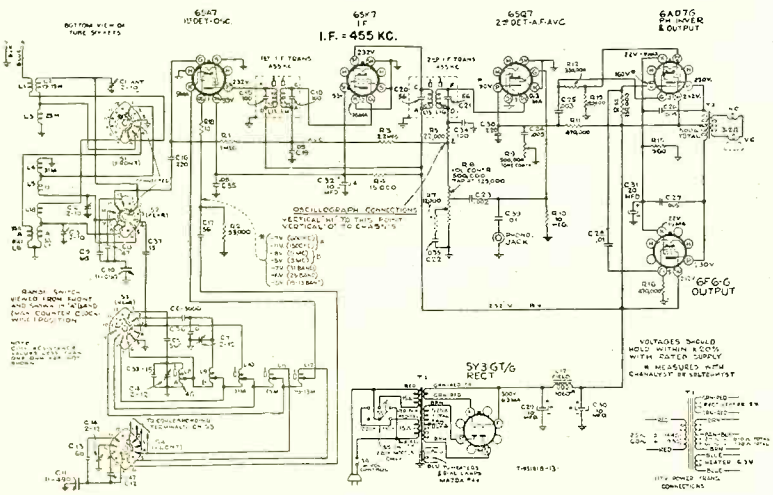


Here, and on following pages, are circuit diagrams and parts lists of many new postwar radio receivers. Radio News will bring to you other circuits as quickly as possible after we receive them from manufacturers.

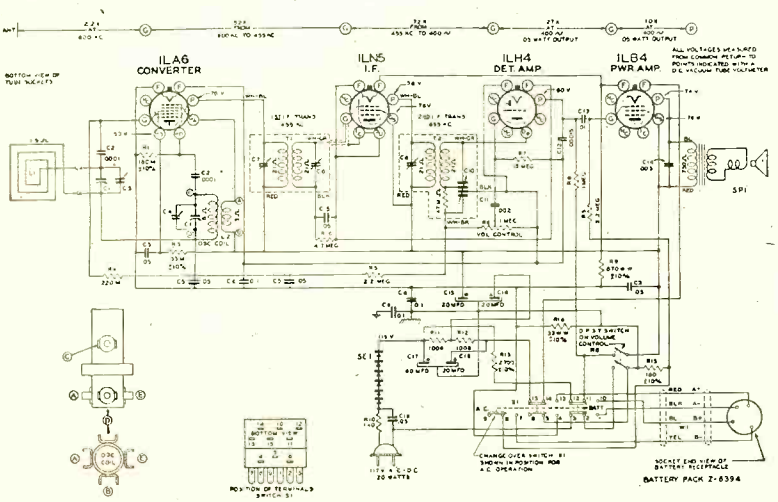
RADIO NEWS, JANUARY, 1948 — MAJESTIC MODELS 8S452, 8S473



RADIO NEWS, JANUARY, 1948 — RCA MODELS Q22A, Q32

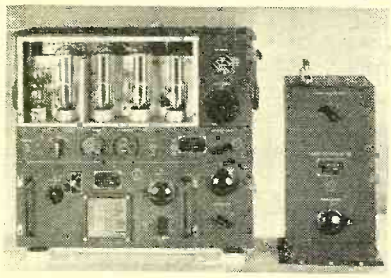


RADIO NEWS, JANUARY, 1948 — ZENITH MODEL 5G003ZZ



RADIOMEN'S HEADQUARTERS ✱ WORLD WIDE MAIL ORDER SERVICE!!!

Minimum order $3.00—All prices subject to change—25% deposit with COD orders.



GENERAL ELECTRIC 150 WATT TRANSMITTER

Cost the Government $1800.00
Cost to you $44.50!!!!

This is the famous transmitter used in U.S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: FREQUENCY RANGE: 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with slight modification.) OSCILLATOR: Self-excited, thermo compensated, and hand calibrated. POWER AMPLIFIER: Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class "B"—uses two 211 tubes. POWER SUPPLY: Supplied complete with dynamotor which furnishes 1000V at 350 MA. Complete instructions are furnished to operate set from 110V AC. SIZE: 21½ x 23x9¼ inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, five tuning units, antenna tuning unit and the essential plugs. These units have been removed from unused aircraft but are guaranteed to be in perfect condition.

BENDIX SCR 522—Very High Frequency Voice Transmitter-Receiver—100 to 156 MC. This job was good enough for the Joint Command to make it standard equipment in everything that flew, even though each set cost the Gov't $2500.00. Crystal Controlled and Amplitude Modulated—HIGH TRANSMITTER OUTPUT and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has ten tubes and transmitter has seven tubes, including two 832's. Furnished complete with 17 tubes, remote control unit, 4 crystals and the special wide band VHF antenna that was designed for this set. These sets have been removed from unused aircraft and are guaranteed to be in perfect condition. We include free parts and diagrams for the conversion to "continuously variable frequency coverage" in the receiver.
The SCR522 complete with 24 volt dynamotor sells at only **$37.95.**
The SCR522 is also available with a brand new 12 volt dynamotor for only **$42.95.**

110V. CIRCUIT BREAKERS of Magnetic type: Following Current Ratings in Stock; 1.25, 3, 4, 8 Amps. Please specify. $1.95 each.

Seven Assorted I.F. Transfomers—**$1.98**; Five Asstd. Oscillator Coils—**69c.**

SPEAKERS-PM dynamic type-4"—**$1.55**; 5" **$1.55**; 6"—**$1.95**; 8"—**$3.95**; 10"—**$5.95**; 12"—**$7.50.**

SELENIUM RECTIFIERS—Dry disc type 1½" 1". 1.2 Amp. maximum, suitable for converting DC relays to AC. for supplying filament source in portable radios, converting DC meters to AC applications, and also may be used in low current chargers 90c.

METER RECTIFIER—Full wave, may be used for replacement, or in construction of all types of test equipment—**$1.25.** Half Wave—**90c.**

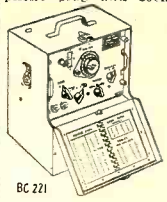
MICROPHONES—All nationally known brands. Bullet crystal—$5.45; Bullet Dynamic—$7.45; Mike Jr.—60c; Handy Mike—90c; Lapel Mike—93c; SHURE T-17 MIKES, with push to talk switch—99c.

20 ASST'D COIL FORMS, including 11 ceramic, 3 polystyrene, and 6 fiber, all useful sizes—**50c.**

VARIABLE CONDENSERS: 350 MMFD, 5 gang—$1.95; 4 gang—$1.49; 3 gang—83c; 2 gang—79c; 7.5 to 20 MMFD, 1750v spacing, extra long shaft Hammarlund—69c; miniature variables, 25 MMFD—39c; 50 MMFD—49c; 75 MMFD—59c; 100 MMFD—69c; 140 MMFD—79c.

FLUORESCENT LIGHT BALLASTS. Single 30 or 40 watt, $1.68; Dual 40 watt High Power Factor—$3.75.

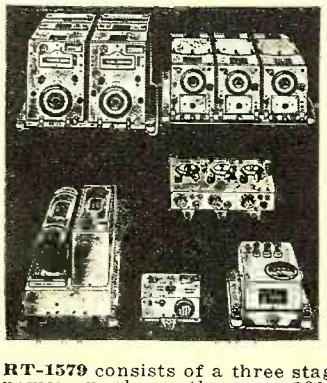
HEADPHONES—Highest quality Signal Corps headsets with 12" cord and plug **$1.25.** 5' rubber covered patchcords with phone plug and socket—45c.



BC-221 FREQUENCY METERS with calibrating Crystal and calibration charts. A precision frequency standard that is useful for innumerable applications for laboratory technician, service man, amateur, and experimenter at the give away price of only **$36.95.**

Six assorted POWER and AUDIO TRANSFORMERS. All new—$1.98
Ten assorted R. F. Chokes including high frequency types—$.35
Five assorted AUDIO or FILTER CHOKES—$.99
One Hundred assorted Resistors—$1.95
Ten new JAN CABLE CONNECTORS including many popular types—$.99
Ten assorted WIRE-WOUND BLEEDERS, 50 and 100 Watt, many with taps—$2.49
Six assorted OIL FILLED CAN TYPE CONDENSERS, all with mounting brackets—$1.49
Ten assorted METAL & BAKELITE KNOBS—(no wooden knobs)—$.39
Six assorted VARIABLE CONDENSERS, including butterfly types—$1.49

The above nine assortments, totaling over $12.00 at the unbelievable bargain prices listed; can be purchased together as one lot at a super-special total price of $9.95,a value so incredible that you will rub your eyes as you read this, our new year get-acquainted offer. All merchandise guaranteed to be as advertised.



SCR-274N COMMAND SET

The greatest radio equipment value in history.

A mountain of valuable equipment that includes 3 receivers that use plug-in coils, and consequently can be changed to any frequencies desired without conversion. Also included are two Tuning Control Boxes; 1 Antenna Coupling Box; four 28V. Dynamotors (easily converted to 110V. operation); two 40-Watt Transmitters including crystals, and Preamplifier and Modulator. 29 tubes supplied in all. Only a limited quantity available, so get your order in fast. Removed from unused aircraft and in guaranteed electrical condition. A super value at **$29.95,** including crank type tuning knobs for receivers.

Westinghouse 9 Amp. R. F. METER with special linear scale—**$3.89.**

Outdated EVEREADY 90 Volt and 1½ Volt Battery Pack. This is a unit larger than an auto battery. Regular price $12.00. Your cost **$1.49.**

Outdated BRIGHT STAR standard flashlight cells. Carton of 48—**$1.00.**

1947 Edition Editors and Engineers Radio Handbook. Regularly $2.50, now **$1.79.**

1947 Edition Amateur Radio Relay League Handbook. Regularly $1.25, now **$.89.**

We are overstocked on the following Rider's Manuals: Rider's A. C. Calculation Charts (complete coil and transformer design data). Regular price, $7.50. Temporarily reduced to **$5.00.**

Rider's Automatic Record Changers and Recorders. Regularly $9.00, now **$5.95.**

ICA 1081 BLACK BAKELITE POINTER TYPE KNOBS. Regular List 20c each; 25 for **$1.00.**

RT-1579 consists of a three stage (cascade 6SJ7's and 6F6 output stage) high gain, high fidelity amplifier with 60 cycle, 110V power supply on the same 13½x14½ chassis, which is protected by a substantial steel cover over tubes and parts. Made by Western Electric with typical quality components such as a husky power transformer and oil condensers, this unit is obviously intended to give years of trouble-free service with no more need for repairs than a telephone. Disconnecting one wire each, from the special input and output filters, will result in as high a fidelity amplifier as can be obtained. Your cost with tubes, diagram and parts list included—**$14.95.**
We also offer the **RT-1579** with a Raytheon Magnetic Voltage Regulator already installed beneath the cover. Imagine an amplifier complete with tubes, built to Western Electric quality standards, and immune to line voltage variations besides, making it perfectly suited for the most difficult industrial, circus, carnival, or commercial installations, offered for a total price of only **$19.95,** our price for both units.

BUFFALO RADIO SUPPLY, 219-221 Genesee St., Dept. IN, BUFFALO 3, N. Y.
CABLE ADDRESS BUFRAD

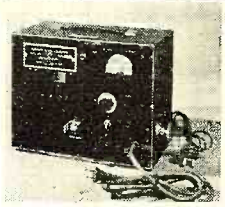
RADIOMEN'S HEADQUARTERS ✱✱ WORLD WIDE MAIL ORDER SERVICE!!!

AT LAST YOU CAN AFFORD A LABORATORY STANDARD MICRO VOLTER

The famous Measurements Corp. Model 78B, 5 Tube Laboratory Standard Signal Generator (that sold new, FOB Boonton, N. J., for $310.00 net), is available in perfect condition for 25 to 60 cycles, 115 V AC operation. Until now this is the sort of top-flight lab equipment that discriminating buyers have only vainly hoped would be released at a bargain price. Worth every cent the manufacturer asks, but available FOB Buffalo while our limited supply lasts for only **$79.95.**

Such companies as Admiral Corp. and John Meck, Inc., have ordered from us and repeated many times on these 78 generators for use in their labs and production line testing.

"REMEMBER THAT A STANDARD IS ONLY AS RELIABLE AS ITS MAKER."



Model 78-B Standard Signal Generator. Two Frequency Bands between 15 and 250 megacycles.

TRANSMITTING RF CHOKES, 4 PIE, 350 Ma.—25c or 5 for **$1.00.**

INTERRUPTION FREQUENCY COILS for super-regenerative receivers or the tremendously popular FM adapters for standard broadcast sets. Iron core with a resonant frequency of 50 KC—39c; Air Core, 100 KC—29c.

30 MC IF TRANSFORMERS, double slug tuned—25c.

VIDEO AMPLIFIER PLATE COILS—Slug tuned—25c.

REMOTE CONTROL UNIT: Aluminum case 4x3x2" containing 2 potentiometers, triple pole switch, 4 knobs, gear mechanism, counter and phone jacks—59c.

MODULATION TRANSFORMERS—10 watt, metal case 98c; 30 watt, open-type, $1.95; 40 watt, cast aluminum case, $2.95; Class "B" input transformers, cast aluminum case, $1.95; Transceiver audio transformers, 65c; Transceiver modulation transformers, 65c.

LINE FILTERS—110V—each unit contains two 2 mfd. oil filled condensers and a 15 amp. iron core choke. This filter has innumerable uses such as oil burner line filter, etc. A ten dollar value for 98c.

$9.95 TAKES ALL THREE BIG BARGAINS

1. AUDIO AMPLIFIER Undreamed of value. Uses 6V6's. Has 4 microphone inputs brought to jacks at rear panel. Various output impedances available at rear panel connections. Steel case with chrome handles. 9" long x 9" high x 6" deep. Tubes included. New in original carton. Shipping weight 15 lbs. **SUPER SPECIAL**—$4.95 while supply lasts.

2. RADIO HEADSETS Latest supersensitive type with rubber earpieces. Every pair guaranteed perfect. $.59 per pair OR 3 PAIRS FOR $1.00.

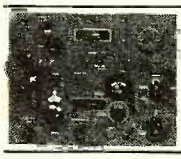
3. HOME WORKSHOP AT BARGAIN PRICE

Accurate and precise 2 speed guaranteed hobby lathe, the essential machine for the home workshop. Sturdy enough for light production work or factory standby service. Supplied with 56" of belting for connecting to any available electric motor or power take-off, such as on a jeep or tractor. Also included in this unbelievable offer are such accessories as a ½" drill chuck with specially hardened tool steel jaws, a 4" electric furnace high speed grinding wheel, a cotton buffing wheel with a large supply of buffing compound, and a 4" steel wire scratch brush. Your cost $6.00. Sole export agent. Distributor inquiries invited.

NO C. O. D.'s

ORDER NOW—DON'T DELAY

RT1463 7 tube amplifiers containing 3—7F7, 1—7Y4, 3—7N7, 4 potentiometers, numerous resistors, filter and bypass condensers, filter chokes, power and audio transformers, and six sensitive plate relays. A military development that provided amazing stepless control proportional to correction required, for ailerons, rudder and elevator, in the original application. A control amplifier of the ordinary type would deflect the rudder by some arbitrary amount when the ship was blown off the course to port or starboard. The result would either be that the correction was insufficient and the plane continued off course, or the correction would be too great, starting a series of tackings that would greatly increase fuel consumption and elapsed time in reaching the objective. This phenomenal unit, with its 3 amplifiers and six 5000 ohm relays in bridge circuits, will accurately control any 3 operations, related or unrelated, in minutely adjustable uniquely quantitative variations in either forward or reverse directions. 9"x7"x8" black crackle aluminum case. Brand new in original carton **$12.95,** or used **$9.95.**

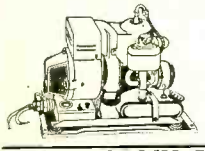


SCR-284 TRANSMITTER-RECEIVER—This medium power transmitter and the accompanying 7 tube very sensitive receiver are naturals for 80 or 40 meter operation (phone or CW), on either fixed stations or mobile applications. These units are brand new and come complete with 17 tubes, key, microphone, 200 KC calibrating crystal and instructions and diagrams for use with up to 100 watts input to the final stage on 40 or 80 meters for either phone or CW, using vehicle or 110 Volt power supply. Your cost.....**$39.95**

GENERAL ELECTRIC RT-1248 15-TUBE TRANSMITTER-RECEIVER

TERRIFIC POWER—(20 watts) on any two instantly selected, easily pre-adjusted frequencies from 435 to 500 Mc. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's, as first detector and oscillator, and 3—7H7's as IF's, with 4 slub-tuned 40 Mc. IF transformers, plus a 7H7, 7E6's and 7F7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for use in mobile or stationary service in the Citizen's Radio Telephone Band where no license is necessary. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice, in AM or FM transmission or reception, for use as a mobile public address system, as on 80 to 110 Mc. FM broadcast receiver, as a Facsimile transmitter or receiver, as an amateur television transmitter or receiver, for remote control relay hookups, for Geiger-Mueller counter applications. It sells for only **$29.95** or two for **$53.90.** If desired for marine or mobile use, the dynamotor which will work on either 12 or 24V DC and supply all power for the set is only $15.00 additional.

PE-109 32-VOLT DIRECT CURRENT POWER PLANT



This power plant consists of a gasoline engine that is direct coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run many of the surplus items that require 24-32V DC for operation. **The price of this power plant is only $59.95.** We can also supply a converter that will supply 110v AC from the above unit or from any 16-32V DC source for **$29.95.**

ARMY BC-312 COMMUNICATIONS RECEIVER

This receiver covers the frequency range of 1.5 MC to 18 MC in six direct reading bands. The dial, that is driven with split gears to prevent backlash, has 4500 logging divisions per band with approximately 600 divisions on the 20 and 40 meter ham bands and 1000 divisions on 80 meters. Two stages of RF before the converter in this set give it a very high signal to noise ratio and maximum sensitivity. Outstanding features of this receiver are: BFO with pitch control, send-receive relay, jacks on the front panel for headphones and speaker output, and mike and key inputs. All tubes are standard 6 volt types. This receiver was designed to withstand rough usage in the field and for operation from vehicles while in motion, so it is ruggedly constructed and contains a dynamotor power supply—Your cost—**$49.95.** Conversion kit to 110V AC is available for **$6.50.**

CLOSING OUT

THE FOLLOWING DESIRABLE ITEMS IN "AS IS" CONDITION AT SACRIFICE PRICES TO MAKE ROOM IN OUR WAREHOUSE FOR INCOMING STOCK

947A ONE KILOWATT HIGH FREQUENCY TRANSMITTER

This relay-controlled transmitter includes a 115V, 60 cycle power supply, protected by 8 magnetic circuit breakers, that alone is worth more than the price we are asking for the whole rig, even on today's surplus market. On the front panel are six 3½" GE or Weston meters, including 250 MA, 50 MA, 1000 MA, 150 V AC, and 1500 V DC at 1000 ohms per volt for screens and plate. The rack-type 21"x15"x36" unit contains six amplifier and rectifier tubes aggregating over $60.00 at WAA current wholesale prices. Western Electric's price to the Government was $1500.00. Shipping weight, 500 lbs.

Your cost at close-out price.....**$39.95**

BC-412 5" RADAR OSCILLOSCOPE

Easily converted to a first class lab. scope or to an excellent home television receiver using the instructions in the August, 1947, RADIO NEWS. Furnished with a brand new 5BP4 tube for the television application or a brand new 5BP1 for the scope application. Specify your choice. Sold at close-out price.....**$29.95**

5 INCH RECEIVER INDICATOR SCOPE

This unit, originally sold by Western Electric for $2500.00, includes a 13-tube receiver with 7 IF stages; 2-tube multivibrator sweep generator; 2-tube sweep amplifier; video amplifier; pedestal impulse and sweep generator; and 115 volt, 60 cycle supply with 2x2 for high voltage. Equipped with more than 15 tubes of the 43 originally used and including a brand new scope tube in original carton. Makes a wonderful laboratory instrument and is better adapted for television than any other war surplus item. Reduced close-out price.....**$39.95**

TRANSFORMERS—All types in stock. **AUTO-TRANSFORMERS;** Steps up 110v to 220v, or steps down 220v to 110v—$1.95. **FIL. TRANS.;** 6.3v, 20 Amps.—$1.98; Universal Output Trans. 8 Watt—89c; 18 Watt—$1.29; 30 Watt—$1.69. **AUDIO TRANSFORMERS:** S. Plate to S. Grid, 3:1—79c; S. Plate to P.P. Grids—79c; Heavy Duty Class AB or B, P.P. inputs—$1.49; Midget Output for AC-DC sets—69c; **MIKE TRANSFORMER** for T-17 Shure microphone, similar to UTC ouncer type—$2.00, Stancor SB or DB mike to line or grid—$1.95.

POWER TRANSFORMERS—Half-shell type, 110V, 60 cy, Centertapped HV winding. Specify either 2.5 or 6.3V filament when ordering.

For 4-5 tube sets—650V, 40MA, 5V & 2.5 or 6.3V.....**$1.49**
For 5-6 tube sets—650V, 45MA, 5V & 2.5 or 6.3V..... 1.75
For 6-7 tube sets—675V, 50MA, 5V & 2.5 or 6.3V..... 1.90
For 7-8 tube sets—700V, 70MA, 5V & 6.3 or two 2.5V... 2.35
For 7-8 tube sets—700V, 70MA, 5V & 6.3 (25 Cycle)..... 3.60
For 8-9 tube sets—700V-90MA. 5V-3A. 2.5V-3.5A. 2.5-10.5A 2.85
For 9-11 tube sets—700V, 5V & 6.3V-4A..... 2.85
For 9-15 tube sets—600V, 150MA, 5V & 6.3V..... 2.95

CONDENSERS—PAPER TUBULAR 600 WV—.001, .002, .005—8c; .01, .05—9c; .1—10c; .25—23c; .5—35c; **ELECTROLYTICS:** 8mfd 200v—20c; 10mfd 35v—20c; 30mfd 150v—23c; 20/20mfd 150v—35c; 30/20 150v—46c; 50mfd 150v—43c; 8mfd 475v—34c; 16mfd 350v—65c; **OIL CONDENSERS:** 4mfd 600v 49c; 2mfd. 600v. 29c 3X.1mfd 600v—29c.

FILTER CHOKES: 200, 300, 400, 500 ohm light duty—59c; 200 or 300 ohm heavy duty—99c; 250 ma 35 ohm, made for U.S. Navy, fully shielded—$1.95; 75 ohm 125 ma—25c or 25 for $4.25; "Meissner type" tapped filter chokes—25c; 8 amp. iron core A filter—25c; Choke-condenser combination, ideal to replace any size speaker field when installing PM speaker—79c.

SOCKET WRENCH SET consisting of 5 sockets ranging in size from 5/16 to ½" and a handle—79c.

AUTOMATIC WIRE STRIPPERS will strip up to 1000 wires per hour, a handy tool for any service job—$3.52.

Six Foot Asbestos Insulated Flat Iron Cord, one end has a male plug, the other end has a standard flat iron socket. Your price—50c each or 10 for $4.

5" **"SO" RADAR P.P.I. OSCILLOSCOPE,** complete with 9 tubes. This unit contains magnetic deflection yokes, Selsyn motor, and self-contained 110 V. power pack designed to run on the AC supply on LST and PT boats. Various ranges from 2 to 80 miles. The most satisfactory scope available for navigational radar or panoramic television applications. Uses 807 tube in final power stage that provides yoke deflecting current. Your cost, **$39.95.**

"SO" RADAR ECHO BOXES. The perfect calibrated cavity wavemeter—**$10.00. LORAN INDICATOR OSCILLOSCOPE,** including 26 tubes with 5" cathode ray tube. Govt. instruction manual supplied with each of these—$39.95. 2" **OSCILLOSCOPE,** complete with tubes and brand new—$9.95.

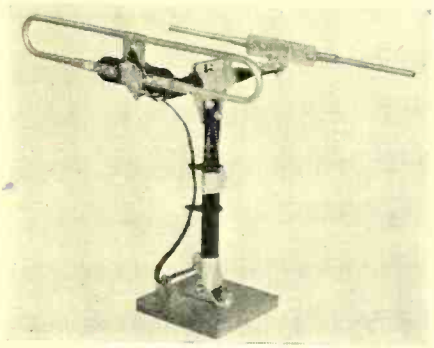
BUFFALO RADIO SUPPLY, 219-221 Genesee St., Dept. IN, BUFFALO 3, N. Y.

CABLE ADDRESS BUFRAD

What's New in Radio

DIPOLE ANTENNA

The *Ward Products Corporation* of Cleveland has designed a new point-of-purchase display designed to merchandise the company's line of "Magic



Wand" antennas for FM and television.

Included in the line are a choice of straight or folded dipoles for either the 88 to 108 mc. FM band or the 44 to 88 mc. television band. A reflector kit is available with any of these models to assure maximum direction gain and to eliminate interfering reflections.

The *Ward Products Corporation,* 1523 East 45th Street, Cleveland 3, Ohio, invites inquiries about this line and the new display unit.

THERMISTOR BRIDGES

Two new thermistor bridges which provide r.f. power measurement up to two milliwatts at frequencies up to the shorter microwave regions have been announced by the *Electronics Division* of *Sylvania Electric Products Inc.*

The Type 7BN-7SE is designed for continuous duty at normal laboratory ambient temperatures where measurement in S, X, and K microwave bands may be made with suitable r.f. measuring heads. The bridge is independent of frequency but should be used with appropriate thermistor mount, according to the manufacturer. Two milliwatt scale sensitivity is essentially linear but a calibration curve is required for each r.f. head used.

The Type TBN-6SE bridge requires an external oven and thermistor

mount. It contains a Wheatstone Bridge circuit with three precision resistor arms and externally mounted thermistor; a stabilized 2000 cycles source for the bridge; stable d.c. source for substitution measurement of r.f. power; and an amplifier. It is independent of frequency and can be used as a balanced or unbalanced bridge, providing accurate full scale meter readings from 20 microwatts to 2 milliwatts.

The *Electronics Division* of *Sylvania Electric Products Inc.,* 500 Fifth Avenue, New York 18, New York, will furnish full details on request.

SIGNAL GENERATOR

Coastwise Electronics Co., Inc., has added a new piece of test equipment to its already extensive line of instruments for the serviceman.

The newest addition to the line is the "Ferret" Model 701 signal generator which provides a range of from 170 kc. to 110 mc. on fundamentals. This instrument is especially suitable for use in servicing FM-AM and television receivers. The unit is crystal calibrated and uses low-loss permeability tuned coils. The signal generator provides a 400-cycle sine wave internal modulation from 0 to 100 per-cent, calibrated on the dial, and 20 to 10,000 cycle external modulation for frequency response measurements.

Full details on the "Ferret" Model 701 signal generator and other test equipment in the "Ferret" line will be supplied by *Coastwise Electronics Co., Inc.,* 130 North Beaudry Avenue, Los Angeles 12, California.

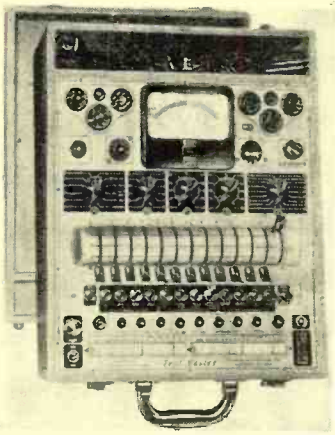
"ELECTRONAMIC TEST MASTER"

Precision Apparatus Co., Inc. of Elmhurst, Long Island has just added a new unit to its line of test equipment, the Series 10-20 "Electronamic Test Master."

The new instrument includes the company's exclusive "Precision Electronamic Tube Performance Test Circuit" plus a complete push-button operated a.c.-d.c. set tester. The special circuit subjects tubes under test to appropriately phased individual element potentials which are swept over a complete path of operation, on a sinusoidal time base, encompassing a wide range of plate family characteristic curves. The indicating meter reads directly "Replace," "Weak," and "Good."

The circuit features direct facilities to accommodate up to 12 elements and tests all standard receiving and low power transmitting tubes, including acorns, Noval 9 pins, dual capped h.f. amplifiers, etc.

The set tester has 34 a.c. and d.c.



ranges, plus complete radio "A," "B," and "C" battery test facilities.

For additional information write direct to *Precision Apparatus Co., Inc.,* 92-27 Horace Harding Blvd., Elmhurst, Long Island, New York.

TV ANTENNA

LaPointe-Plascomold Corp. of Unionville, Conn., has just developed a new television antenna which is said to provide twice the present range of reception available with the usual TV antennas.

Known as the "VEE-D-X" antenna, this unit is capable of providing, by direct reception, clear signals at distances up to 125 miles from the television transmitter, according to the manufacturer.

The new unit has a high forward gain, thus providing maximum pickup in one direction while having minimum pickup from the sides and rear, helping to eliminate interference. A matching section has been incorporated in the new antenna which permits matching the impedance of the transmission line which may be from 50 to 600 ohms, with that of the antenna, thus helping to prevent ghosts and other undesirable characteristics caused by mismatching.

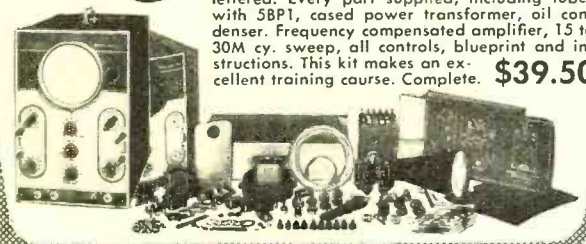
While the antenna is fundamentally broadband in its characteristics, it may be adjusted in those areas where more gain is desired at some slight decrease in bandwidth.

Connections to the antenna are made by means of coaxial connectors or

THE NEW

HEATH 5" OSCILLOSCOPE

Complete kit to build a beautiful 5" scope, cabinet, chassis and panel punched, formed and lettered. Every part supplied, including tubes with 5BP1, cased power transformer, oil condenser. Frequency compensated amplifier, 15 to 30M cy. sweep, all controls, blueprint and instructions. This kit makes an excellent training course. Complete. **$39.50**



RCA RECEIVER MODEL ARB

LIMITED QUANTITY AVAILABLE

A brand new Navy communications type receiver with BROADCAST BAND. Covers 200 KC to 9.1 MC continuous, has two RF stages, electric motor band switching, complete with calibrated dial, 6 tubes, control head, remote control box, 24 volt dynamotor, and circuit diagram.

$29.50

OIL FILLED CONDENSERS

CAP	WVDC	PRICE	CAP	WVDC	PRICE
5	400	$ .39	1.	1000	.49
5-5	400	.79	2.	1000	.69
4	400	.49	4	1000	.90
5	600	.59	8	1000	1.00
8	600	1.00	8-8	1000	1.95
2.5-2.5-5	600	1.50	.25	1500	.49
5-5-5	600	1.95	1.5	1500	.79
8-8-8-8	600	3.95	.1	3000	1.20
5-5	600	1.00	.25	3000	1.30
.1	1000	.29	.05	7500	2.50
.25	1000	.39			

BC 438 FREQUENCY METER

Only 40 available

A beautifully constructed frequency meter, built by Link for Western Electric, 5 tube, AC OPERATED, covers 195 to 215 MC, comes complete with tubes, standard crystal, calibration chart, circuit diagram, in used condition. The excellently filtered 110V AC power supply alone worth our price of..... **$8.95**

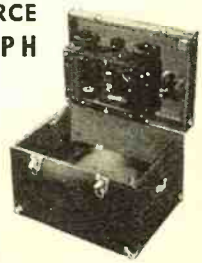
OIL FILLED BATHTUB CONDENSERS

200 Volt in .5, .1, dual .5 MFD..... **20 for $1**

400 Volt in .1, dual .1, triple .1, .2, .25, .5, 1, MFD..... **15 for $1**

600 Volt, .1 dual .1, triple .1, .25 dual .25, .5, 1..... **10 for $1**

BRAND NEW ARMY AIR FORCE ASTROGRAPH



The case of this unit makes the finest tool and service kit ever designed. Plywood construction, 14x11x10" high, with 8 covered compartments in the bottom for repair parts, leather handle, steel reinforced covers, hinged lid. Also excellent as case for radio phonograph, movie projector, camera, shell case, fishing kit, picnic kit, etc. The astrograph itself, (which cost the government $125.00) makes an excellent contact printer, and can be used as a foundation far enlarger, strip map holder, etc. The case alone worth twice the give-away price of..... **$3.95**

PUSH BUTTON TUNER

This beautifully constructed unit was used on an Army FM receiver. A ten push-button assembly operating four gang silver plated tuning condenser drum dial manual tuning. Brand new. Shipping weight, 10 lbs..... **$2.50**

SPECIALS

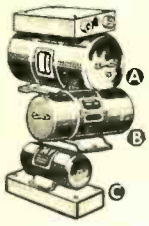
Selsyn Indicators 5" Brand New $2.95
PE 104A power supplies operate from 6 or 12 volt input — output 84V plate 1.4 volt filament $4.95
Ceramic Variable Condensers 50 MMF screw driver adj. ..... Special 5 for $1.00
Lip Microphones T-45 in original sealed cartons $1.00
Thermocouples for RF Ammeters, 3 for $1.00
10 henry 50 ma Filter Chokes .... 2 for $1.29
5BP1 Cathode Ray Tubes..... $2.49
5BP1 Socket ..... .79
Syncro Motors 5SDG Brand New, ... per pair $6.95
Kit of Screw Driver Type Potentiometers ..... 10 for $1.00
Kit of Metal Tubular Bypass Condensers ..... 20 for $1.00
Kit of Relays, excellent types . 5 for $2.50

BC 306 ANTENNA

TUNING UNIT

GE unit from BC 375 matches 150 watt transmitter to antenna. Brand new..... **$2.95**

DYNAMOTORS



Consists of electric motor operating generator on same shaft. Many applications — operating radios from storage battery — using as motor.

Dynamotor A — Input 12 volts, output 1000 volts at 350 MA, Shipping weight, 72 lbs..... **$7.95**

Dynamotor B — Input 6 or 12 volts, output 350 volts, 160 MA. Shipping weight, 30 lbs..... **$5.95**

Dynamotor C — Input 28 volts, output 220 volts at 60 MA. Shipping weight, 6 lbs..... **$1.50**

RG-B/U FLEXIBLE

COAXIAL CABLE

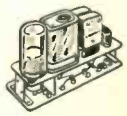
Only 4¢ PER FT.

Ideal for feeding any antenna up to 1 K.W. All frequencies up to 250 MC. Brand new any length. Lowest price ever offered.

MINIATURE HEADPHONES

Miniature type headphones. Ideal for hearing aids, listening to radio in bed, etc. Complete with headband, cord and two sets rubber ear plugs. Shipping weight, 1½ lbs. ONLY..... **$1.00**

TUNING UNIT

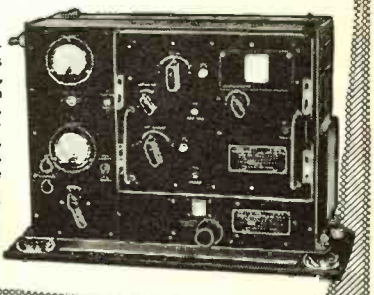


The heart of the Army Walkie Talkie. Contains transmitter crystal and tank coil, receiver coil, tuning condenser and crystal; ideal foundation for small set. Shipping weight, 1 lb..... **$1.00**

BC 457A TRANSMITTER

Brand new transmitters covering 4-5.3 MC. Contains M.O. 1625, two 1625's as P.A., these make excellent VFO from conversion in May 1946 CQ. Complete in original cartons with tubes..... **$4.95**

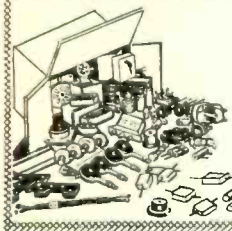
BC 223 TRANSMITTER



One of the most desirable military transmitters, 4 crystal-controlled frequencies and master oscillator. Meters for Osc., Ant., and total current. Uses 46 speech amplifier, 2-46 modulators, 801 each as oscillator and power amplifier. Practically no conversion necessary: plug in crystal, mike and connect power supply and it's ready to operate. Brand new with one tuning unit and circuit diagram. (less tubes)..... **$12.95**

Vibrator Power Supply PE 125 for BC 223 (12 V. operation) new..... $9.95

ELECTRONIC KIT



Experimenter's paradise. Five lbs. of new condensers, transformers, coils, switches, sockets, resistors, selenium rectifier, earphones, etc. Parts for dozens of experiments. Shipping weight, 6 lbs..... **$1.00**

NO ORDERS UNDER $2. • • WE WILL SHIP C.O.D.

The HEATH COMPANY

BENTON HARBOR, MICHIGAN

screw terminals, depending on the type of transmission line used. The entire assembly may be erected by one man without technical knowledge in about a half-hour. The assembly weighs about 25 pounds and may be mounted in the end of a short length of 2 inch pipe or other structure which may then be affixed to the house.

Complete details on the "VEE-D-X" antenna will be supplied upon request to *LaPointe-Plascomold Corp.*, Unionville, Conn.

"HOMEFONE" INTERCOMS

Homefone Corporation of Pasadena has introduced a new line of intercoms designed for the home and available in either custom or standard models.

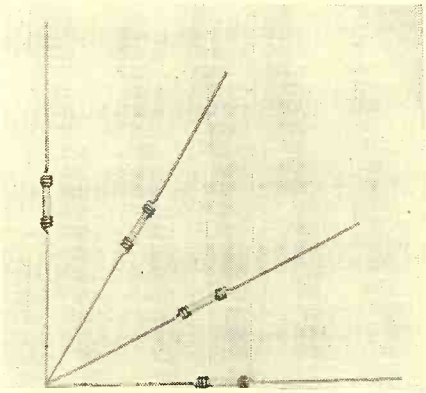
According to the company, the installation of the "Homefone" system permits the user to call and receive a direct response from any point, monitor any point desired where safety is a factor or hazards exist, transmit radio programs or music from any location to another, relay telephone calls, act as a burglar detection device, make emergency calls to the entire household, answer the door or remotely located gatehouses, and provide secret two-way conversations when desired.

The equipment is manufactured in two styles, flush wall units or cabinet style units finished in walnut with mahogany panels.

A catalogue covering some of the company's standard and custom line of units is available for the asking. Address your request to *Homefone Corporation*, 24 South Oak Knoll, Pasadena 4, California.

FUSE RESISTORS

International Resistance Co. of Philadelphia has developed a new wire-wound resistor which performs two



functions, that of a resistor and that of a fuse.

The difference between these two functions is one of power level. At a relatively low level the unit functions as an ordinary resistor, at a higher power level it functions as a fuse and opens the circuit when the wire burns out.

This new resistor, which has been designated as the type OWA, is custom-built to individual circuit requirements and is available in RMA values from 15 to 150 ohms. Power rating is one watt.

Inquiries on this new fuse resistor will be answered promptly by *International Resistance Co.*, Phila., Pa.

COMMUNICATIONS RECEIVER

National Company Inc. of Malden, Massachusetts, has recently brought out the newest of the HRO line of communications receivers, the HRO-7.

This new, custom-built receiver has been thoroughly modernized with the time-proven features of the HRO series retained and new laboratory circuit features added.

The HRO-7 includes automatic, adjustable-threshold noise limiter for use on c.w. or phone; improved high-frequency oscillator; voltage regulator; front-of-panel tone switch; lever-type handles for coil sets; slide-rule type calibration on coil sets; band-spread on 11 meter band; accessory connector socket; and a radio-phonograph switch. The circuit employed on all bands of the HRO-7 is made up of two tuned stages of r.f. amplification, a tuned first detector, a high-frequency oscillator employing a tube separate from the first detector tube, two stages of i.f. amplification operating at 456 kc., a combined second detector-automatic volume control stage, an automatic adjustable-threshold series valve noise limiter, a first audio

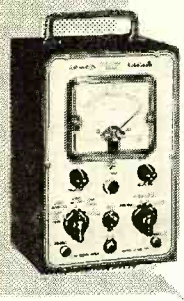
(*Continued on page* 157)

The WORLD'S FINEST SURPLUS BARGAINS..

THE NEW
HEATHKIT
VACUUM TUBE
VOLTMETER KIT

The most beautiful VTVM ever offered now available in kit form. **Every part supplied:** all punched, lettered and formed.

A balanced bridge circuit, 11 megohms input resistance, measures both AC and DC electronically. Ranges 3-30-100-300-1000 volts AC or DC. Ohmeter .1 ohm to 1000 megohms. Includes DB scale. Complete with tubes, 500 microamp meter, cabinet, blueprints, and instructions. Shipping Wt., 8 lbs.

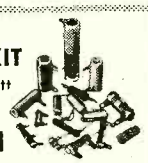


BUILD IT YOURSELF AND SAVE ⅔ COST

$24.50

TRIMMER
CONDENSER KIT
10 brand new variables 12 MMF to 50 MMF ceramic insulated.
$1.00

VITREOUS
RESISTOR KIT
Five and ten watt units.
15 FOR **$1**



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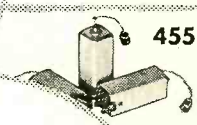
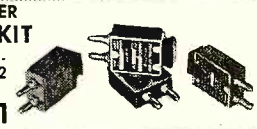
455 KC I.F.'s
Dual slug tuned square can.
3 FOR **$1**



BATHTUB
CONDENSER KIT
.1 MFD. to 1. MFD. up to 600 Volt.
20 FOR **$1.00**

TRANSMITTER
CRYSTAL KIT
4 mounted crystals between 2 MC and 3 MC.
4 FOR **$1**



SOCKET KIT
20 beautiful octal, loctal and miniature sockets.
20 FOR **$1**

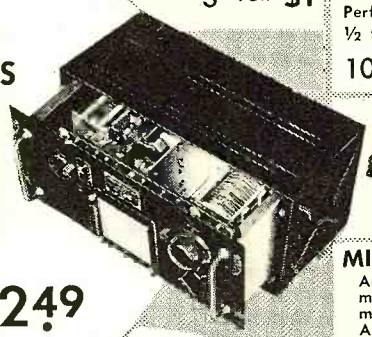
R.F. CHOKE KIT
Perfect sizes from ½ to 2½ MH.
10 FOR **$1**

TELEVISION
CONDENSER
Aerovox hyvol .05 MFD at 7500 volts
Limited quan. **$2.50**

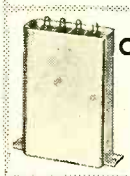
MODEL BC 375
TUNING UNITS

These units need no introduction but ours are **brand new** with the cabinet, which is ideal for a receiver case, at the lowest price yet. State model number preferred and we will ship as close as we can.

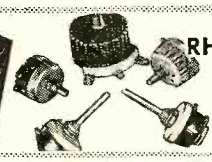
At least a $30.00 value in parts for **$2.49**



OUR BEST
CONDENSER BUY
An ideal power supply filter has 2.5 MFD., 2.5 MFD., and 5 MFD., sections at 600 V. working. All oil filled, extra special **95c**



POWER
RHEOSTAT KIT
All knob types in 25 and 50 watt I.R.C., etc.
5 FOR **$2.95**



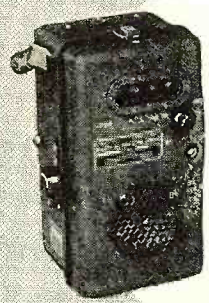
MICA CONDENSER KIT
An excellent assortment with silver mica and regular. All color coded or marked.
25 FOR **$1.00**

CONDENSER SPECIAL
Brand new Cornell-Dubilier 2 MFD. 600 V. oil filled filter condensers, porcelain insulators.
3 FOR **$1.00**

MODEL BC 728
PUSH BUTTON
RECEIVER

An excellent portable push button permability tuned receiver covering 2-5 Mc. Easily converted to broadcast band, operates from 2 or 6 volts with six tubes. PM speaker — two vibrator power supplies slightly used.
Only 100 available

$14.95



CERAMIC
CONDENSER KIT
20 beautiful condensers all marked or coded, many zero temp. coef. types.
20 FOR **$1.95**

G.E. CIRCUIT BREAKER
Protect your equipment at one-fourth of cost, new G.E. 50 amp. 220 V. circuit breakers..... **$2.95**

RESISTOR KIT
The best available all insulated color caded in ½ - 1 - 2 watt sizes.
100 FOR **$1.95**

---

4 Gang CONDENSER
A silver plated 147 MFD. per section variable tuning condenser — long ¼" shaft, an outstanding surplus buy..... **$1.00**

AIRCRAFT INTERPHONE
AMPLIFIER
New BC 347C using 6F8 tube with tube ouncer, transformers, diagrams, etc. **$2.95**

BC 733
RECEIVER
A Western Electric 10 tube receiver cover 100-120 Mc. complete with 10 tubes, crystals, etc. Used condition.

$7.95

2½" VOLTMETER
Ideal for making pocket tester, scale 0-3 D.C. volts, made by Weston and Simpson. Tester diagram and Multiplier Resistors for 30-300 V. D.C. included **$1.95**

BC 645
GENERAL ELECTRIC
TRANSMITTER-RECEIVER

A beautiful brand new tranceiver operating in the 450-500 Mc range. Comes with 15 new tubes (list price **tubes alone** $58.00) and all conversion data and diagrams. Covers 420-450 ham band, citizens two way communications band, mobile ham band, and Exp. television band. Cost government over $400.00. Our price complete.

$14.95 2 FOR $27.00

FREE
T30 Throat Microphone with each order over $10.00.

MILITARY CONVERSION
POWER TRANSFORMER
Especially for 24 volt receivers. Supplies 500 volts C.T. at 50 MA, 5 V. at 2A. and 24 V. at ½ amp. To convert command sets without rewiring..... **$2.95**

NO ORDERS UNDER $2.00
WE WILL SHIP C.O.D.

The HEATH COMPANY
BENTON HARBOR, MICHIGAN

Parts Lists

(FOR CIRCUIT DIAGRAMS APPEARING ON PAGES 74 AND 75)

WESTINGHOUSE MODEL H-148

Part No.	Code and Description
V-3852	R_1, SW_1—Vol. control & sw.
RC10AE681K	R_2, R_3—680 ohm, ¼ w. res.
RC10AE821K	R_4—820 ohm, ¼ w. res.
V-3869	R_5—2300 ohm ballast res.
RC20AE222K	R_6—2200 ohm, ½ w. res.
RC10AE473K	R_7—47,000 ohm, ¼ w. res.
RC40AE680M	R_8—68 ohm, 2 w. res.
RC10AE224M	R_9, R_{10}—220,000 ohm, ¼ w. res.
RC10AE152K	R_{11}—1500 ohm, ¼ w. res.
RC10AE104K	R_{12}—100,000 ohm, ¼ w. res.
RC10AE684K	R_{13}—680,000 ohm, ¼ w. res.
RC10AE225M	R_{14}, R_{15}—2.2 megohm, ¼ w. res.
RC10AE475K	R_{16}, R_{17}, R_{18}, R_{19}—4.7 megohm, ¼ w. res.
RC10AE106M	R_{20}—10 megohm, ¼ w. res.
V-3858	C_1, C_2, C_3—2-gang var. cond.
V-4542	C_4—Antenna trimmer
RCM20A101M	C_5, C_6, C_7, C_8—100 μμfd. mica cond.
RCM20A331M	C_9—330 μμfd. mica cond.
RCP10W6102A	C_{10}, C_{11}—.001 μfd., 600 v. cond.
RCP10W2503A	C_{12}—.05 μfd., 200 v. cond.
RCP10W2204A	C_{13}—.2 μfd., 200 v. cond.
RCP10W6502A	C_{14}, C_{15}—.005 μfd., 600 v. cond.
RCP10W4103A	C_{16}, C_{27}—.01 μfd., 400 v. cond.
RCP10W4503A	C_{17}—.05 μfd., 400 v. cond.
RCP10W4104A	C_{18}—.1 μfd., 400 v. cond.
RCP10W4204K	C_{19}—.2 μfd., 400 v. cond.
V-3861	C_{20}, C_{21}—20/50 μfd., 150/150 v. elec. cond.
V-3866	C_{22}—100 μfd., 25 v. elec. cartridge cond.
V-3877	C_{23}, C_{24}, L_4, L_5—First i.f. trans.
V-3876	C_{25}, C_{26}, L_6, L_7—Second i.f. trans.
V-3845	L_1, L_2—Osc. coil
V-3915	L_3—Loop antenna
V-3872	SW_2, SW_3, SW_4, SW_5—A.c.-d.c.-battery sw.
V-3868	Output trans.
V-4115	Selenuim rectifier
V-3874	Plug & cable assembly

ZENITH MODEL 5G003ZZ

Part No.	Code and Description
63-654	R_1—180,000 ohm, ¼ w. res.
63-579	R_2—220 ohm, ¼ w. res.
63-646	R_3—33,000 ohm, ¼ w. res.
63-296	R_4—220,000 ohm, ¼ w. res.
63-600	R_5—2.2 megohm, ¼ w. res.
63-1549	R_6—Vol. control & sw.
63-976	R_7—15 megohm, ¼ w. res.
63-271	R_8—1 megohm, ¼ w. res.
63-1097	R_9—870 ohm, wirewound 1 w. res.
63-1366	R_{10}—Zipohn
63-1363	R_{11}, R_{12}—2-section Candohm res.
63-439	R_{13}—2700 ohm, ¼ w. res.
63-1099	R_{14}—33 ohm, wirewound ½ w. res.
63-627	R_{15}—180 ohm, ¼ w. res.
63-602	R_{16}—4.7 megohm, ¼ w. res.
22-1450	C_1—Two-section var. cond. (Chassis 5C40-40Z)
22-1653	C_1—Two-section var. cond. (Chassis 5C40ZZ)
22-162	C_2—.0001 μfd., 500 v. cond.
22-829	C_3—.05 μfd., 200 v. cond.
22-827	C_4—.1 μfd., 200 v. cond.
22-492	C_{11}—.002 μfd., 600 v. cond.
22-470	C_{12}—.00015 μfd., 600 v. cond.
22-196	C_{13}—.01 μfd., 600 v. cond.
22-326	C_{14}—.003 μfd., 400 v. cond.
22-1014	C_{15}, C_{16}—20/20 μfd., 150/150 v. elec. cond.
22-1081	C_{17}, C_{18}—40/20 μfd., 150/25 v. elec. cond.
22-1017	C_{19}—.05 μfd., 200 v. cond.
95-937	T_1—First i.f. trans.
95-938	T_2—Second i.f. trans.
S-11999	L_1—Cabinet back & Wave-magnet assembly
S-11830	L_2—Osc. coil assembly (Chassis 5C40-40Z)
S-13765	L_2—Osc. coil assembly (Chassis 5C40ZZ)

MAJESTIC MODELS 8S452, 8S473

Part No.	Code and Description
9-222	R_1—22,000 ohm, ¼ w. res.
9-186	R_2—22,000 ohm, 1 w. res.
9-17	R_3—10,000 ohm, ½ w. res.
9-272	R_4—180 ohm, ½ w. res.
9-255	R_5, R_{22}—1 megohm, ¼ w. res.
9-177	R_6—56,000 ohm, ½ w. res.
9-226	R_7—47,000 ohm, ¼ w. res.
9-227	R_8—470,000 ohm, ¼ w. res.
9-213	R_9—10 megohm, ¼ w. res.
9-234	R_{10}, R_{14}, R_{19}, R_{20}—470,000 ohm, ½ w. res.
9-225	R_{11}—18,000 ohm, ¼ w. res.
13-15	R_{12}—2 megohm vol. control & sw.
14-4	R_{13}—2 megohm tone control
9-220	R_{15}—220,000 ohm, ¼ w. res.
9-107	R_{16}—2200 ohm, ½ w. res.
9-95	R_{17}—18,000 ohm, ½ w. res.
9-180	R_{18}—22,000 ohm, ½ w. res.
9-185	R_{21}—390 ohm, 2 w. res.
9-296	R_{23}—2.2 megohm, ¼ w. res.
9-299	R_{24}—15,000 ohm, 2 w. res.
8-35	C_2, C_4, C_5—2.5-30 μμfd. trimmer cond.
5-39	C_3, C_{15}—.1 μfd., 200 v. cond.
6-177	C_6—6900 μμfd., 500 v. mica cond.
8-36	C_7—1.5-15 μμfd. trimmer cond.
8-33	C_8—330-960 μμfd. padder cond.
7-22 or 7-23	C_{9a}, C_{9b}, C_{9c}—Tuning cond.
6-159	C_{10}—47 μμfd., 500 v. cond.
5-74	C_{11}—.01 μfd., 600 v. cond.
8-41	C_{12}, C_{14}, C_{17}, C_{18}—Dual trimmer cond.
5-77	C_{13}, C_{16}—.05 μfd., 600 v. cond.
6-132	C_{19}, C_{24}, C_{28}, C_{29}, C_{36}—.01 μfd., 400 v. cond.
6-151	C_{20}, C_{21}—220 μμfd. mica cond.
6-133	C_{22}, C_{25}—.006 μfd., 400 v. cond.
5-57	C_{23}—.01 μfd., 200 v. cond.
5-40	C_{26}—.05 μfd., 200 v. cond.
5-79	C_{30}, C_{31}, C_{32}—.001 μfd., 600 v. cond.
19-16	C_{33}, C_{34}—16/16 μfd., 450/450 v. elec. cond.
6-232	C_{35}—100 μμfd., 500 v. mica cond.
3-165	T_1—First i.f. trans.
3-166	T_2—Second i.f. trans.
2-12	T_3—Power trans.
22-8-2	T_4—Power trans.
3-120	L_4—S.w. antenna coil
3-118	L_5, L_6—Osc. coil

RCA MODELS Q22A, Q32

Part No.	Code and Description
30652	R_1—1 megohm, ¼ w. res.
30685	R_2—33,000 ohm, ¼ w. res.
30649	R_3—2.2 megohm, ¼ w. res.
35595	R_4—15,000 ohm, 3 w. res.
30492	R_5—22,000 ohm, ¼ w. res.
35620	R_6, S_6—Vol. control & power sw.
30436	R_7—12,000 ohm, ¼ w. res.
35629	R_9—Tone control
30992	R_{10}—10 megohm, ¼ w. res.
30648	R_{11}, R_{16}—470,000 ohm, ½ w. res.
14983	R_{12}—330,000 ohm, ¼ w. res.
30180	R_{13}—120,000 ohm, ¼ w. res.
30493	R_{14}—150,000 ohm, ½ w. res.
30735	R_{15}—560 ohm, 1 w. res.
34761	R_{18}—10 ohm, ¼ w. res.
34654	C_1, C_2, C_3—Triple 2.5-10 μμfd. mica trimmer
12714	C_4, C_7, C_{14}—2-12 μμfd. air trimmer
70667	C_5—560 μμfd. mica cond.
70687	C_6—3000 μμfd. mica cond.
70582	C_8—47 μμfd. ceramic cond.
70586	C_9—68 μμfd. mica cond.
35619	C_{10}, C_{11}—Var. tuning cond.
35644	C_{12}—47 μμfd. ceramic cond.
35645	C_{13}—68 μμfd. ceramic cond.
39628	C_{15}, C_{18}, C_{34}—100 μμfd. mica cond.
39636	C_{16}, C_{38}—220 μμfd. mica cond.
39622	C_{17}—56 μμfd. mica cond.
70615	C_{19}—.05 μfd., 200 v. cond.
39632	C_{20}, C_{21}—56 μμfd. mica cond.
70614	C_{22}—.035 μfd., 200 v. cond.
70601	C_{23}—.002 μfd., 200 v. cond.
70627	C_{24}—.005 μfd., 600 v. cond.
70624	C_{25}—.003 μfd., 600 v. cond.
70648	C_{26}, C_{27}—.005 μfd., 1000 v. cond.
70631	C_{28}—.01 μfd., 600 v. cond.
33014	C_{29}, C_{30}, C_{31}, C_{32}—10/10/10/20 μfd., 450/450/450/25 v. elec. cond.
45465	C_{33}—15 μμfd. ceramic cond.

70636	C_{35}—.05 μfd., 600 v. cond.
35646	C_{36}—6 μμfd. ceramic cond.
36012	C_{37}—15 μμfd. ceramic cond.
35631	L_1, L_2, L_3—19-13 & 25 m. ant. coil
35632	L_4, L_5, L_6, L_7, L_{18}—"A," "B" & 31 m. ant. coil
35623	L_8, L_9—"A" & "B" osc. coil
35626	L_{10}—31 m. osc. coil
35625	L_{11}—25 m. osc. coil
35624	L_{12}—19-13 m. osc. coil
35636	L_{13}, L_{14}—First i.f. trans.
35628	L_{15}, L_{16}—Second i.f. trans.

WARDS MODELS 54BR-1501A, 1502A

Part No.	Code and Description
BEA-9B1-78	R_1—22,000 ohm, ½ w. res.
BE101255	R_2, S_1—500,000 ohm vol. control & sw.
BEA-9B1-34	R_3—3.3 megohm, ½ w. res.
BEA-9B1-35	R_4—4.7 megohm, ½ w. res.
BEA-9B1-26	R_5, R_8—150,000 ohm, ½ w. res.
BEA-9B1-27	R_6—220,000 ohm, ½ w. res.
BEA-9B1-52	R_7—150 ohm, ½ w. res.
BEA-9B2-63	R_9—1200 ohm, 1 w. res.
BEA-9B2-4	R_{10}—33 ohm, 1 w. res.
BEA-9B1-43	R_{11}—27 ohm, ½ w. res.
	C_1—Washer cond. mounted on ant. plate
BE129114	C_2—300 μμfd., 500 v. mica cond.
BE124137	C_3, C_6—Dual mounted ant. & osc. trimmers
BE1009	C_4—.05 μfd., 200 v. cond.
BE12939	C_5—50 μμfd., 500 v. cond.
	C_7, C_8—Pri. & sec. trimmers (Part of T_2)
	C_9, C_{10}—Pri. & sec. trimmers (Part of T_3)
BE12912	C_{11}—250 μμfd., 500 v. mica cond.
BE10025	C_{12}—.002 μfd., 600 v. cond.
BE1292	C_{13}—500 μμfd., 500 v. mica cond.
BE10011	C_{14}—.01 μfd., 400 v. cond.
BE10026	C_{15}—.02 μfd., 400 v. cond.
BE11992	C_{16a}, C_{16b}—20/40 μfd., 150/150 v. elec. cond. (60 cycle models)
BE11993	C_{16a}, C_{16b}—40/60 μfd., 150/150 v. elec. cond. (25 cycle models)
BE10091	C_{17}—.15 μfd., 400 v. cond.
BE10013	C_{18}—.05 μfd., 400 v. cond.
BE105138	L_7—R.f. choke coil
BE13614	T_{1a}, T_{1b}—Ant. & osc. coil assembly
BE108157H	T_2—Input i.f. trans. with trimmers
BE108157I	T_3—Output i.f. trans. with trimmers
BE105128B	T_4—Output trans. for spkr.
BEB-18A-10251	T_5—4" PM speaker

TRUETONE MODEL D4620

Part No.	Code and Description
C-9B1-31	R_1—1 megohm, ½ w. res.
C-9B1-22	R_2—33,000 ohm, ½ w. res.
C-9B2-76	R_3—15,000 ohm, 1 w. res.
C-9B1-52	R_4—150 ohm, ½ w. res.
C-9B1-56	R_5—330 ohm, ½ w. res.
C-9B1-34	R_6—3.3 megohm, ½ w. res.
C-9B1-23	R_7—47,000 ohm, ½ w. res.
C-9B1-35	R_9—4.7 megohm, ½ w. res.
C-9B1-27	R_{10}—220,000 ohm, ½ w. res.
C-9B1-29	R_{11}—470,000 ohm, ½ w. res.
C-9B1-60	R_{12}—680 ohm, ½ w. res.
C-9B1-50	R_{13}, R_{14}—100 ohm, ½ w. res.
C-9B2-64	R_{15}—1500 ohm, 1 w. res.
124-187	C_{1a}, C_{1b}—Dual ant. & osc. trimmer
129-188	C_2—.00008 μfd. mica cond.
129-2	C_3, C_{10}—.0005 μfd. mica cond.
129-21	C_4—.0002 μfd. mica cond.
100-9	C_5—.05 μfd., 200 v. cond.
100-13	C_6—.05 μfd., 400 v. cond.
100-20	C_7—.1 μfd., 200 v. cond.
129-161	C_{8a}, C_{8b}—.0001 μfd., dual trimmer
100-26	C_9—.02 μfd., 400 v. cond.
100-25	C_{11}—.002 μfd., 600 v. cond.
119-105	C_{12a}, C_{12b}, C_{12c}—20/15/15 μfd., 25/350/350 v. elec. cond.
100-87	C_{13}—.01 μfd., 600 v. cond.
100-125	C_{14}—.0035 μfd., 1600 v. cond.
100-31	C_{15}, C_{16}, C_{17}—.5 μfd., 120 v. cond.
11749B	C_{18}—Spark plate
129-12	C_{19}—.00025 mica cond.
C-211-10961	T_{1a}, T_{1b}—Permeability tuning unit complete with ant. & osc. coils
108139B	T_2—Input i.f. coil
108211	T_3—Output i.f. coil
B-12C-10235	T_4—Output trans. for spkr.
104295	T_5—Power trans.
10568	L_1, L_2—"A" choke, #18 wire
10566	L_3—"A" choke, #16 wire

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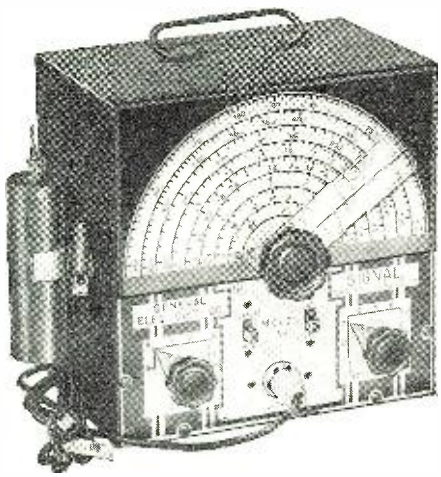
The Model 88-A *COMBINATION*

SIGNAL GENERATOR AND SIGNAL TRACER



We're prepared for the demand we know will be created by this long overdue combination of the two units which have always been used together. The ultimate in signal tracing procedure is achieved by the Model 88, for the use of this model, enables you to use either the broadcast signal itself or the signal injected by the Signal Generator. This is especially useful of course when servicing "dead" or "intermittent" receivers. The Model 88 you will find is the greatest time-saver ever provided for by combining a full range Signal Generator and Signal Tracer into one unit; the set up time for interconnecting, etc., is entirely eliminated.

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- The R.F. Signal Frequency is kept completely constant at all output levels. This is accomplished by use of a special grid loaded circuit which provides a constant load on the oscillatory circuit. A grounded plate oscillator is used for additional frequency stability.
- Modulation is accomplished by Grid-blocking action which has proven to be equally effective for alignment of amplitude and frequency modulation as well as for television receivers.
- Positive action attenuator provides effective output control at all times.
- R.F. is obtainable separately or modulated by the Audio Frequency.

Signal Tracer Specifications:

- Uses the new Sylvania IN34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megacycles.
- Simple to operate—Clips directly on to receiver chassis, no tuning controls.
- Provision is made for insertion of phones of any impedance, a standard Volt-Ohm Milliammeter or Oscilloscope.

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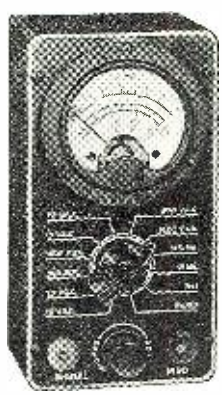

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- 4 D.C. VOLTAGE RANGES: 0-15/75/300/1500 volts.
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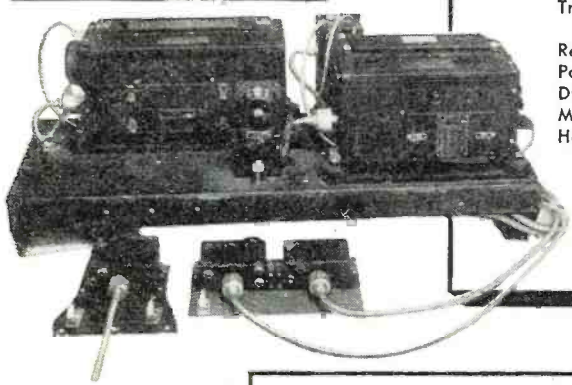
RU-16GF-11



Transmitter & Receiver—12 Volts (Do not confuse this with RU-17GF-12 which is 24 Volts).
Transmitter frequency 3000-4525 and 6000-9050 Kc. Frequency changes by means of plug-in coils.
Receiver frequency 195-13,575 Kc. Frequency changes by means of plug-in coils.
Power output 12 watts on voice, CW, or MCW.
Dynamotor input 12 V. DC at 10 amps—output 435 V. at 143 Ma., well filtered.
Mounted on rack about 13"x31" (transmitter and receiver shock-mounted).
Has receiver remote tuning control with cable, junction box, receiver switch box, test meter and cord, antenna relay unit, instruction manual, and all tubes. All coils included.
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We have but a few of these left and will sell them at this bargain price of $49.75.

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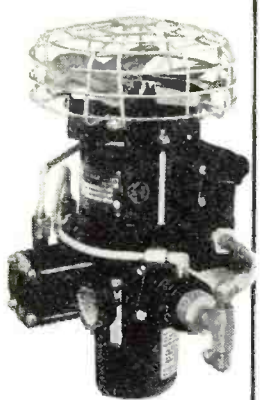

Made by the Cornelius Manufacturing Company. This small compressor will pump pressure up to 1500 lbs. per square inch. Compressor is 3-stage type air-cooled, powered by a 24 V. DC motor. This is one surplus item which your shop cannot afford to be without. Ideal for use with airgun, small paint sprayer, and numerous other applications.

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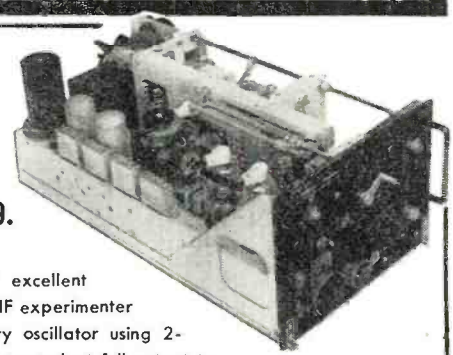

Contains many excellent parts for the VHF experimenter such as a cavity oscillator using 2-RCA 8012 tubes rated at full output to 500 Mc. Tubes are forced air cooled by 24 V. DC motor, which is easily converted for 110 V. AC operation. Other valuable parts such as a pair of 807's, 2-6AC7, 1-931 and 1-6AG7 tubes; ceramic switch, potentiometers, gears, revolution counter, etc.

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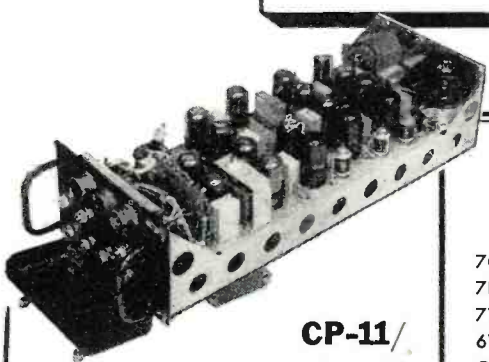

CP-11/APS-15

Contains following tubes: 13-6SN7-GT's, 3-6SA7-GT's, 1-5Y3-GT. 1: 24 V. motor and blower (blower will operate on 110 V. 60 cy.), 4-one megohm precision wire-wound resistors, 80-86 Kc. crystal, numerous other transformers, condensers, etc. Shipping weight approximately 25 lbs.

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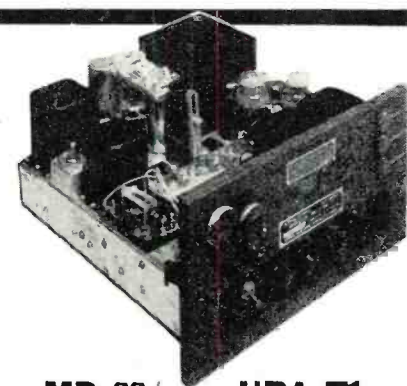
7Y4	each	.35
6V6	each	.35
CW-931	each	.35
30 (VT-67)	each	.35

(Hi-freq.-low-loss base)

6SN7	each	.35
VT127A	each	3.75
OZ4	each	.70
12A6	each	.35
1625	each	.35
1629	each	.35

All tubes checked before shipment.



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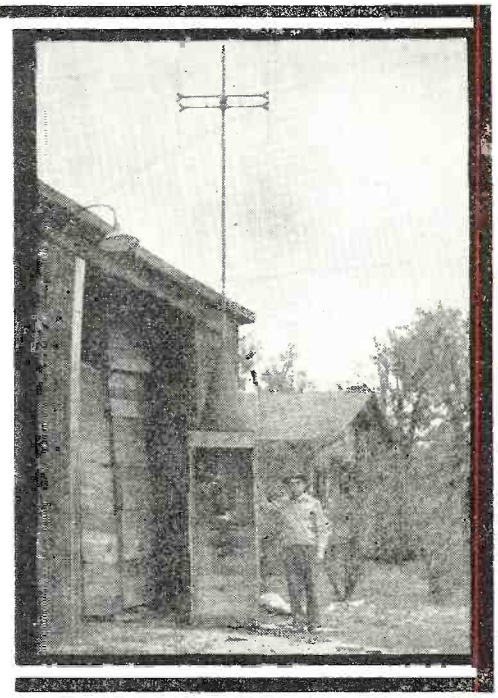
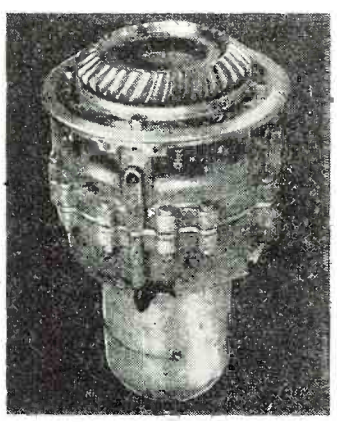
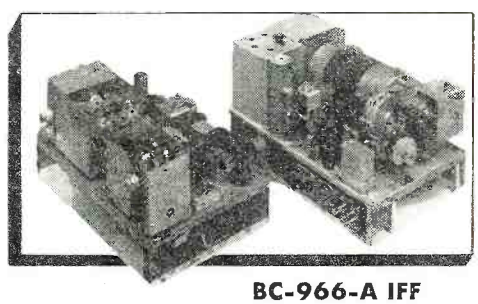


ANTENNA KIT 2A-264-126

Consists of 1 canvas bag containing 20 ceramic insulators each 3″ long—1¼″ dia. with screw-in type eyelets, one covered wire 5′ long, 1 covered wire 10′ long, 1 covered wire 35′ long, 2 covered wires 25′ long each, 5 covered wires 20′ long each (all wires included have ⅛″ thimbles and 6″ connecting leads at each end), wire 150′ long (all of this is stranded copper wire covered with weather-proof insulation). Brand new, packed in original boxes. Can be useful to any ham, serviceman or experimenter. Each kit..... **$6.75**





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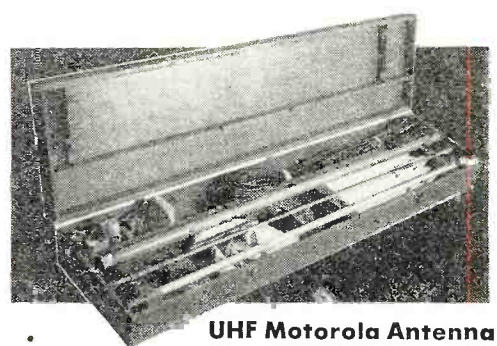

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Practical RADIO COURSE

By ALFRED A. GHIRARDI

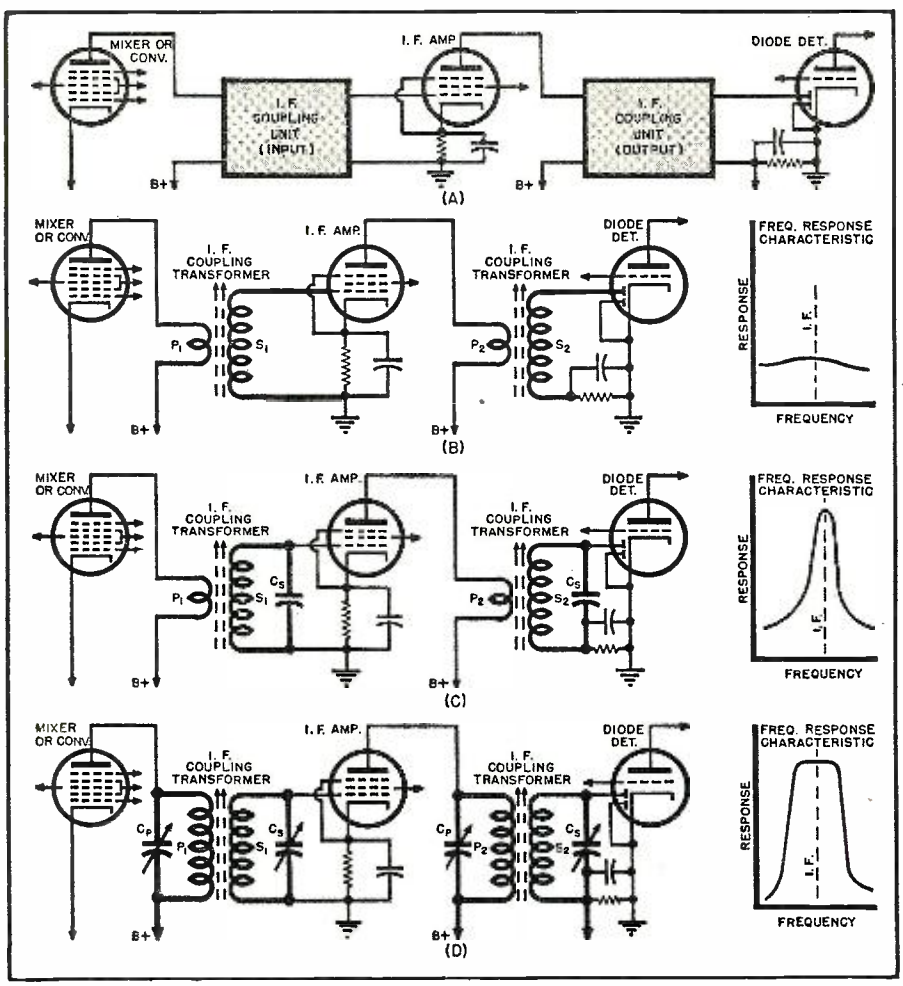
Part 58. The i.f. amplifier requirements for different types of receivers; need for an interstage coupling device that provides tuning for adjacent-channel selectivity; and characteristics of single tuned i.f. transformer

THE intermediate-frequency amplifier is essentially a fixed-tuned r.f. amplifier designed to operate in class *A* at whatever fixed intermediate frequency the receiver is designed to employ. As it is the major *gain* and *adjacent-channel selectivity* element of every superheterodyne, it is important that it be designed to have the particular operating characteristics required in the type of receiver in which it is to be employed. Before proceeding with a study of its design, it will be instructive to review, briefly, the requirements that the i.f. amplifier of a superheterodyne must fulfill.

I.F. Amplifier Requirements

The i.f. amplifier in an AM or FM sound superheterodyne, and the sound and video i.f. amplifiers in a television superheterodyne receiver, are depended upon to perform several highly important functions. The i.f. amplifier must provide:

Fig. 1. Progressive development of interstage coupling units for an i.f. amplifier.



(1) Sufficient *amplification* of the desired-signal voltage in order to provide a satisfactory amount of gain at the intermediate frequency.

(2) A suitable passband *acceptance response* characteristic (that depends upon the type of receiver) so that it will amplify and pass on both the i.f. carrier and all transmitted sideband frequency components of the desired signal that are considered important for its reproduction with acceptable fidelity.

(3) Sharp attenuation to below audibility of all carriers (and their sideband frequency components) in the adjacent upper, and lower, transmitting channels, so that any interfering adjacent-channel signals that may succeed in getting to the plate circuit of the frequency converter will be attenuated to below audibility.

(4) A satisfactory place in the receiver at which to make possible the application of *automatic volume control* (a.v.c.) if desired (usually in AM amplifiers only).

Satisfactory fulfillment of requirement (1) is often closely dependent upon requirement (2).

As the performance of every superheterodyne receiver depends to a large extent upon how well these requirements are fulfilled, the design of the i.f. amplifier is based upon them.

I.F. Amplifier Design Requirements Becoming Increasingly Complex

Until a few years ago i.f. amplifier design had narrowed down to a somewhat standardized pattern from which little variation was necessary in order to meet the foregoing requirements in receivers designed for the comparatively few different AM broadcasting and communications services then in operation. These early i.f. amplifiers employed screen-grid amplifier tubes, and later r.f. pentode amplifier tubes for increased stability and high gain per stage. One or two such i.f. amplifier stages usually provided sufficient gain for the requirements of the then-used types of receivers.

The band acceptance requirements of these receivers were comparatively simple—for AM broadcast receivers a total band-acceptance width of 9 or 10 kc. was sufficient to pass all important sideband components present in the received signal; for AM communications receivers a narrower passband, 3 kc. or less in width, was satisfactory. Consequently, the successive tubes

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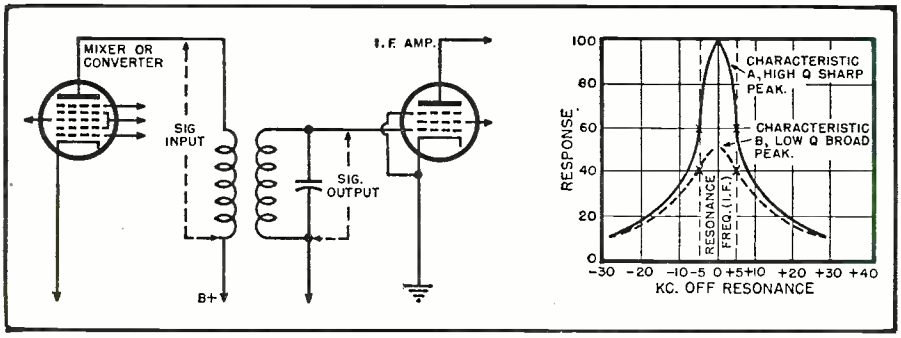


Fig. 2. Typical "peaked" frequency-response characteristics of a single-tuned interstage coupling transformer. Compare this response with that of Fig. 3.

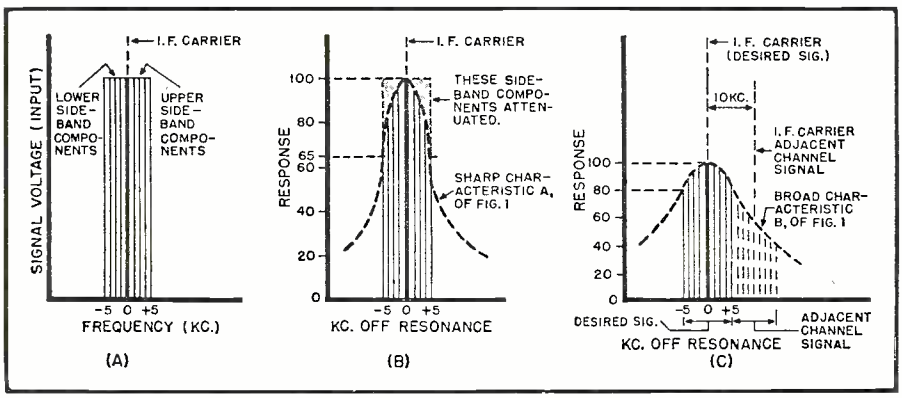


Fig. 3. Effects of sharply-peaked and broadly-peaked response characteristics on sideband attenuation and adjacent-channel selectivity of i.f. amplifier.

were usually coupled together by double-tuned, fixed-frequency transformers of comparatively simple design, the arrangement shown in Fig. 1D being most widely used.

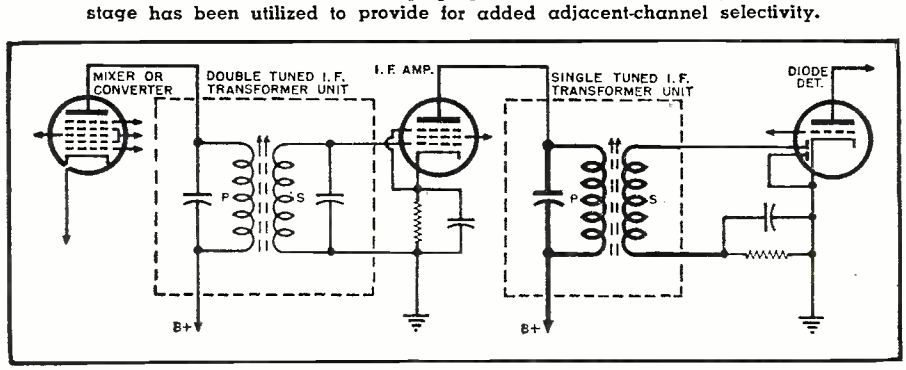
As the r.f. signals to be received lay in the comparatively low-frequency portion of the radio spectrum these i.f. amplifiers could be designed to operate at comparatively low intermediate frequencies such as 110, 175, 262, or 370 kc. Thus, high gain per stage with good stability was rather easily attained.

As new broadcasting and communications services have been developed and assigned mostly to the higher-frequency regions of the radio spectrum, the problems of designing superheterodyne receivers for satisfactory reception of their signals has become increasingly complex. For example, the trend toward signal transmission at the higher frequencies has made it necessary to employ higher intermediate frequencies in the i.f. amplifiers. This has necessitated improved coupling transformer design and construction in order to obtain adequate gain per stage at these higher intermediate frequencies. Also, the widely differing passband acceptance requirements of the many different types of present-day receivers has further complicated the design problem. To illustrate, instead of it being necessary to design i.f. amplifiers to have only the few different passband acceptance widths required by such services as AM broadcasting, AM communications, etc., it is now necessary to design them to provide such widely differing total passband acceptance widths as:

(1) 9 to 10 kc. for AM short-wave and standard broadcast receivers.

[1]Alfred A. Ghirardi, *Practical Radio Course. RADIO NEWS* Part 54, July 1947; Part 55, October 1947; Part 56, November 1947; Part 57, December 1947.

Fig. 4. Use of single-tuned i.f. coupling transformer to feed diode detector tube in an auto radio receiver employing 175 kc. i.f. A tuned r.f. preselector stage has been utilized to provide for added adjacent-channel selectivity.



(2) 3 kc. or less for AM communications receivers.

(3) 150 kc. for FM high-fidelity broadcast receivers.

(4) 4 mc. for video i.f. channels of television broadcast receivers.

(5) About 80 kc. for sound i.f. channels of television broadcast receivers.

The necessity for constructing present-day "combination" type receivers of reasonable cost that make possible the reception of the signals of two or more of these different services at will, for example (1) and (2), (1) and (3), (3) and (4-5), etc., has added varied and rather severe performance requirements that have further complicated the problem, since the i.f. amplifier response characteristics required for each of these types of signal differs so widely. As a result of this challenge to receiver design ingenuity, almost every "design trick" known in the r.f. amplifier field has been utilized in building the i.f. amplifiers for some of these types of receivers (especially those of television receivers). A rather thorough basic knowledge of the theory of operation of coupled tuned-circuits, filters, and i.f. amplifier design is required before the construction and operation of such amplifiers can be understood. Consequently it will be well to first review the pertinent basic principles.

I.F. Amplification Required and Tubes Employed

The amount of i.f. amplification required in conventional superheterodyne receivers designed for AM broadcast reception, AM communications work, FM broadcast reception, FM communications work, and television broadcast reception has already been discussed in the several preceding articles[1] of this series. High-gain r.f. pentodes of the type known under the various names "super-control," "remote cut-off," and "variable-mu" are of course the most logical i.f. amplifier tubes to use, as they have extremely low grid-to-plate capacitance for maximum circuit stability, high plate resistance for minimum loading of the tuned circuits, high mu and high transconductance for high gain. Such remote cut-off types are preferred to the sharp cut-off types to prevent cross-modulation from strong local signals when the volume control is set for low sensitivity, and to permit a wide range of a.v.c. action (in AM receivers) without detuning.

Passband Response Characteristics Required

The passband acceptance characteristic that is required in each of these types of receivers has also been discussed in detail in these previous articles. This ranges all the way from the narrow 3000-cycle (or less) total passband required in AM communications receivers to the 4-megacycle (4,000,000 cycle) passband characteristic of rather unusual shape required in the video i.f. amplifier of a television receiver.

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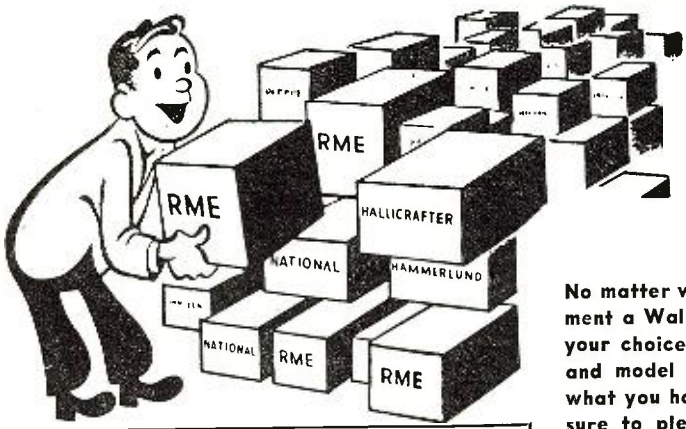

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the interstage coupling and tuning units of the intermediate-frequency amplifier must be constructed in order to make possible high i.f. stage gain, practical circuit stability in quantity-produced receivers, and at the same time provide the particular bandpass acceptance and interfering-signal rejection characteristic required—and this, for each of the several common types of receivers. Also, methods for obtaining two or more different bandpass acceptance characteristics (any one of which may be selected at will) in a single i.f. amplifier, when desired, will be investigated.

Need for an I.F. Interstage Coupling Device

Fig. 1A illustrates the basic elements of a simple single-stage i.f. amplifier such as is commonly employed in AM broadcast receivers. It contains a single high-gain pentode amplifier tube for high gain, a suitable interstage (input) coupling device for electrically coupling its signal-grid circuit to the plate circuit of the mixer or converter tube that precedes it, and another interstage (output) coupling device for suitably coupling its plate circuit to the input circuit of the detector tube that follows it. Transfer of signal energy from the plate circuit of each tube to the grid circuit of the next, without actually having direct electrical contact between them, could be easily accomplished by connecting between them a suitable transformer (untuned) having a primary winding, *P*, electrically insulated from, but magnetically coupled to, a secondary winding *S*, Fig. 1B.

Need for Tuning in I.F. Amplifier

This untuned transformer coupling arrangement would be satisfactory if it were not for the very important fact that the coupling device is required to not only transfer signal energy from the plate circuit of one tube to the input circuit of the following tube without direct electrical contact between them, but it must do so *selectively* by efficiently transferring only that signal energy which lies within a definite band of frequencies above and below the frequency of the intermediate carrier, and effectively attenuating to below audibility signal energy of all other frequencies. As an untuned coupling transformer is not sufficiently frequency-selective, it is seldom used[2] for this purpose. In those rare cases when one is employed to provide high gain at little cost, it is used in conjunction with one or more tuned i.f. coupling transformers in the i.f. amplifier—the latter supplying the required selectivity.

Since the i.f. amplifier must pass only those signals whose carriers are converted to the correct intermediate frequency value by the mixer or frequency converter, it is apparent that some sort of electrical resonance or tuning arrangement must be employed to tune it to the intermediate frequency that is to be employed in the receiver.

Single-Tuned I.F. Transformers

The simplest tuning arrangement would be one in which one of the windings of the coupling transformer, either the primary or the secondary[3], was tuned by shunting it with a fixed (or adjustable) condenser, C_s, of proper capacitance to produce a resonance at the intermediate frequency which is to be employed in the receiver. This arrangement is illustrated in Fig. 1C.

Frequency-Response Characteristic of Single-Tuned I.F. Transformer

Examination of the typical frequency-response characteristic (curve *A* in

[2]Frequently, i.f. interstage coupling transformers that appear to be untuned will be seen on the circuit diagrams of superheterodyne receivers—especially in the video i.f. amplifiers of television receivers. What appear, in such diagrams, to be untuned transformers are, in reality, double-tuned transformers whose windings are tuned to the high video i.f. by the stray plate and grid circuit capacitances (not shown on the diagrams) which exist in all amplifiers. These stray capacitances assume relatively great importance in video amplifiers because they are of sufficient magnitude to make it possible to employ them to tune the transformer windings to the rather high intermediate frequency (12.75 mc. or 25.75 mc.) employed in these amplifiers.

[3]Single-tuned i.f. transformers may be divided into two classes, according to which circuit is tuned—some have their *primaries* tuned, while others have their *secondaries* tuned. As far as the secondary voltage developed is concerned, there is not a great deal of difference, irrespective of which winding is tuned. However, if there is a likelihood of single-stage oscillation in the tube driving the single-tuned transformer, greater stability may usually be had by tuning the *secondary* rather than by tuning the primary.

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Fig. 2) of such a single-tuned i.f. transformer reveals that it is sharply "peaked" at the resonance frequency (the i.f.), therefore it does not fulfill the bandpass requirements[1] of either sound or video i.f. amplifiers. Briefly, the signal voltage which appears across the tuned inductance (the tuned secondary winding of the transformer here), or the tuning capacitance, and which is applied to the input circuit of the tube that follows in the amplifier circuit is at a *maximum* at the resonance frequency, and *rapidly decreases* for signal frequencies higher or lower than this. This signal voltage at any particular frequency is a measure of the "response" of the circuit for that frequency. (If several similar single-tuned transformers are used in cascade as interstage coupling units of an i.f. amplifier, the resulting over-all response of the entire amplifier is sharper than that of each such unit.)

Sideband Attenuation Caused by "Sharp" Single-Tuned I.F. Transformer

Let us assume that the i.f. carrier, together with all the important upper and lower sideband frequency components (all assumed to be of equal amplitude and ranging in frequency to ±5 kc. either side of the carrier frequency) of an AM broadcast signal of full tone as shown in Fig. 3A, is applied to a single-tuned coupling transformer tuned to this carrier frequency and having the sharply-peaked response characteristic illustrated by *A* of Fig. 2. Only the i.f. carrier and those sideband components close to it in frequency would get through without appreciable attenuation and be transferred at full strength to the input circuit of the following tube. All others, would be appreciably attenuated by the sharply-peaked response characteristic. The severely distorted signal shown in Fig. 3B would result.

An AM sound broadcast receiver that employed an i.f. amplifier having so sharply "peaked" a response characteristic would so distort the signal that very "boomy" and deep-toned unnatural reproduction of music, badly deficient in the life-giving high-frequency modulation components, would result (unless such severe attenuation of these components were exactly compensated for by the use of a following audio amplifier and reproducer system whose response characteristic was purposely designed to correspondingly over-emphasize these audio frequencies so as to attain a uniform over-all audio-frequency response for the i.f.-a.f. system as a whole). The effect of such severe sideband attenuation on the fidelity of the reproduced signal in an FM sound receiver or in a television receiver would be even more drastic and serious.

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band components could be reduced considerably by employing a single-tuned transformer having a response-characteristic that is much more broad at the peak. It is possible to broaden the peak in the response characteristic somewhat (but it will always continue to be a *peaked* type of response and never a flat-topped response) by designing the coupling unit so that the effective *Q* of the tuned circuit is lower. Unfortunately, when this is done for a single-tuned transformer, the maximum response (at the peak) decreases very materially but the response at frequencies appreciably removed from resonance is not altered very much. This is illustrated by broad-peaked response characteristic *B* in Fig. 2. Observe that the response at the resonance frequency is only about one-half that for sharp characteristic *A*, while for frequencies 10 kc. or more off resonance the response is almost identical for both characteristics.

The effect of such a broadened response on the signal illustrated in Fig. 3A is shown in Fig. 3C. Observe that the sideband attenuation is now less severe than in case of Fig. 3B, so the signal is not distorted so severely. However the amplitude of both the carrier and the sideband components is greatly reduced, which means that the stage gain is reduced. In addition, the adjacent-channel selectivity has been materially reduced. This will become evident if the adjacent-channel selectivity [for the i.f. amplifier in an AM broadcast receiver may be expressed as the ratio of the response at frequencies ± 5 kc. removed from resonance, to the response at the resonance frequency (intermediate frequency)] for the two operating conditions illustrated in Fig. 3B and 3C are investigated.

In Fig. 3B, assuming that the maximum peak response is 100 units, the response to sideband components of frequency ± 5 kc. from the resonance frequency is seen to be approximately 65. This is 100-65/100 = 35% down from the response at the resonance. This response at ± 5 kc. from resonance is that which would be encountered by one of the high-frequency sideband components of an adjacent-channel signal whose carrier is 10 kc. removed from that of the desired signal. Consequently, it is a measure of the adjacent-channel selectivity of this single-tuned i.f. transformer.

In the case of the transformer having the more broadly peaked response characteristic, illustrated in Fig. 3C, the peak response at the resonance frequency, though much lower than for the sharply-peaked transformer, is also considered as 100 (smaller units). The response to an adjacent-channel signal's sideband components (drawn dotted at the right) of frequency 5 kc. from the resonance frequency is seen to be approximately 80. This is only 100-80/100 = 20% down from the response at resonance. Therefore the higher-frequency sideband components at least, of an adjacent-channel signal of equal strength, will get through at 80% of the strength of the desired signal. Naturally, severe adjacent-channel interference will result.

It is apparent that the single-tuned i.f. coupling transformer suffers from inherent characteristics that are undesirable. If the peak of the response characteristic is made broad enough to reduce attenuation of the signal sidebands to a sufficiently low level to be acceptable, the flanks of the response curve also become so broad that the off-channel selectivity is too low to prevent interference from strong adjacent-channel signals.

Applications of Single-Tuned I.F. Transformers

Because of the practical difficulties involved in designing single-tuned i.f. transformers that have a sufficiently broad response at the peak to prevent severe sideband attenuation and yet have adequate off-channel selectivity to prevent adjacent-channel interference, such transformers are not widely used in the i.f. amplifiers of AM broadcast receivers, and not at all in FM broadcast or television receivers. They have found their greatest application in the less expensive AM broadcast receivers, in which they are usually employed to feed the diode detector tube, as shown in Fig. 4 (a double-tuned i.f. transformer being used to couple the frequency conversion tube to the i.f. amplifier tube). When 175 kc. is used for the i.f. and a double-tuned i.f. transformer is used in combination with it, as shown in Fig. 4, use of the single-tuned type of interstage i.f. coupler does result in sufficient over-all adjacent-channel selectivity for those automobile or home receivers that employ a tuned radio-frequency preselector (3-gang tuning condenser used in the receiver), for in such receiver a well-designed t.r.f. stage aids the over-all adjacent-channel selectivity of the receiver.

The Double-Tuned I.F.

The foregoing discussion shows that single-tuned i.f. transformers have found only very limited use in i.f. amplifiers because they provide a peaked type of frequency response characteristic whose response decreases markedly if attempts are made to broaden it sufficiently to prevent severe cutting of the sideband frequency components of sound in video signals.

Two properly coupled, similarly tuned circuits, both tuned to the same frequency, forming, in effect, a double-tuned transformer can be made to provide the flat-topped, steep-sided type of frequency response curve that is desired. A one-stage i.f. amplifier employing two such double-tuned transformers is illustrated in Fig. 1D. The flat-topped (bandpass), steep sided, type of response curve that can be obtained by proper design is illustrated to the right. The operation of this type of interstage i. f. coupling unit will be explained in the next article.

(To be continued)

SPRAGUE TRADING POST

SWAP-BUY OR SELL

FOR SALE—Hallicrafters S-38 receiver 4 months old, in perfect condition. Harry Beazley, 1843 W. Kings Highway, San Antonio 1, Texas.

WANTED—Information and/or circuit diagrams to convert GP-7 tuner to VFO. John Coker, W8STE, 757 E. 82nd St., Cleveland 3, Ohio.

FOR SALE—Antenna poles, 40' telescopic sections comp. guy wires, rope, pulleys, $50 ea. Wally Moore, 235 Pulaski St., Lawrenceburg, Tenn.

FOR SALE—Complete Meissner 150 B transmitter converted for 20 meter operation $250; also Abbott TR4 A with Carter dynamotor and BM 2 five element beam; HQ-129-x with matching speaker. Clyde Keeler, W2NQW, 46 Seward Ave., Port Jervis, N. Y.

SELL OR TRADE—Abbott TR-4 complete with vibrapack and 115v power supply. Want Amertran, 6200v transformer or similar. A. Adolph, W2VWM, 73-51 184th St., Flushing, N. Y.

FOR SALE—National 1-10A receiver used less than 6 hours, less speaker and power supply. L. C. Millard, W4DQB, 937 Boiling Ave., Norfolk, Va.

FOR SALE—U. S. signal corps radio receiver BC-728A including Willard battery and E-200 signal generator. John J. Levine, Carr Electric Products, 1517 Kelley Square, Worcester 4, Mass.

WANTED—Home recording unit or motor for 25 cycle current a-c. John Sullivan, Charing Cross, Ont. 3, Canada.

WILL TRADE—Radio parts and tubes. Want camera and short-wave receiver. P. Gurshewitz, Launder-Rite, 176 Smith St., Brooklyn, N. Y.

FOR SALE—300 watt phone, 450 watt c.w. transmitter, 5 meters commercial in appearance and operation; also single 6K8 10 meter converter 1500 kc IF, $8 and other items. Herbert Bender, WØMBY, 4515 Upton Ave. N., Minneapolis, Minn.

FOR SALE—Navy SSR-1G receiver with external supply for 110v operation, covers 2.4-16.3mc; very compact 5 tube set including new headset. Ideal for SWL, $25; also new Hickok 435 VOM, $40. L. Leoni, 2673 Euclid Heights Blvd., Cleveland, Ohio.

SELL OR TRADE—Several 32v radio receivers complete and late model 32v Westinghouse cleaner. Want National FB7 or FB7X with coils and pack. W. W. Brackenridge, 213 Harrison Ave., Harrison, Ohio.

FOR SALE—FBXA National power supply, 80, 40, meter coils; 20 meter coils homewound, $40. W2MMW, Jerry Mirra, 4412 Hill Ave., Bronx, N. Y.

SELL OR TRADE—Hallicrafter S38 AC-DC broadcast and longwave band, new in good condition; also Springfield 22 rifle. John Moy, Box 169 Canal Station, New York 13, N. Y.

FOR SALE—QST in A-1 condition, 97 issues from 1938-47 all consecutive; teleplex practically new with 20 lessons and instructions, 110v ac $20. Stancor DC-3 transmitter, $8. Will exchange lists. Raymond H. Ives, 822 Windsor Ave., Norfolk 4, Va.

FOR SALE—BC348 new with instruction book works on 110v a.c.; rebuilt xtal filter; parts for extra stage audio and a meter included, etc. Philip Writer, 4633½ Pickford St., Los Angeles 35, Calif.

FOR SALE OR TRADE—New McMurdo-Silver 800 H.F. receiver complete with tubes and coils. Want Gonsett 10 meter converter or make offer. H. J. Berg, W3KPO, 1609 Jenny Lind St., McKeesport, Pa.

FOR SALE—Speech amplifier and modulator complete for 150 watt rig; also four variable transmitting condensers. Write for details. Paul Niles, W9KXK, Waupaca, Wisc.

FOR SALE—Cabinet type Edison phonograph with built in horn and about 100 old round wax records. Will make fine recording outfit for radio or dictograph. J. W. Peyton, Rt. 5, Springfield, Tenn.

FOR SALE—Supreme AF-100 transmitter, perfect condition, complete, postpaid $475. J. Farrington, W2KGD, 24 Concord Ave., Larchmont, N. Y.

FOR SALE—NRI complete course on am-fm television, $50; Solar Quick check capacitor analyzer QCA-1-60, $20; also assortment of tubes, controls, condensers, resistors, etc., send for list FM & Servicing by Resistance Measurement, Rider, $1.25 ea. Charles Becker, 1350 E. 18th St., Brooklyn 30, N. Y.

SELL OR TRADE—National 1-10 receiver with coils, power supply, used for test purposes only. Want 10 meter Gonset converter or $40. S. Semel, W2SHE, 111-55 77th Ave., Forest Hills, N. Y.

SELL OR TRADE—Neon condenser tester, 4 amp. battery charger; Lenk dc milliampere and voltmeter, 6 volt 10 amp battery eliminator, low resistance ohmmeter, cased 0-3 dc voltmeter, $40, takes everything or trade for what have you? Stanley J. Zuchora, W8QKU, 2748 Meade St., Detroit, Mich.

FOR SALE—10 watt, 75 meter fone, cw rig 802 final, complete with mike, stand, key, 2 xtals, coils and power supply as well as complete instructions, $35. A. Brown, 3551 Willys Parkway, Toledo 12, Ohio.

FOR SALE—Amateur mark II transceiver, new condition, fones, connectors, etc., $25; BC375E 50' rubberized cable, plugs $5; new dual power supply 900v/280ma; 175-300v R/175ma; 5v/3a; 6v/2a, $30. Kendrick Martin, 7569 Sterling Drive, Oakland 5, Calif.

WILL TRADE—New Mark II tank transmitter, receiver, aerials, power supply, headphones and mike, ready to operate. Want late model dynamic tube tester, dynamic headset-mike combinations for a pair of telephone type handsets. Dave Irvine, Box 232, Coos Bay, Ore.

FOR SALE—National 101-XA with S meter, speaker in good condition, $125. Wm. A. Blum, Fort Washington, Pa.

WANTED—Rider manuals 3, 4, 6, 7, 8; good used set tester VTVM; condenser tester, plate transformer 1.10v primary 3000-25000-0-2500-3000v sec. 400 to 500 mils; 5 volt filament transformer 25 amps and insulated for 5000 volts; a 2 meter mobile rig complete. State condition. Baney Radio Service W3EPZ, 115 Cleveland St., Butler, Pa.

FOR SALE—BC1267A, transmitter-receiver, $35 and BC-1072A transmitter using PP826 including power supply, $40; both in new condition and fine for 2 meters; Instructograph code machine with built-in oscillator, $15. HYQ75 with tube, $8. Local buyer preferred, W3LCX, P. J. Hagan, 7411 Fayette St., Philadelphia, Pa.

URGENTLY NEEDED—Wiring diagrams and data for U. S. army PE-110-C power supply made by Hallicrafters. Will borrow or buy. Antone L. Oliveria, W1PWL, 94 Potomaka St., New Bedford, Mass.

FOR SALE—Hallicrafters S-22R receiver, new PA system, tubes, mike, etc. Robert Paxton, 10110 Hereford Place, Silver Spring, Md.

WANTED—National NC-46, have Hallicrafters S-41 to trade plus cash. Stephen J. Gurka, 26351 Zeman Ave., Euclid 23, Ohio.

FOR SALE—BC312 receiver, less tubes with instruction book, $20. A. Larky, 223 W. Summit St., Somerville, N. J.

FOR SALE—National NC-101X receiver with matching 10" speaker, all hambands, xtal filter, terrific bandspread, S meter like new. Fred Singer, APLJHU, Silver Spring, Md.

SELL OR TRADE—Vomax 900. Want N.R.I. professional resistor-condenser tester or $55 worth of popular tubes and Sprague resistors and condensers or cash. Reuben Lagman, Viola, Idaho.

FOR SALE—McMurdo-Silver 900 vomax in very good condition, $55. E. Flowers, W2FWP, 439 Wooden Ave., S. Plainfield, N. J.

FOR SALE—Hallicrafters recliner, SX-42 and speaker to match. $250. Ben F. Locke, Marthaville, La.

URGENTLY NEEDED—Final tank coil 14. to 18. mcs; antenna tuning unit 14. to 18. mcs for BC610E. S/Sgt. E. E. Bernfeld Special Services, RCAAF, Rapid City, S. Dak.

FOR SALE—Kenyon T-656 plate transformer, T367 filament transformer and UTC S61 filament transformer; Stancor C1402 and C1403 Choke 250ma, UTC LS-50, 15,000/50; Cardwell Tuning Condensers, EU-75-AD Dual 75; ET-30-AD1, Dual 30, MT-100 dual 100 double space and misc. other parts. R. Hamilton, W6YGL, 432 W. Santa Barbara, Los Angeles, Calif.

SELL OR TRADE—Pierson PR15 communication receiver 550kc to 40 meg, $85. Will accept BC221 frequency meter as part payment. A. G. Courchene, 60 Broadway St., Concord, N. H.

FOR SALE—RCA 155C 3" oscilloscope, like new, in original carton, $80; Thordarson T30W14, 14 watt amplifier in original carton, $42; also 88-108 mc FM tuner using 10 tubes and various amateur equipment. John V. Urban, 140-34 Holly Ave., Flushing, N. Y.

WILL TRADE — 3 line cushion, index, rubber stamp. Want one new or two used 12SA7, 12SK7, 12SQ7 or 50L6 tubes. T. Cookson, Puxico, Mo.

FOR SALE—Coils, 2 40 m, 1—10 m, 150 w., surplus 16.5 ceramic; transformers, OPT assembly BC348P, 7500 V.A.C.C.T. 18 ma/115v a-c, 150 w., 500hy AF choke; Relays, 3-Ig, protective, 4 PST—220v a-c time delay, 100v d-c; some multiconductor cable. Ralph L. Gunther, W6THN, 1440 S. Curson Ave., Los Angeles 35, Calif.

SELL OR TRADE—TR-4 on 2m with ac power supply—20 watt bandswitch cw transmitter with PI ant. network; Weston 324 multimeter. Want 8mm projector, tube tester, VTVM, AudioOscillator, signal generator or what have you? Arthur R. J. Johnson, W2NFC, 217-38 35th Ave., Bayside, Long Island, N. Y.

FOR SALE—Abbott TR4 transmitter and receiver on 2 meters, never used, with tubes, single button carbon mike, $40; also Hallicrafters S20-R sky champ just aligned, $45. R. K. Ruggiero, W2RRV, 132 N. 13th St., Newark, N. J.

FOR SALE — Hallicrafters S40A communications receiver 3 months old, $52 plus shipping charges. C. Nagy, 228 S. Main, South Bend, Ind.

WANTED — 35mm camera. Will make good trade in radio tubes or parts for camera. M. Gershowe, 147 Chester St., Brooklyn 12, N. Y.

SELL OR TRADE—Erwood record changer and following tubes: 25Q, 45Q, 35T, 87S, 3B24, 72, 3D23, T1B35, 24, 24G, 3C28, 3C24, 2C34, 247A, 217C, 4C32, 257C, 4D23, 4-125A, 6B21, 304, etc. Write for prices. Want 16mm camera and projector and radio parts and receiver. Jim Simpson, Star Route, Alma, Calif.

FOR SALE—Simpson 315 signal generator, new, perfect, $50. Albert M. Herring, 3422 Galloway, Memphis 12, Tenn.

FOR SALE—QST from March '32 to 1946 in good condition, $25; also 12 White earpenter's chisel handles, loose, $8. L. J. Wood, Stafford, Genesee County, N. Y.

Selling Service

By G. E. VINSON

Alert, active salesmanship is the key to the successful operation of your radio business.

IT IS time that something was said about the independent radio serviceman and some attempt made to clarify some of the erroneous ideas that were making the headlines in radio circles during the war years. This is a candid, unbiased opinion of the situation as it stands today.

There were many articles written during the war concerning the status of the serviceman. Most of these voiced pessimistic misgivings which only caused conflict in the mind of the serviceman. If the individual radioman had taken this over-cautious advice seriously it might have been the cause of his undoing. At any rate, it caused financial setbacks if not a complete failure in several cases.

These articles advised the servicemen to become sales-minded, and warned that if they did not they were going to lose out. This is sound advice, but entirely too much emphasis was laid on the selling of appliances, however, and little was said about salesmanship in regard to repairing. For the small independent shop owner whose only business is to be the repairing of radios, salesmanship must be developed just as much as it must be for the successful selling of appliances. Perhaps you wonder why, if this salesmanship is developed for the purpose of selling service, it could not be put to good use in selling merchandise. The answer is, "It could be!" but here is the catch. The average serviceman lacks the necessary capital to start or maintain a going business in merchandise. An abundance of capital is necessary in order to weather the storms in this line.

I have seen small shops turn against selling new radios and appliances after the postwar buying spree dropped. Of course, this was an unusual period but the same difficulties that were then present are continuing. The main obstacle was lack of capital. Small shop owners had a considerable amount of cash tied up in their stock of merchandise, and could not profitably compete with the larger establishments.

When radios started moving too slowly, the department stores offered theirs at attractive discounts. If the small shop does this, it usually has to forfeit not part but all of its profit. The larger establishments can afford to take a loss of this nature in order to move their merchandise, but it usually does not consume the entire normal profit. Then too, the large business has a much greater working capital which allows it to buy in huge quantities. This, of course, effects a neat deduction in cost which, in turn, allows a more flexible price range to sell profitably at discounts.

People like to buy in large, modern, air-conditioned showrooms where they can make their selections from a large and well-balanced stock. Of course, most of these stores are located in the downtown business sections where the rent is high. It takes a great deal of capital to construct a dream showroom. The serviceman is in an excellent position to market radios and appliances only if he has a large, modern store in a good location, and an abundance of capital. This might seem unfortunate to some, but it seems the serviceman should not lose sight of the aims which he had when he started his shop, that of radio service. His fortune lies in his ability to sell himself and radio service.

If an individual serviceman has the capital, then he should, by all means, try to expand; but he should not try to do so until he has the facts and figures on the contemplated expansion. To attempt it without advice, especially on the necessary expenditures, is simply courting failure. One should never make expenditures or buy with credit when it involves living beyond his means.

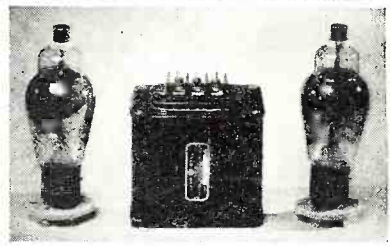
A good budget is a cure for over-expansion and a business should use one. The U. S. Department of Commerce is a reliable place to get information on business trends and data regarding any expansion plans you may have. Their advice is quite sound.

Since the average serviceman lives on the income derived from his shop and usually does not have the capital to venture into the selling of radios and appliances, he should explore the sales angles which can be used in selling more and more service. To do this he must acquaint himself with the principles of modern salesmanship and endeavor to develop these techniques. A discussion of salesmanship would take too much space, but there are many good books on the subject which the serviceman should seek out in his public library. I would like to mention, however, the importance of a good personality because it cannot be stressed too much. I think the average serviceman has a good personality, but some personalities could stand a little refurbishing. By all means, make the most of your

"TAB"

• NEW GUARANTEED — That's A Buy — ELECTRONIC PARTS •

RELAY Thyratron/BO/5000 ohms/18ma/10A $1.95
RELAY Allied BJ/115VAC/5Amp 1.89
LS3 SPEAKERS Cased PM used $3.95, *LN 4.95
C'TAB FOR S.C. Techmanuals & Diagrams TM for BC221&211/$1; BC312/ MAINT. $1.00
DIAGRAMS ARC5/SCR522/SCR-274/BC348 BC191/BC375/BC624& 625 @40c. ..... ALL $1.75
GIBSON GIRL BC778/PO/SCR578 *LN ... $4.95
BC212 TANK Interphone tubes & dyn *LN. 3.95
COILS FOR BC191/TU5,7,8,9,10 ... each 2.70
WILCOX RCVR CW3 & coils NEW 10.95
COILS CW3—5to10 or 9to16mcs @ 2.70
BC457/458/459/ARC5 XMTTER LN@ 5.95
BC1206 BEACON RCVR 200-400 KC *LN ... 4.95
BC453 RCVR/po/SCR274/190-550kc *LN ... 6.95
BC454/3-mcs or BC455/6-9mcs/RCVR *LN 4.50
SOUND POWERED TELEPHONES, per pair 19.90
AUTOSYN AY1&5/24-28V/60&400cy 3.95
AUTOSYN Type 5/50V/2for115V/60cy ..ea 4.95
AUTOSYN Type 5/115V/60cy NEW .2 for 18.00
ANTENNA S.C. MULTISECTION 16'/ 2.95; 19' 3.49
Same 22'/$4.25; 25'/$6.95; 28'6" 7.95
Same 31'9"/$8.95; 34'11"/9.95;38'1" 10.95
5ft. 4"/29c; Sections 38"/15 for 1.00
ANTENNA TELESCOPIC 12"to9' 1.00
ANTENNA BOWL HF 2⅛"D&ROD ..2 for .98



CONSISTS OF TWO JAN NEW 866A TUBES, TRANSFORMER GARDNER ELEC CASED 2.5V 10 AMP, 115V/60cy inpt. M.V. insltd 9000V wkg similar to illustrated unit; "TAB" Tested 16000 VAC Test; Same mtg as KENYON T389—SOCKETS CERAMIC, Two HVType.

"TAB" SPECIAL $5.95

TRANSFORMER ONLY for Two 866A's... $ 3.95
872A's COMBINATION TRANSF. sockets.. 12.00
872A TRANSFORMER 115 60 cy 6.95
872 BRIDGE TRANSF 220V/3x5V/20KV ins 3x5V/ 20KV ins 16.95

FOXBORO GRAPHIC STRIP RECORDER with 115V/60c motor, New $39.95
BENDIX GYRO SERVO, NEW $2.95
SYNCHRONOUS CLOCK Mtr 1RPM/115V. 2.49
SYNCH CLOCK Mtr 10V/60c/24RPM ..... .69
REMOTE CONTROL UNIT RM-53, NEW HAS 2 plugs, 2-4mfd oil condrs, SENS 4ma Relay, DP NO&NC switches, UTC Transf CT IIne to G or multiline or mike & Water-proof box $1.60@ ..... 2 for $3.00
GE SAFETY SWITCH, 69c@ ..... 2 for $1.00
LACING CORD #9, per pound 1.49
MICROSWITCH: SPDT 35c @ ..... 10 for 3.00
MICROSWITCH LEAF OR ROLLER 2 for 1.39
NATIONAL XS-2 Feed thru insltr.. 2 pr. .25
VARIABLE CONDSR Millen 150mmf/3000V & 2 non-ind 12ohm/40watt resist, Knob Clips, PO/SC/A2T Phantom Ant New $1.00
SIMPLEX RUBBER CO-AXIAL SPLICE, 10 for $1.00
CONDSR VAR Splitstator 90mmf per sec ... .98
OSCILLOSCOPE 3" KIT 3BP1 includes: Transf 115V/60cypri, 375 VCT/110 ma/1320V, 5V/3A, 2.5V/3.25A, 6.3V/ 2.75A new tubes 3BP1, 5Y3GT, 2V3G RECT Condsrs, choke, low & HV supply Complete $15.95

"TAB" For Tubes

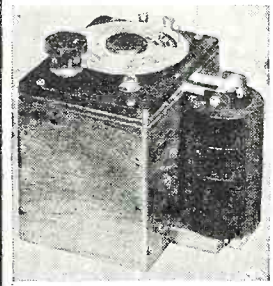
1E7G	$ .89	12SK7	.69
1L4	.98	12SR7	.69
1P5G	.59	12SQ7	.62
2A5	.60	35L6	.62
2X2	.49	35Z5	.52
2Y3G	.69	50L6	.64
3A4	.52	30	.74
3B7/1291	.49	80	.39
3S4	1.00	15E	1.95
5R4GY	.49	3C24/24G	.74
5T4	.97	100TS	2.90
5U4G	.59	VR105	.74
5W4	.97	VR150	.74
5Y3G	.41	211	.59
5Z3	.55	2C26	.74
5Z4	.89	2C40/446	.88
6AB7	.89	3B24	.74
6AC7	.59	304TL	3.75
6AG5	.97	307A	3.25
6AG7	.90	WL531	25.00
6AK5	.59	5D21	19.00
6AL5	.81	6AR6	1.28
6B4G	1.20	703A	3.95
6B8G	1.00	717A	.89
6C4	.20	723	2.95
6C5	.48	725	2.95
6C8	.73	807	1.30
6C8G	.63	808	1.75
6D6	.61	813	9.00
6E5	.69	815	2.20
6F6	.69	826	1.45
6F7	1.20	829B/3E29	
6F8	1.26		2.90
6G5/6H5	.90	836	1.47
6G6	.79	837	2.25
6H6	.39	864	.60
6J4	1.80	866A	1.00
6J5	.62	872A	2.75
6J6	.49	931A	1.87
6J7	.81	954	.29
6K7	.61	955S	.29
6K8	.79	956	.75
6L6	1.15	958A	.39
6L7	.97	991	.39
6N7	1.20	10Y	.30
6SA7	.43	12SH7	.87
6SC7	.84	1299/3D6	.49
6SG7	$ .54	1613	$ .89
6SJ7	.63	1616	2.90
6SL7	.69	1619	.20
6SN7	.68	1625	.15
6V6	.75	1641	.89
6X5	.75	2050	.75
6Y6G	.87	9002	.80
7C5	1.00	9004	.54
12A6	.29	9006	.67
12AH7	1.00	3AP1	2.90
12K8	.84	3BP1	1.95
12SA7	.58	3BP1A	2.90
12SC7	.82	3FP7	1.90
		3GP1	2.90
		3JP1	3.00
		2AP1	1.95
		2AP1A	2.95
		5AP1	3.55
		5BP1	2.25
		5BP4	2.25
		5CP1	2.25
		5CP1A	3.55
		5FP7	4.50
		5HP1	4.50
		7BP7	2.90
		VT127	2.95
		631P1	3.75
		CK1005	.49
		2J21	14.95
		2J32	18.00
		2J55	18.00
		2K29	4.95
		TUNGAR*	
		20X672*	2.95
		199698*	2.95
		289881*	2.50
		C6J	4.95
		2RA15	10.00
		CE215	10.00
		2RA6	3.95
		CE206	3.95
		FG104	14.95
		FG105	16.95
		1B24	2.95
		1B27	2.95
		4E27	8.00
		8012	1.95
		MAZDA	
		44'	.04
		47'	.05
		49'	.06
		S6'	.14
		NE20/51	.08
		NE16/48	.25
		805	3.70
		845	3.70
		450TL	25.00
		12DP7	4.00
		8013	2.00
		9JP1	2.95

C'TAB Microwave Gear tubes, Klystrons 723/2K29 Magnetrons. TUBES GTD except open Fil. & Breakage.

SOCKETS CR/MAGINAL 59c, DIHEPTAL $ .69
TBY VIBRAPACK NEW COMPLETE 9.95
VIBRAPACK ONLY $6.50; S'Battery 5.95
Used VIBRAPACK $4.50; Used S'BAT 3.95
HEINEMAN CIRCUIT BREAKERS 10ma 3-35-40-50AMP (LP$6.95) ..... each $1.25
SQUARE D 25Amp Ckt Brk Toggle ..... .69
ANT RELAY HIF/SPNC/115V/60Cy 1.95
VOLTAGE REGULATOR NEW RAYTHEON 95-130V/60cy OUTPUT 115V/1.25amp 10.95
V'REGULATOR Same 198-242Vinpt/50-60cy ..... OUTPUT 220V/500Watts/.5' regultn 29.95
SAME UNIT WITH TRANSF 115VOLTS 39.95
CRYSTAL DIODES IN34@$1.15,5 for$5.25; 10 for 10.00
CRYSTAL DIODE IN21/23/26/@$1 .3 for 2.00
WIRE AN#10/STD'D/100' $1.50; 1000' 12.95
WIRE AN#18/STD'D/1000 ft. $4.95; 10000' 39.50
EE65 TELEPHONE & RINGER INTERCOM for Testing lines & equp Reads V&ohms to 2 megs. 19.95
SELENIUM IT&T 6B8AV1/FW85V/2.4Amp 6.95
SELENIUM 110VDC/2.6Afw$6.95 2.2V/1.5A 1.79
COIL 5 PRONG Slug tuned 2to2.7mcs 10 for 1.00
GE TELV 0.4mu'sec pulse Transf 1.49

POWER RHEOSTATS 25Watt 100,125,250,350, 400, 500, 1600, 2500 ohm 69c @ ..... 4 for $2.49
POWER RHEOSTATS 50 Watt 8, 25, 60, 100, 225 ohm 98c @ ..... 4 for 3.49
FUSES 250 ma or 4A/3AG, or 200 ma/ 8AG ..... 50 for $1.00
IF Transf Telev or FM Dbl slugtuned Hifreq 11 to 13 mcs HiQ ..... 2 for .98
WILLARD STORAGE 2 V BATS, NEW NONSPIL BB54/ER27/30AH $1.79@2 for 3.30
BB206/U/2V/26AH $1.25@ ..... 2 for 2.25
BATTERY, BURGESS 3V/F2BP/1947 ..... .25
PILOT LIGHT 1" & S6/115V bulb ... 2 for .98
SEND FOR "TABOGRAM" BARGAIN CAT.

★★★★★★★★★★★★★★★★★★★★★★★★★★



TYPE 566A
Direct Reading 0.5 to 150 mc's 600 to 2MTR's HIGH ACCY DIAL CALIB'FIVE COILS LP$60 NEW SPECIAL
$29.95

★★★★★★★★★★★★★★★★★★★★★★★★★★

BLOWER& TRANSF 115V/60c/100CFM ... $5.95
BLOWER, CASED 115V/60c/125CFM 7.95
CO-AX CONNECTORS PL259/35c; SO239/35c; Pair ..... .63
RELAY STRUTHER SPNO/115V/60c/6A .. 1.69
RELAY CLARE A/4PDT/3AX/115V/60c ... 2.95
RELAY SD DPDT/115V/60c/10A IND ... 1.95
RELAY CONTACTOR/4PNO/110V/60c/35A 6.95
RELAY GE SENSITIVE SPDT/2.5 ma/5A .. 1.95
RELAY SENS SPDT/4ma/700 ohm/5A 1.95
RELAY SENS. SPDT/2000 ohm/8ma/3A ... 1.69
RELAY latching overload 110 VAC&10ma/5000 ohm 3.95
RELAY Allied BJ/DPDT/6VDC/5A 1.49
SWITCH GE-SPERTI SPDT/15000V/5A/1S21 ..... 2.95
PUSH BUTTON SWITCH 8 POSITION 69c@ 2 for ..... .98
EXT CORD HVY DUTY SJ/16, M&F plugs. .98
WRITE FOR TRANSFORMER &CONDSR LIST
VIBROPLEX KEY USED $3.95; NEW 5.75
I-222 SIGENERATOR 8to15 & 45to77mcs .. 39.95

PRECISION RESISTORS IRC, SHALLCROSS MEPCO, INST. RES. CO., OHMITE, WE, for METERS BRIDGES, AMPLIFIERS

*½%	**5%	†10%	(Rest 1%)
2000**	4300**	5100**	12000**
30000**	84000**	150000**	220000**
245000**	250000†	950000†	1155

ABOVE SIZES, 30c each asstd ..... 10 for $1.98

1	2	3	4	5
6	10	12	20	25
30	37	45	55	60
70	80	100	101	107
120	125	150	160	165
182.4	200	209.4	220	230
240	250	266	280	286
300	320	340	400	426
440	452	480	500	520
540	550	550	600	612
640	700	750	800	850
900	910	1000	1030	1100
1110	1150	1175	1200	1250
1260	1330	1350	1500	1600
1650	1800	1900	1960	2000
2080	2142*	2300	2400	2485
2490	2500	2600	2635	2800
2850	2860	2900	3000	3100
3290	3500	3730	4000	4300
4440	4444	4500	4720	4850
4885	5900	5000	5025	5210
5270	5500	5730	6000	6300
6500	7000	7500	7613	7700
7950*	8000	8250	8500	9000
9710	10000	10500	12000	14600
15000*	17000	18000	19000	20000*
21500	23000	30000*	40000	50000
95000	68000	75000	80000	91000

ABOVE SIZES, EACH 45c ..... 10 for $3.00

147000	150000	166750	175000	185000
201000	229000	250000	254000	265000
268000	294000	314000	333000	333500
400000	402000	420000	422000	458000
478000	500000	575000	600000	654000
700000	750000	900000		

ABOVE SIZES, EACH 60c ..... 10 for $5.00

950000	1 MEG	1.200	2 MEG	2.855
3 MEG	3.673	4 MEG	4.230	4.250
4.5 MEG	5 MEG	9.050	10 MEG	11.55
12.83	20 MEG			

ABOVE SIZES, EACH 90c ..... 10 for $6.95

VICTOREEN VACUUM PRECIS. RSTRS. .83meg, 1meg, 1.5meg, 2meg, 3meg., 3.75meg, ¼of1% ACCY Hivolts ..... ea. $1.00
IRC NAVY PRECIS. 1meg ¼of1% WW 1.69
IRC NAVY WW 2meg HV 1/5 of1% caged .. 4.95
CENCO LECTURE GALVANOMETER #82145 SCALE 13", READS 25MV,5.25,125V; Amps 1,5,25 & 5ma NEW SPECIAL $19.95
WST & GE O-150VAC/2½"B'Csd new $3.95

KIT SILVER & MICA CONDSRS .. 50 for $2.00
KIT SILVER MICA CONDSRS ..... 30 for 1.50
KIT CONTROLS 50-2meg AB/POTS 10 for 2.00
KIT RESISTORS ½ &1Watt/50to2meg. 100 for 2.50
KIT VITREOUS WW RESISTORS .. 20 for 1.00
KIT SOCKETS 25ASSTD (8-7-5-4P) 2.49
KIT POWER RHEOS. 25&50Watt .... 6 for 3.49
KIT ROTARY SWITCHES, ASSTD .. 6 for 1.75
KIT G&P Tube caps ¼, ⅜, 9/16" ..... 50 for 1.49
KIT COIL FORMS Thd'd small HF 50 for 1.00
KIT IRON CORE SLUGS AND SCREW ..... 50 for 1.00
KIT ELASTIC STOPNUTS RADIO ASSTD. ..... 75 for 1.00
KIT LUGS LARGE RADIO Elec Type 100 for 1.00
KIT LUGS SMALL RADIO Type ... 500 for 1.00
KIT KNOBS ASSTD With Insert ..... 25 for 1.25
KIT MOTOR BRUSHES ASSTD ... 100 for 1.00
KIT FUSES ASSTD BUSS & L.F. ... 300 for 1.95
KIT GROMMET Rubber Radio asst. 100 for 1.00
KIT SPAGHETTI SLEEVING ASSTD. 75 for 1.00
KIT CERAMICON CONDRS ASSTD 15 for 1.00
5mfd/600WV oil condsrs & brackets ... 2 for .98
MICROSWITCH 2 for 39c ..... 10 for 1.49
AUDIO BAND PASS FILTERS 20DB cutoff HiQ 60 or 90 or 150cycles $1.95 ea ... 3 for 4.50
CRYSTAL ROCHELLE Salts mtd .... 4 for 1.00
TIME DELAY RELAY 115V/10Amp/ACDC . 1.49

COLLINS ART/13 SPEECH AMPLIFIER COMPLETE INPT

DYNAMIC OR CARBON MICROPHONE OR LINE INPT; Output PP class "B" GRIDS. Noise Level down—55DB. INCLUDES INPT TRANSF 1st AUDIO to PPGrids MODULATOR TUBES, 6V6 sidetone adj Audio osc AMP & Hdphone monitoring jack. WT 5LBS. DIM 7-½L 3½ W 5"H. minus tubes & pwr supply "TAB" SPECIAL WITH TWO 6V6 & 6SJ7 ..... $4.95

$2 Min. order FOB N.Y.C. Add Postage all orders and 25% deposit. WOrth 2-7230. Send for catalog. Specialists in International Export, School, College & Industrial trade. Money Back Guarantee.

"TAB" • Dept. 1RN, Six Church Street, New York 6, N. Y., U.S.A. • "TAB"
THAT'S A BUY • • • CORNER CHURCH & LIBERTY STS., ROOM 200 • • • THAT'S A BUY

personality; it always pays dividends!

After the serviceman has learned good sales principles, he is ready to adapt these to the selling of his important services. Sales techniques are fairly easy to learn and no serviceman can afford to ignore them. However, do not overdo it to the exclusion of keeping abreast of important technical knowledge.

Proper advertising in plain everyday words that everyone understands is also important to the serviceman. The article, "What Does Your Customer Buy?," in the July issue, seems to me to be the ideal in good advertising. This was written on the theme of making your customer's radio "sing," a technique which is customer-wise.

The article, "At Your Service Madame," in the June issue, also seems to approach an ideal. Trying to please the housewife has always been a sore spot. You cannot overlook this important factor since it is she who will judge your ability as a radioman. She will not know if it sounds perfect, but she will scrutinize details as to cleanliness and neatness.

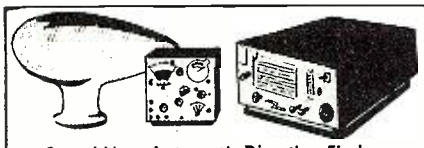
I firmly believe the average serviceman may enhance his position and increase his income by being sales conscious in regard to service, keeping abreast of important technical knowledge, making a determined effort to please, and by using good down-to-earth advertising. The extra effort will certainly be reflected in your cash register.

While the service business, for the most part, has declined over the past several months, time-tested sales techniques can help you over the rough spots. The measure of benefit gained is directly related to how faithfully you are able to carry them out.

Television should bring about the large volume of business of which we are so desirous, but you must be prepared to take advantage of this wonderful opportunity when it presents itself. While it is important to make radios "sing" now, it will be even more important to make the television pictures "beautiful."

—30—

"We gotta get it fixed by noon, Charlie, or we'll have to eat lunch without music!"



Brand New Automatic Direction Finder

RADIO COMPASS

SCR-269F Complete with Component Parts Less Power Supply — J-254 — $75.00

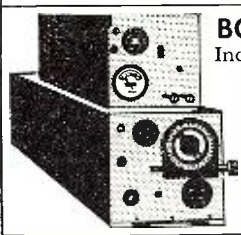
This equipment comes complete with 17 - tube superheterodyne receiver which is tunable from 200-1750 KC in three bands. A complete instruction book for operation and maintenance accompanies this equipment.

TRANSMITTER TUNING UNIT BC-375

Approximately 65 MMFD cond., coils RF chokes, dials, assorted mica condensers, 2500 WVDC. Over $50.00 parts! — J-201 — $1.95

DYNAMOTOR UNIT PE-101-C

Duo output Dynamotor, input voltage 12 to 24V., output voltage 400V. at 135 ma. 800V at 20 ma, and 9 V. at 1.1 amp. — J-226 — $2.95



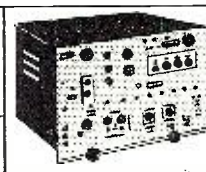
BC-AR230 Transmitter

Including 4 tubes and Rf Amps. meter.

BC-AL229 Receiver

Including 6 tubes. Used in aircraft.

BOTH UNITS ONLY — $9.95 — J-226



J-227 — 1FF TRANSMITTER AND RECEIVER — $9.95

Successfully used as a television receiver. 30 MC I.F. channel and video amplifier; original diagram furnished. Less tubes and power transformer.

BC223AX TRANSMITTER

Complete with tubes and tuning unit covering 80 meter Ham band, including frequencies charts, less xtals. — J-255 — $12.50

BC 433G RECEIVER

Complete with tubes, used, in good condition. — $29.50

T-17 CARBON MICROPHONE

89¢ — J-225

Like new.

Azimuth Control

J-216 — 49¢

Dial calibrated, 360° face, ideal for antenna rationalizing indicator.

Overload Relay

$1.95 — J-236

Patter and Brumfield. Relay 1, 5,000 ohms, coil current 10 MA., Relay No. 2, 110V, 60 Cy, AC coil, S.P.D.T.

POWER TRANS.

$1.95

110V. 60 cy. Sec. 1: 4V at 16 Amps. Sec. 2: 2½V at 1.75 Amps. Ideal for 2x2 and 826 tubes. Hermetically sealed. size 6" x 3½" x 4¼"

Variable Resistor

2500 ohm, 100 W. — 49¢

IF TRANS.

J-275A — 95¢

Mounted in aluminum shield can 1500 KC. with air trimmer. impedance coupled type.

GEN. ELECTRIC METER

$3.95 — J-232

Type DO41, 3" 0-1 MA, meter scale graduation 0-5 D.C. Kilo V and 0 10 MA D.C.

BK22K RELAY

$2.95 — J-256

Used in conjunction with SCR269F. changeover contains 29V, step relay, 5 deck, 6 position switch. 12V D.P.S.

5 GANG VARIABLE CONDENSER

$1.95

S-243

5 gang, approx. 50 M.M.F.D. per section with individual air-tuned padders. 18 to 1 vernier drive.

POWER TRANSFORMER

$1.95

110V, 60 cy Sec. 300V ea side of center of 125MA, 6.3V at 2.1 Amps, 5V at 3 Amps. Hermetically sealed. size 6" x 3½" x 4¼"

POWER TRANS.

J-224 — $1.95

Primary 110V, 60 cy., Sec. 700V each side of center at 80MA. 6.3V at 1.2 Amps, 5V at 3 Amps. Hermetically sealed size 6" x 3½" x 3"

BC-654 Transmitter & Receiver

J-267

With tubes and xtals. used, in good condition. The frequency range of both transmitter and receiver is continuous from 3700 to 5800 KC; all stages gang tuned by anti-backlash worm gear dial mechanisms. . . $12.50

FILAMENT TRANS FORMERS

110-V, 60-cy. Pri. Sec. 5-V, 3". Shelled case. — $1.49

110-V, 60 cy. Sec.: 2.5V at 5.25 amps. Shelled case. — $2.45

Toggle Switch

J-223 — 39¢

D.P.D.T. 30 Amps. in black Bakelite case.

PYRANOL CAPACITATOR

J-229 — $2.95

General Electric. 1 MFD. 5,000 VDC

4" x 4½" x 3¾"

DYNAMOTOR DA-3A

J-210 — $1.50

Input. 28 V.D.C., 10.5 AMPS

Output. 300 V.D.C., .260 AMPS 150 V.D.C., .010 AMPS 14.5 V.D.C., 5 AMPS

Shipping Wt. 25 Lbs.

RADIO RECEIVER TRANSMITTER BC-620-A

J-200 — $9.95

20 MC - 27.9 MC

This Xtal controlled FM set has 13 tubes and has dual Xtal controlled channels. It also contains built-in Fil. and Plate Meter. Tubes used. (4) 1LN5, (1) 1LC6, (1) 1LH4. (2) 1291, (4) 1299, (1) 1294.

Ideal for communication between Trucks. Boats. etc. Used, in good condition. Less power supply. Wt. 38 lbs. Complete with carrying case and diagrams.

30MC IF TRANSFORMER — 29¢

Slugged Tune.

Condensers

Cap. MFD	Working Volt	Your Cost
1	1000 oil	44c
8	600 oil	95c
2	600 oil	49c

Butterfly Condensers

Oscillator assembly 76 to 300 MC with acorn tube socket mounted on condenser. — J-238A — $1.95

Type B, frequency range 300 to 1000 megacycles. — J-239B — 95¢

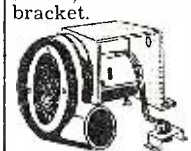
antenna condenser 105-330 MC. — J-239C — $1.95

Oscillator 105-330 MC. — J-239D — $1.95

Squirrel Cage Blower — $7.50

J-258

2" outlet. 110 AC. 60cy Silent Ball Bearing Motor, with mounting bracket.



Sockets for acorn tubes	$ .19
Powdered iron ⅜ slug	.10
Jacks, PL55, PL68	.15
Asst. mica condensers	1.95
3 lbs. asst. hardware	1.00
Pin straightener for min. tubes	.49
Ear phones, 2000 ohms, used	.95
Johnson sockets, No. 210, 25W	.39

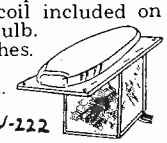
CORONA BALLS

$1.00 Dozen 10¢ Each

High-Speed Photo Flash Tube

10,000 Flashes

12,000,000 lumens light output. Stops all action. Ignition coil included on back of bulb. 10,000 flashes. Diagrams furnished.



$8.95 — J-222

TUBES

813	5.95	872A	1.95
VR150	.69	9004	.49
955	.65	9006	.59
9002	.89	50B5	.89
RK60	.95	VT127A	
9001	.89		2.95
6J4	1.50	35W4	.69
5 FP7	1.95	3AP1	1.95
7BP7	2.95	3BP1	1.95
9LP7	3.95	6J5	.49
6N7	.89	5BP1	3.95
		6H6	.59

1T4, 3Q5, 6SN7 .59

3S4, 5W4, 6SA7, 1G5, 12H6, 6SH7 — 44¢

Shallcross AKRA-OHM WIRE WOUND

J-264 — 89¢

±1% 1 MEG.

General Electric 25 MFD Photoflash pyramol capacitator. 2000 VDC-INT $14.95

SPST relay 24V, 528 ohm. coil contact rating 5 amp. Packed 2 to a carton ..... 2 for .49

Coxail solid copper tubing. 30 foot 2.95

30-20 MFD Solar condenser. 150 V. tubular ..... .49

Assorted tubular oil-filled condensers. up to 5 MFD, 15 for 1.00

Westinghouse oil 1MFD 6000V, WVDC 7.95

144 MC radar osc., uses 15E with variable coupling. complete less tubes 3.95

Assorted high frequency chokes. 25 for 1.00

Thordansen 300 MA power transformer, 110 or 220V, 60 cy. input, secondary 500/ct/100 tapped at 400/400 extra bias winding 200/ct/100 at 50 MA. 18 lbs. 4.95

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Thordorsen T48003, 2H-7H 550 MA swing choke, size 4½x5½x5½. square black crackle case 5.95

Wafer sockets. 4, 5, 6. 7 and 8 prong. per 100 ..... 2.95

Assorted knobs. push on wood and plastic 1.95

Ideal filament transformer. 110V. 60 Cy. 220V. at 50 MA. 6.3V. at 1 amp. 6.3 at 2 amp. at 6.5 amps. 6" x 4½" x 5". 11 lbs J271 .... $1.29

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A SIMPLE REMOTE CONTROL CIRCUIT

By

JACK D. GALLAGER, W5HZB

THOSE who are confronted with remote-controlling their transmitter will find the following circuit very helpful. It provides a method of controlling the filament and plate switches of the transmitter plus the added protection of keeping the plate voltage off until the filaments are allowed to heat.

A simple time-delay circuit using a type 27 tube (chosen only because of the 2.5 volt filament winding on the power transformer available) is employed with C_1 and R_1 as the time-delay components. The time in seconds for C_1 to discharge through R_1 can be determined from the formula $T = R \times C$, where R is in ohms and C in farads, or R in megohms and C in μfd. Each individual will probably desire a different time constant for the delay, therefore, the values of R_1 and C_1 have been purposely omitted.

When S_1 is turned on, a negative charging voltage is applied to C_1. After the filament of the delay tube has heated, S_2, the filament control switch, may be turned on. This action shorts R_6, actuates RL_3, and supplies plate voltage through RL_1 to the delay tube. Simultaneously, C_1 begins to discharge through R_1 and the plate current builds up closing RL_1. S_3, the plate control switch, can then be operated to apply plate voltage to the transmitter.

Turning off S_2 will remove the plate voltage at the transmitter as well as the filament voltage; thus, S_2 will turn the transmitter off or on, and provide adequate delay before the plate voltage is applied if S_3 has been accidentally left on. Since the relays at the transmitter are controlled by voltage from the control unit, anything happening to the control unit, such as a shorted filter condenser, will automatically turn off the transmitter.

Tests and adjustments of the relays can be made with short leads for convenience. The sensitivity of the relays is an important factor, but those closing on 10 ma. will be perfectly suitable for this purpose. However, ruggedness and dependability are also important qualifications that should not be overlooked when choosing relays for any type of control unit. Such relays, suitable for use in this circuit, can be found at reasonable prices listed as war surplus items.

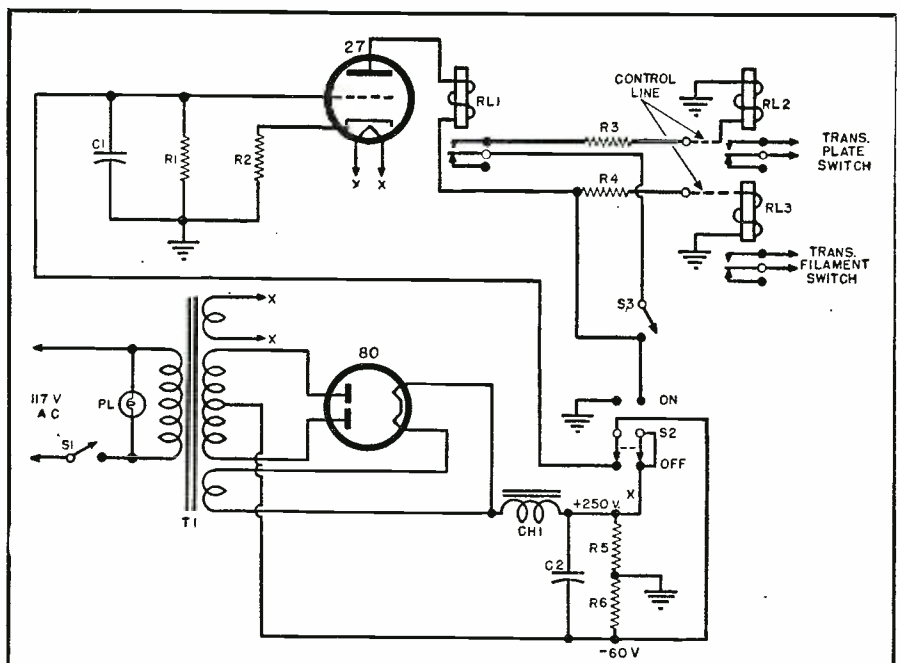
If it is desired, a 0-50 ma. meter, or larger, can be inserted at the point marked "X" for current indications when RL_2 and RL_3 are actuated, therefore providing a visual means of detecting the operation of the relays.

This unit can be constructed on any type of chassis, but with the careful selection of parts it can be made into a 6″x6″x6″ metal box. The line terminals must be insulated, and the control lines must be kept free from contact with ground.

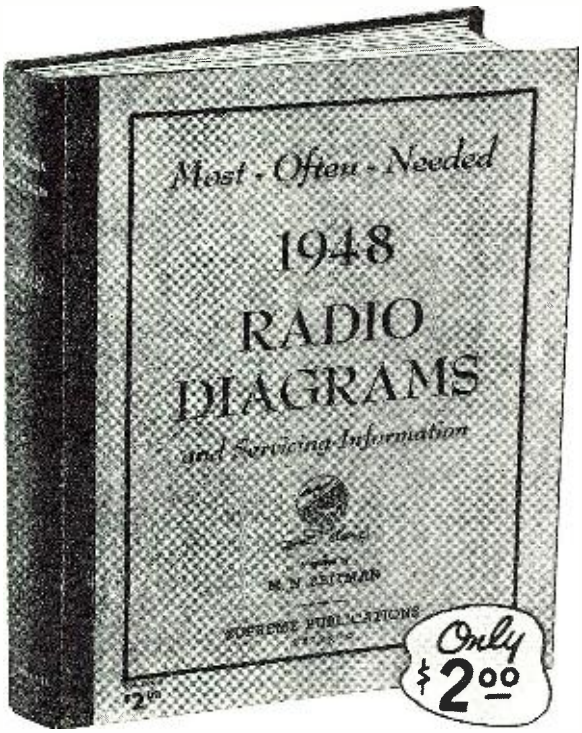
If the transmitter is to be placed in a locked garage, or in an attic or basement, it is advisable to use fuses in the transmitter wherever possible because of certain unusual situations which sometimes arise with remote control systems as well as transmitters.

-30-

Wiring diagram shows method for remote control operation of transmitter filament circuits and plate voltages, with special delay feature.



R_1—*(See text)*
R_2—*500 ohm, 1 w. res.*
R_3, R_4—*15,000 ohm, 10 w. res.*
R_5—*60,000 ohm, 2 w. res.*
R_6—*15,000 ohm, 1 w. res.*
C_1—*(See text)*
C_2—*8 μfd., 450 v. elec. cond.*
RL_1, RL_2, RL_3—*2000 ohm relay s.p.s.t. sw. (See text)*
S_1, S_3—*S.p.s.t. toggle sw.*
S_2—*D.p.d.t. toggle sw.*
PL—Pilot lamp 110 v.
CH_1—*Filter choke, 400 ohm, 10 hy., 50 ma.*
T_1—*325-0-325 v. @ 50 ma., 5 v. @ 2 amp., 2.5 v. @ 2 amp. power transformer.*
1—27 tube
1—80 tube



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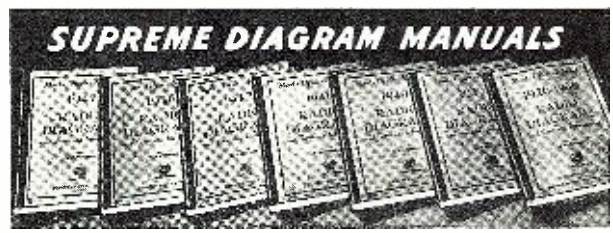

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LETTERS *from our readers*

AN OBJECTION

"IN your October issue of RADIO NEWS, page 108, S. G. Gainey describes a 'Low Range Ohmmeter' having two ranges, reading from left to right, on the same scale.

"I wish to draw your attention to the fact that the device shown in the diagram and described is covered by my U. S. Patent No. 2,188,588."

Haig Antranikian
R.D. 3
Lakewood, New Jersey

Thanks for bringing this to our attention Mr. Antranikian.

* * *

WHY, THANK YOU, SIR!

"WHILE in the service I read RADIO NEWS and found it helpful in my rate of radio tech. Entering college (physics and math) I carried on a small repair business to help with expenses and RADIO NEWS helped out again. Now I am out of school and employed with the Civil Service CAA as maintenance tech and your magazine is still in there helping.

"I have meant to write many times and tell you how much this magazine has helped in various fields—especially the *Radio-Electronic Engineering Edition* which I receive—and at long last I have—written that is.

"Keep up your good work, the fields covered are many and the articles good. I've been tempted to send in some stuff but it never seems good enough to compare with what you print. Perhaps some day I'll send it along.

"I like your method of printing articles about scopes and how to construct them—very good."

W. J. Allaback
X-76-30568-69
Windham, Ohio

* * *

Perhaps Reader Allaback is being too modest about his abilities. We are always looking for good articles on radio subjects which would be of interest to the radio serviceman, the amateur, and the experimenter.

* * *

THAT GERMAN SET

"YOUR October issue gives on page 156 a description of a Saba Home Radio Receiver. Knowing by experience the difficulties of controlling "long distance" information, we would like to point out a few items where author Greif missed the point.

"When he states 'that the usual type of receivers manufactured on the Continent is of the two or three tube regenerative variety' he gives evidence of being poorly informed and not a good judge. How would it be possible to assure a reasonable selectivity with existing densities of broadcasting stations and receivers?

"The truth is, in Europe as well as in America, the production is almost exclusively in the super field.

"Where the author states that 'this Saba receiver could be classed as above average' he is right as long as he compares it to receivers of American make. Compared to the other European receivers, i.e., to the prewar German receivers, the Saba is *not* above average.

"Please note that we are not interested in the Saba Works and that our sole aim is to supply you with true information.

"With fraternal greetings."

Editor
De Radio Revue
Antwerp, Belgium

Thanks for the comments on the Saba receiver. It is nice to hear from fellow editors.

* * *

"THE October issue of RADIO NEWS has an article on page 156 regarding a 'new' German radio receiver. This receiver seems to be the same or very little different than the ones manufactured by Telefunken in 1942 and 1943.

"The station spacing in Europe is only nine kilocycles compared to ours of ten kilocycles. In addition all Europeans are wavelength rather than frequency conscious so that marking the dial in wavelengths would not be sufficient, therefore the stations are marked on the dial with the country's own stations being capitalized so as to be more noticeable. This is true of English, German, French, and Italian receivers.

"This model radio receiver was made for many, not all, of the voltages available on the Continent. The power transformer had the rectifier tube mounted on it with various means of adjusting the voltage.

"Tests of a number of receivers showed a sensitivity of about 30 to 50 microvolts and an audio response of about 100 to 3500-4000 cycles. Since the stations were closer geographically and were of higher power, 10 to 500 kw. or 100 to 1000 watt satellite transmitters (particularly in Germany) fed by wire, greater sensitivity was not necessary.

'The statement that the general run of home receivers were regenerative does not seem to be correct. The receivers were usually table model superhets with 5 or 6 tubes. Most of the receivers, except German, copy United States models in appearance with the exception of long-wave bands. Generally they were greatly inferior to

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5Y3	6S8	6V6	12SH7	955
6AL5	6SA7	7E5	12SJ7	956
6C4	6SD7	7N7	12SN7	9001
6C5	6SG7	12A6	30	9003
6H6	6SK7	12C8	31	9006

CHOICE 60¢ EACH

1A7	6K7	7Y4	12SQ7	
1G4	6SJ7	12AH7	14A7	
1N5	6Y6	12AT6	14B6	
1R5	7A6	12BA6	2526	
1S5	7A7	12BE6	35L6	
1T4	7C7	12SA7	35Z5	
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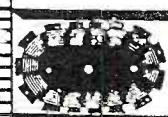

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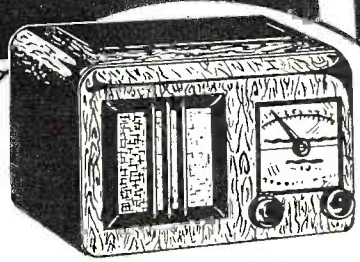

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"In my opinion we are greatly advanced in radio over any other country and can remain so if we continue to progress as we have done in the past. If we stop progressing or consider that better radios are made in other countries we will not remain in the lead. Along with articles such as you published it would be well, perhaps, to include information as to sensitivity, audio response, and wiring diagrams. A comparison would be of advantage."

Robert J. Woolsey
Chicago, Illinois

* * *

"ON PAGE 156 of the October issue of RADIO NEWS magazine is a short article concerning a German home radio receiver. I very much desire to make contact with the author of the aticle, Karl Greif, so as to determine if the receiver described is or will be available in this country.

"Incidentally, the receiver is not a new product in Germany as I had the pleasure of repairing and operating the identical model while serving in the Army Signal Corps as a radio repairman. Your article, while praising the receiver, does not do it half the justice it deserves. Performance was in every way exceptional and ease of operation and workmanship put it head and shoulders above comparable American receivers.

Walter C. Snyder
Grand Rapids, Michigan

There seems to be a slight difference of opinion between Mr. Snyder and Mr. Woolsey on the merits of the receiver. Are you sure you two fellows are talking about the same set?

* * *

CONDITIONS IN INDIA

"WE ARE very sorry to write you today of having closed down our interest in Karachi owing to the recent division in India, which also resulted in inflicting heavy damages on us.

"You may have also heard that postal, railway, and all such public services, which used to be very efficient normally have been paralyzed thus we have not received any issues of RADIO NEWS for the months of September and October. It is therefore requested that you send duplicate copies of these issues to our new address.

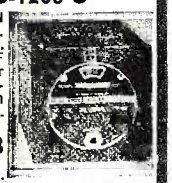
"If not inconvenient and possible, we would like to request that you announce in a forthcoming issue of RADIO NEWS that we have moved to Bombay from Karachi. Our new address is now Imperial Cinema Building, Lamington Road, Bombay 4, India. We believe such an announcement would be helpful to the manufacturers and suppliers in your country. Our cable address is the same, 'Vomax, Bombay'."

Chopra Radio Electric Co.
Bombay, India

-30-

NEW YEAR SPECIALS

SETCHELL CARLSON RADIO RECEIVER BC-1206-C



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1B24	4.50	6SS7	.75	715B	4.95
1G4	.98	6U5	.98	717A	.75
1G6	.98	6V6GT	.99	723A/B	9.95
1H4G	.98	6Y6G	.89	800	2.25
1L4	1.10	6x4	.98	801A	.75
1R4/1294	1.29	6x5	.89	802/RK25	1.49
1T4	1.10	7AE7	.75	803	8.95
1H5	.99	7C4	1.50	807	1.25
1N5GT	1.10	7C5	.89	808	2.95
1N21B	.35	7F7	1.25	809	1.50
1LN5	1.92	7L7GT	1.39	811	1.95
1R5	1.10	10Y	1.50	812	3.25
1S5	1.10	12A6	.89	812H	6.90
2A3	1.39	12AH7	1.10	813	8.95
2C22	.98	12AT6	1.10	814	4.49
2C26A	.75	12BA6	.89	815	2.25
2C34	1.15	12BE6	.89	826	1.75
2C40	2.60	12C8	.89	829B	3.95
2C44	1.75	12J5	.69	830B	5.25
2D21	.75	12K5	1.25	832A	2.25
2E22	1.50	12SA7GT	.99	833A	34.50
2E25	3.95	12SG7	.89	836	1.15
2E30	2.25	12SH7	.89	837	2.50
2J32	20.00	12SJ7	.79	838	3.75
2J33	20.00	12SK7	.89	841	1.20
2J56	20.00	12SL7	1.10	845	3.75
2JB5I	4.95	12SN7GT	.79	860	3.00
2X2	.84	12SQ7GT	.99	861	50.00
3A4	.49	12SR7	.79	866A	.75
3B7	.98	12x3	.98	872A	2.25
3B22	4.95	14A7	1.10	874	1.95
3B24	1.95	14B7	1.10	884	.75
3D6/1299	.89	14H7	1.25	923	.49
3E29	2.95	14J7	1.25	954	.75
3Q4	1.10	14R7	1.10	955	.75
3Q5GT	1.10	15E	1.50	956	.75
3S4	1.10	23D4	.49	957	.75
4C35	7.95	23D6	.98	958A	.75
5R4GY	1.15	24G	1.35	959	.75
5T4	1.25	25A6GT	.75	991	.50
5U4	.98	25L6GT	.75	1005	.39
5V4G	.98	25Z5	.75	1006	.39
5W4	.98	25Z6	.98	1613	.95
5Y3	.60	28D7	.75	1614	1.75
5Y4G	.59	30	.78	1616	2.95
5Z3	.89	32L7	1.50	1619	.98
5Z4	.89	34	.98	1624	.98
6AB7/1853	.99	35L6GT	.75	1625	.98
6AC7	.99	35Y4	1.10	1851	1.25
6AG5	.99	35W4	.69	2050	.90
6AG7	.99	35Z3	.99	2051	.90
6AK5	.99	35Z5	.69	5514	3.95
6AL5	.59	36	1.10	7193	.49
6AQ5	.98	37	.69	8005	3.25
6AT6	.75	38	.89	8011	4.95
6AU6	.89	39/44	.59	8012	4.95
6B4	1.29	41	.69	8016	1.49
6B6G	.89	45	.64	8020	5.95
6B8	.99	46	.65	9001	1.15
6C4	.64	47	.90	9002	.98
6C5	.51	50B5	1.89	9003	.98
6C6	.75	50L6GT	.75	9004	.98
6C21	12.95	70L7	.89	9005	.98
6D6	.75	71A	.69	9006	.69
6F4	1.35	75	.69	HF100	6.95
6F5	.51	75T	2.95	HY69	1.75
6F6	.95	76	.75	HY75	1.25
6F6G	.80	77	.75	HY615	1.25
6F7	1.25	78	.75	OZ4	1.25
6F8	1.10	79	1.10	RK60	1.25
6G6	1.10	80	.53	RK72	8.50
6H6	.69	82	.98	T20	1.95
6J4	1.50	83	.98	TZ40	2.95
6J5	.59	83V	.98	V70D	6.90
6J6	.89	84	.75	VR78	.75
6J7	.89	85	.89	VR90	.75
6K6	.69	100TS	3.00	VR105	.75
6K7	.79	117L7	1.89	VR150	.75
6K8	1.25	117Z3	.89	Z225	1.95
6L6	1.25	117Z6GT	1.10	902	2.95
6L6G	1.20	121A	2.65	913	3.00
6L7	.98	205B	4.50	2API	2.25
6N7	1.25	211	1.25	3API	3.45
6Q5	.98	215A	3.00	3BP1	2.95
6Q5G	.98	217C	7.50	5BP1	3.95
6Q7	.89	250R	3.95	5BP4	5.45
6R7	.98	274B	1.50	5CP1	3.95
6SA7	.90	304TH	9.85	5FP7	4.50
6SC7	.85	307A	6.25	5TP4	54.00
6SF5	.79	371A	3.00	7BP7	7.95
6SG7	.89	371B	3.00	7BP4	14.95
6SH7	.65	394A	4.50	7EP4	18.95
6SJ7GT	.69	417A	18.95	7GP4	19.40
6SK7	.79	446A	2.60	9AP4	50.00
6SL7	.89	703A	7.50	10BP4	39.60
6SN7GT	.69			12JP4	69.75

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Niagara can supply a power supply kit which will completely power the ARC 5 Transmitter used as a VFO or any one of the ARC 5 receivers. All basic components included for delivering 300 v. @ 150 mills & 24 v. or 12 v. for the filaments—no rewiring of equipment necessary. This kit will also power the BC-348, BC-312, and the BC-1206. A good buy at..... **7.50**

Master Oscillator MI-19427-B

This unit was built for R.C.A. Add a final—becomes a complete transmitter with signal shifter. 2-20 mg—also FM—only a few cycles drift from cold start. Complete with regulated power supply and heavy duty deluxe rack. Illustrated flyer giving complete description, technical summary and specifications available upon request.

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We have a complete power supply containing all the necessary parts down to the line cord, pilot light switch & terminal blocks & delivers the following voltage—300 v. DC @ 250 mills, 150 v. gang regulated bias and sufficient 12 v. to operate the tubes of both receiver and transmitter at the same time. Complete at the amazingly low price of **14.95**

Model 200-EA. 5-ELEMENT 2 METER BEAM KIT. Folded di-pole driven element. All-aluminum construction. Feed with low impedance coaxial cable. Amateur net price..... **$8.40**

MINIATURE TUBE PULLER

Niagara solves your miniature tube breakage problem with this new sensational invention. Tubes may now be easily extracted or placed into those hard-to-reach places, without the fear of breakage or burning of hands. This new invention incorporates a heat resistant rubber cap with aluminum body and handy thumb-operated plunger release. Be sure to get yours today. Money back guarantee. Only **88c**

MAKE YOUR SCR-522 RECEIVER operate on 144 to 148 Mc. with only ONE control—complete kit & Instructions **$3.00**

FLEXIBLE ANTENNA MAST BASE

For Mobile Antennas, will handle up to 50 pounds. This ends the vibration and breakage problems in mounting either receiver or transmitter antennas in moving vehicles—16" in length, ⅝" in diameter. Extra Special while they last..... **1.89**

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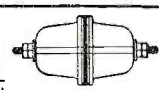

Made of genuine Pyrex—3" in diameter; brass rod 5½ long—complete with hardware and waterproof rubber gaskets.

Special—$1.49

BC-348 Owners

CONVERTER for BROADCAST BAND

Convert that BC-348 without any alteration in your circuit. Our special converter takes power from receiver. Just tune your set to 450 kc. and forget it. All tuning is done on a converted panel covering 550 to 1600 kc.—double conversion means High Sensitivity. Excellent Fidelity and Higher Selectivity—complete basic kit with schematic and full instructions—less chassis dial and tuning knobs. Terrific Buy at..... **6.50**

Sperti RF Vacuum switch used as antenna switch in the ART 13—9200 v. peak 8 amps **1.95**

BAT HANDLE SWITCH

Mfgd. by Cutler-Hammer—10 amp. SPDT with neutral position—Perfect for rotary beam control—a positive steal at..... **29c**

Selsyn Motors Synchronous Type

Pair in Series for 110 v. AC.

Type I—5¼" long, 3" dia.—50 v. AC. 50 cy.—4 lbs. ..... **$9.95 pr.**

Type II—6¼" long, 4¼" dia.—115 v. AC. 50 cy. 11 oz. ..... **$12.95 pr.**

SYNCHRO—DIFFERENTIAL

Model #1943—C78249-CAL-11280 Bendix Aviation 115 v.—60 cy. 6" length to end of shaft x 4¼" diameter..... **$9.95**

Slip-Ring ROTATOR

Here is the answer to that rotary antenna joint problem for 360°. A compact unit with four slip rings & contacts, silver plated, of course. Can be used for a stacked array—10 & 20, 6 & 10, 2 & 6, etc. ..**$1.89**

COIL FORM

Made of very high grade ceramic—groomed for easy winding, can be used for a multitude of purposes—size 2½ long x 1⅝ wide.

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Within the Industry

(*Continued from page* 30)

for the Accessory Division, covering a large territory in the Middle West with headquarters in Chicago. He became manager of the Southwest Division of the *Philco* storage battery division in 1942 and two years later was appointed district representative for the Pittsburgh territory.

In his new position Mr. Utz will make his headquarters in Philadelphia.

* * *

J. ARDEN STILL is the new manager of the Southwestern Division of *Sylvania Electric Products Inc.'s* Distributor Tube Sales, succeeding Ray Carson, who recently resigned to establish his own business as a manufacturers' agent in San Antonio, Texas.

Active as an amateur operator for the past 33 years, Mr. Still's previous positions include two years with the *Davis Russ Company,* purchasing and managing for the radio department, and 13 years as manager of the radio department of *Strauss Frank Company.*

He will make his headquarters in Houston, Texas.

* * *

VARIETY ELECTRIC COMPANY, INC., of Newark, New Jersey, has announced the purchase of the complete stock of the Radio Parts Department from the *Bowers Battery and Spark Plug Company.*

The newly acquired stock has been placed under the direction of Stanley Dudek, manager of the Radio Parts Department for *Variety Electric Company.*

* * *

E. M. BRAUN has been appointed Jobber Sales Manager for *Maguire Industries* of Chicago. In his new post he will be in charge of all jobber sales for the *Meissner, Radiart,* and *Thordarson Divisions* of the company.

Prior to his new appointment, Mr. Braun was Sales Coordination Manager of the Electronic Distributor and Industrial Sales Department of *Maguire* for two years, and was with *Meissner Manufacturing Co.* for ten years in the Jobber Sales and Purchasing Departments.

* * *

NEWCOMB AUDIO PRODUCTS COMPANY, manufacturers of audio amplifiers and portable sound systems, have recently announced the appointment of Wally Swank of Syracuse, New York, to the post of factory representative for all of New York state excepting New York City.

Mr. Swank has been active in the representative field for six years before becoming sales manager for *E. F. Johnson Company* of Waseca, Minnesota. He recently left the *Johnson* organization to set up his own business in New York state.

* * *

A. D. ADAMS has assumed the post of advertising manager for *Air King Products Co., Inc.,* of Brooklyn, New York.

Formerly an account executive with *Hickey-Murphy-St. George, Inc.,* advertising agency, Mr. Adams served with the army in the Southwest Pacific for nearly five years. He has also been associated with several radio stations in Philadelphia and Trenton, New Jersey.

* * *

MORHAN EXPORTING COMPANY of New York has been appointed world exclusive export representative by *Pickering Company, Incorporated.*

The company manufactures the *Pickering* pickup, a professional studio pickup, equalizers, and cartridge reproducers.

* * *

ROBERT D. FERREE has recently been named Sales Manager of the *International Resistance Company's* Merchandise Division.

He succeeds Bob Baggs, who has left *IRC* to assume the duties of General Manager of a Philadelphia advertising agency.

Mr. Ferree has been associated with the company's jobber and industrial sales activities for seven years. Previous to that, he managed the parts department for a midwestern distributing firm. He is a ham enthusiast and holds the call letters W3JGB.

* * *

RICHARD (DICK) OSBORNE recently joined the staff of the *S. H. Cohn Sales Company,* Los Angeles manufacturers' representative for the *Universal Microphone Company.*

With sixteen years' experience in the radio parts field, Mr. Osborne is well qualified to handle the requirements of manufacturers and the industrial trades.

NORMAN E. WUNDERLICH, executive sales director of the radio division of *Federal Telephone & Radio Corp.,* has resigned from that post to establish a consulting radio engineering firm in Chicago.

He was associated with *Federal* for two years during which time he successfully introduced the company's new line of FM broadcast equipment, the 2-way radio telephone, and the company's selenium rectifier.

The new firm will operate a radio laboratory in conjunction with the consulting office to provide special

Now YOU CAN HAVE IMPROVED No-DRIFT FM in the Sensational New 1948 MIDWEST RADIOS

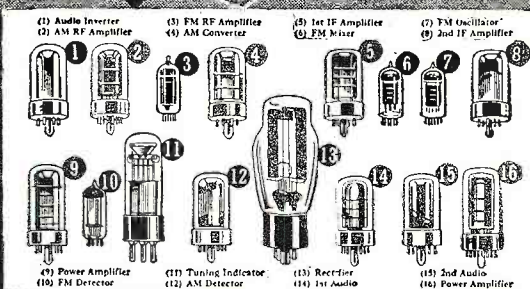
NEW SERIES 16* SUPER DELUXE AM-FM CHASSIS

14½" PANASONIC SPEAKER

5 WAVE BANDS

Here is the finest radio Midwest has ever produced in its 28 years of manufacturing—a world-ranging, 5-band radio with improved Midwest No-Drift FM . . . plus Standard Broadcast and 3 short wave bands, Television Audio Switch-over, and Color-Ray Tone Selection. The Series 16* Super De Luxe Chassis is a powerful, magnificently-toned radio that challenges comparison for performance, sensitivity, selectivity, and advanced engineering features. Supplied with satin stripe copper finish panel—ready to mount in your present cabinet. Send today for the FREE 1948 Midwest Radio Catalog. Buy your radio direct from the manufacturer on Easy Terms and 30 Days Trial and SAVE!

*SERIES 16 CHASSIS USES ALL THESE LATEST-TYPE TUBES



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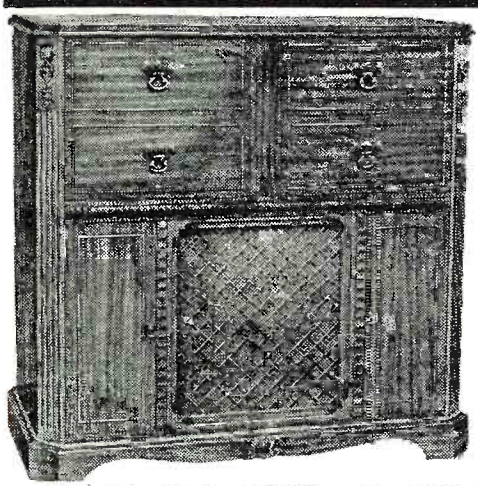
A COMPLETE LINE OF FINE RADIOS AND RADIO-PHONOGRAPHS . . . *Available in Separate Chassis Like the Powerful Series 16* AM-FM Model above, or in beautiful Radio-Phonograph Consoles like this:*

Scores of NEW features such as the Exclusive MIDWEST TRI-MAGNADYNE COIL SYSTEM and COLOR-RAY TONE SELECTION



SYMPHONY GRAND AM-FM RADIO-PHONOGRAPH CONSOLE *with NEW Intermix AUTOMATIC RECORD CHANGER*

Our Finest! A superbly beautiful musical instrument . . . a masterpiece of furniture design and radio engineering that offers the sensational Midwest NO-DRIFT FM, Automatic Intermix Record-Changer, Exclusive Color-Ray Tone Selection, World-ranging 5-Band Reception, Television Audio Switch-Over, and many more new and exclusive features.

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service to both the broadcast and radio communications fields. Headquarters of the organization are at 1337 Fargo Avenue, Chicago, Illinois.

* * *

RADIO CORPORATION OF AMERICA'S Tube Department has recently announced two new appointments which will be of interest to the industry.

G. R. Rivers has been named manager of the Tube Sales Group with responsibility for coordinating all matters pertaining to the sale of tubes to the company's electronic equipment customers.

G. H. Myers has been named manager of the newly organized Customer Service Group. He will be responsible for interpreting customer requirements to the planning and production sections on tubes and component parts, and he will also be responsible for expediting customers' purchase orders.

Mr. Rivers has been with *RCA* for 17 years while Mr. Myers is rounding out a similar period of service for the company, and 31 years in the tube business.

* * *

AIR KING PRODUCTS CO., INC., manufacturer of radios, combinations, and wire recorders, has appointed two new organizations to handle the company's line.

Radio Electric Service of Pennsylvania, Inc., will handle *Air King* merchandise through its seven outlets in Philadelphia, Allentown, Camden, New Jersey, Wilmington, Del., and Easton, Pa.

Chamrose Distributors of Jamaica, Long Island, New York, will serve as distributors of the line for the Jamaica area. —30—

AFTER-SPOT ELIMINATION FOR TELEVISION PICTURE TUBES

By LEO MACKTA, W2BJN

UNDER some conditions of operation of electromagnetic deflection picture tubes, an annoying and harmful after-spot may appear in the center of the screen when the receiver is turned off. This usually occurs when flyback or r.f. high voltage supplies are used, since no bleeders are placed across the filter condensers. This permits the high voltage to discharge slowly through the picture tube, whose cathode may stay sufficiently hot for several seconds to produce considerable emission. The after-spot may be small and the condenser charge large enough to produce a permanent defect in the phosphor after the receiver has been in use for several months.

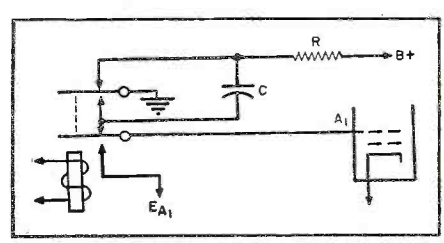
To eliminate this difficulty several methods might be employed. A bleeder which will discharge the high voltage condenser rapidly enough will reduce the output voltage considerably. A shorting relay to discharge the high voltage condenser introduces insulation difficulties. Since the B+ voltage disappears before the high anode voltage, backing off the brightness control to maximum negative bias on the control grid of the picture tube, by a combined potentiometer-on-off switch will not solve the problem. The following simple procedure was finally adopted in constructing a receiver employing a 15" picture tube with flyback high voltage supply, in order to eliminate the after-spot. The additional parts required were a surplus six volt double-pole, double-throw relay, a paper condenser of from .25 to 1 μfd., and a resistance of about .5 megohm.

The relay coil was connected to operate in series with the focusing coil, in order to close when the receiver was turned on. Any other source of current in the receiver may be used to operate the relay. The total plate current might be used, since the voltage drop across the coil is less than six volts. If a high resistance relay coil is used it may be placed across a portion of the plate supply. An a.c. relay may be used across the heater supply or the 110 a.c. line.

The relay is used to apply a negative bias from a charged condenser to the first accelerating anode of the picture tube. The bias voltage is equal to the plate voltage of the receiver, and it effectively stops any current through the tube after the receiver is turned off. The paper condenser will hold an effective charge longer than the smaller capacity employed in the flyback filter circuit, so that the after-spot will never appear unless the receiver is turned on again within several seconds after being turned off. The circuit diagram is shown in Fig. 1. The values of the components are as follows: C is from .25 to 1 μfd., rated at plate voltage, R is .5 megohm. ½ watt. A_1 is the first accelerating anode of the picture tube and E_{A1} is the normal voltage ordinarly applied to A_1 in operation. Points X-X are connected in series with the focusing coil or as otherwise described previously.

As a result of the blocking bias thus applied, the high voltage condenser discharges quite slowly. Therefore, if repairs are to be made on the receiver after turning it off, deliberately discharge the high voltage condenser before proceeding further. Also remember that the capacity of the second anode in the picture tube is comparatively large and will retain a considerable charge. Therefore, discharge both the filter condenser and picture tube simultaneously, rather than attempting to remove the cap from the picture tube anode first. It is conceivable that a charge remaining on the second anode may startle one sufficiently to cause the picture tube to be dropped while it is being taken out of the receiver and the anode contact is touched. —30—

Fig. 1. Schematic diagram.



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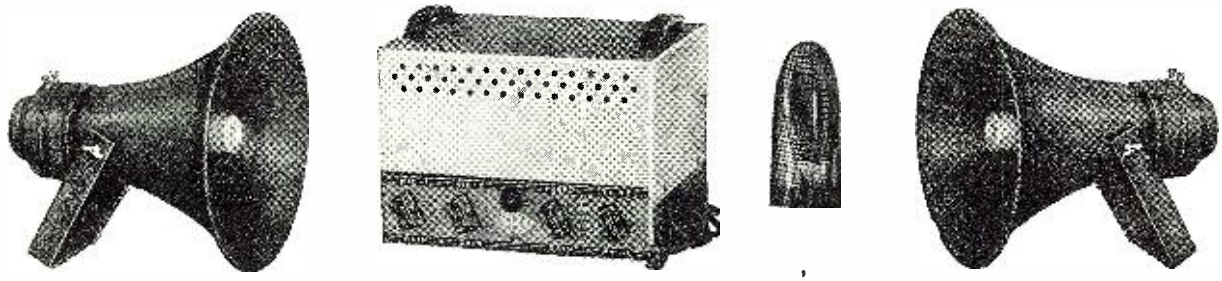

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1 DELUXE 25 WATT AMPLIFIER
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PLUS 50 FT. OF CABLE, PLUGS, CONNECTORS, ETC.

At last, one single system, designed to meet the requirements of most indoor and outdoor installations, offered as a complete package at a sensationally low price. Check the specifications of this most versatile system, then check the values of the various components included. We know you'll be amazed at this truly sensational value. Please note none of the items included are "surplus." All parts are standard and guaranteed. Like all other Moss Values this System is offered with the understanding it may be returned for full credit or refund if it does not meet with your complete approval after a 10-day trial.

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(A) Large size auditorium accommodating up to 5000 persons (low noise level).
(B) Medium size dance-floor accommodating up to 1000 persons (medium noise level).
(C) Medium size fight arena (high noise level).
(D) Medium size skating rink (high noise level).

Outdoor:

(A) Large outdoor meeting accommodating up to 3000 persons (low noise level).
(B) Small ball park (high noise level).
(C) Small stadium (medium noise level).

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TUBES—2—6SC7, 2—6L6, 1—5U4G, 1—6N7.
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RESPONSE—40-12000 cycles plus or minus 7 DB.
OUTPUT IMP.—2-4-8-15-500 ohms at both "Speaker Terminals." Strip or sockets. Handles 2 microphones.
OUTPUT POWER—25 Watts 3% dist. 35 Watts peak. Hum level 57DB below output.
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CAPACITORS—Oil coupling condensers and hermetically sealed electrolytic filter condensers.
SOCKETS—Output and rectifier sockets steatite.
DIMENSIONS—8¾x10x14½ inches.
POWER INPUT—110-125 Volts 60 cycles.

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POWER (Conservative)—35 Watts
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BELL DIAMETER—15".
PROJECTION—½ mile.
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FINISH—Attractive two-tone crystalline.

MICROPHONE SPECIFICATIONS:

Model 718A "Versatex" is an extremely versatile high-output diaphragm type crystal microphone. The "Versatex", the versatile crystal microphone, is suitable for placement on table top, or other flat surface; it fits conveniently in the palm of the hand for use as a hand microphone; and it may be used on a conventional floor stand. The "Versatex", the versatile crystal microphone, has typical semi-directional properties. The crystal used is a Bimorph unit with special process moisture-proofing.

The Moss P. A. System comes complete with amplifier, projectors, microphone, connectors, cables, plugs, etc.,

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Electronic Switching

(*Continued from page* 51)

with the diode-branch of the line and have no effect during the reception of signals. The transmitter, itself, may be located at any distance from the junction point, making this circuit (Fig. 4B) considerably more flexible than the previous circuit.

Design Factors

Circuit design for electronic switching will differ for each installation, according to the arrangement and characteristics of the rig and according to the type of switching tube to be used.

Of primary concern is the *maximum r.f. voltage* output of the ham transmitter. A fairly accurate indication can be obtained from the equation:

$$E_{max} = \sqrt{PZ}$$

where P is r.f. output (in watts) and Z is transmission-line impedance (in ohms)

For example, a rig of 100 watts feeding a typical 300-ohm twin-ribbon line would have a *maximum r.f. voltage* of about 175 volts in the output circuit.

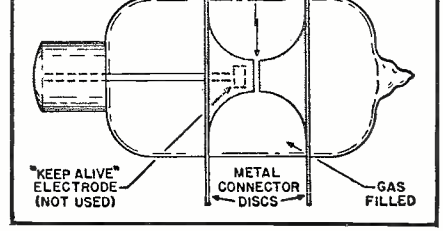
Since a gas-filled diode must arc at all times when the transmitter is operating, the rated *striking voltage* of a proposed switching tube must be less than the computed value of *maximum r.f. voltage* in the output circuit.

For *low* values of transmitter output power, ordinary neon or argon glow lamps can be used for electronic switching. However, these cold-cathode lamps are not too dependable, and after limited use they become erratic in striking and thus permit damage to the receiver input.

When a higher conduction rating is required, the type 866 (or 866JR) mercury vapor rectifier can be used as a switching diode. With the filament leads shorted and the filament operated cold, the striking voltage is very low (about 10 volts) and the tube conducts current up to about 1 amp. with safety.

The most desirable diodes for electronic switching, however, are the war-developed T/R tubes—of which more than 50 different types exist. Most of these are actively in use in Army and Navy apparatus, and cannot be obtained for civilian uses. But well

Fig. 6. Cross-section of a typical T/R switching tube, the Type 721B.



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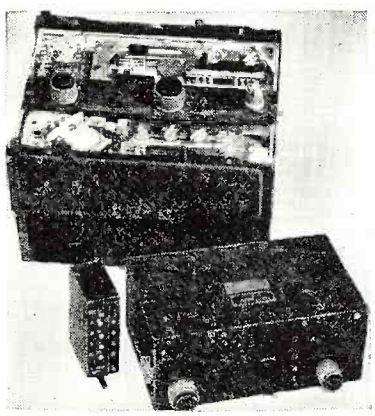

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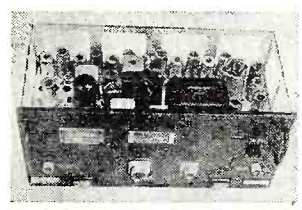

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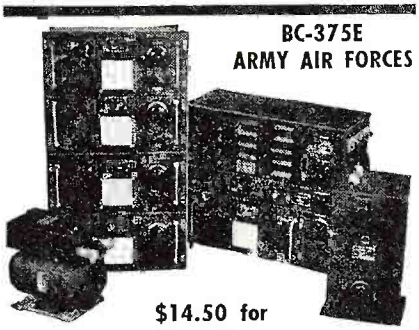

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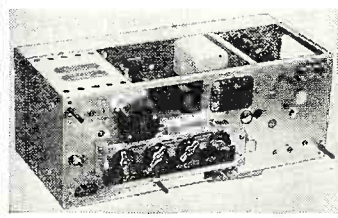

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over a dozen types have recently been declared as war surplus [Table 1], and these are now generally available from parts suppliers and dealers in surplus gear. Also included are several types scheduled to be declared surplus within the next few months.

Most of these T/R tubes were originally designed for operation *with external resonant cavities* at wavelengths of only a few centimeters. However, when used *without* such tuning cavities, the T/R tubes are entirely adequate for electronic switching at ham frequencies. In other words, the tube is used with no modification, just as it is received in its carton (Figs. 1, 2 and 3).

At operating frequencies lower than those for which the tubes were originally designed, however, action of the tubes in ham circuits (particularly at high power) may depart radically from theory. As with any new application, there is a need for quantitative results collected by ham experimenters over a considerable period of time.

The T/R Tube

A typical T/R tube is shown in cross-section (Fig. 6). Essentially it consists of two electrodes enclosed with a suitable gas vapor in a sealed glass or metal container. In most of the currently available types, the two metal electrodes are fixed. In two instances, however, the gap distance can be varied by adjusting the position of one electrode by a thumbscrew (external) arrangement; such tubes (Types 1B24 and 1B27) are extremely desirable for ham experimenters, since the striking voltage can be varied over a wide range by changing the width of the spark gap.

Some of the currently available types (Figs. 1 and 2) are equipped with circular discs or "fins" surrounding the envelope. These are radial extensions of the two principal electrodes, and provide a means of mounting the tube directly to the transmission line—usually by means of clips.

Gap operation in gas vapor and at greatly reduced pressure permits a lower value of striking voltage than would otherwise be possible. Also, some types of T/R tubes have a third electrode (Figs. 1, 2, 3, and 6) which is used in radar technique to maintain a "keep alive" voltage (d.c. and negative) in close proximity to one of the gap electrodes. This "keep alive" voltage assists the gap in striking more rapidly, but for all ham switching purposes this third electrode can be ignored. The T/R tube will function adequately without it; in fact, life of the tube will be considerably increased. If desired, the external (male) stub connector for the "keep alive" voltage can be used to mount the tube more securely.

The ordinary life of a T/R gas-filled switching tube is determined by two factors, both of which are gradual over long periods of operation. The most common cause of failure is due to metal particles knocked loose from the gap electrodes and spattered on the inside of the glass envelope, which act as small conducting areas—first appearing cloudy, then opaque and metallic. A second cause of failure is due to the absorption of gas by the metal electrodes, reducing the pressure in the tube and increasing the value of the striking potential. This increase in sluggishness is gradual, however, and can be detected during routine checks on equipment.

Table 1. Operating characteristics of the more readily available T/R tubes.

TYPE No. of T/R TUBE (currently available, war surplus)	STRIKING VOLTAGE	Recommended for use in transmitter circuits of			Approx. LIFE in hours (continuous)
		LOW Power	MED. Power	HIGH Power	
721A, 721B	200-400		x	x	300
724A, 724B	90-150	x	x		200
702B	300-500		x		300
1B21, 1B21A	Over 500			x	200-300*
1B23, 729A	Over 400		x	x	300-400*
1B25, 1B25A	90-100	x	x		400
1B32/532A	250-1000		x	x	600
1B43 Sub-miniature	100-250	x			200-400*
2J-B51 [Sylvania]	200-400		x	x	300
Special types, with variable gap widths:					
1B24	Variable	x	x	x	200-800*
1B27	Variable	x	x	x	200-800*

Note: The following types of gas-filled tubes are not recommended for amateur use, because of excessive power requirements, short life, or other factors. The types: 702A, 709A, S829, 1960, 1961; and the new series types: 1B22, 1B26, 1B28, 1B29, 1B35, 1B36, 1B37, 1B50, 1B51, 1B52, 1B53, and 1B54.

*Depending upon amount of power used.

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Abrupt failure of a T/R tube is always possible. One means of protecting the receiver from such an event, is to install two T/R tubes in parallel at each switching point (Fig. 4) wherever one tube is indicated. Another method is to insert extremely small fuses in each side of the receiver feed between the T/R tube and the input of the receiver; this is no guarantee that *some* power won't get through, but extremely violent transmitter surges will save the receiver from serious damage.

A test of the effectiveness of any T/R switching tube is to replace it with a shorting bar. Under normal circumstances, no difference in transmitter operation should be apparent.

Tube Types

The selection of suitable T/R tubes will depend on the particular rig. Some experimentation will be necessary to obtain the best operating positions for the diodes, because use of T/R tubes at low radio frequencies is a relatively new and unexplored field. Since power distribution in output transmission circuits is often wholly different from that supposed by many operators, it's advisable to conduct experiments with caution and to take all measures necessary to prevent possible damage to the receiver. —30—

SET PRODUCTION

RADIO Manufacturers Association has just released figures on third quarter receiver production.

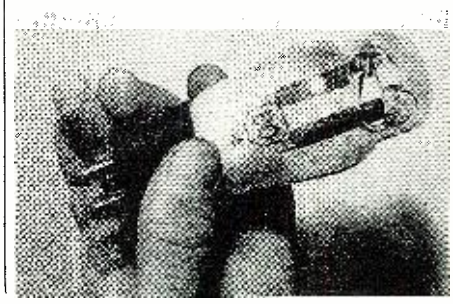
A total of 3,761,271 radio and television receivers were produced by RMA member-companies during that period, raising the total number of sets of all types produced from January through September of 1947 to 12,371,915.

A total of 55,009 television receivers was reported by RMA companies in the third quarter and 32,719 in September, 16,991 of which were manufactured previously but unreported. Third quarter television set production represents a gain of almost 10,000 over the combined first and second quarter output for 1947 and was more than eight times as great as the entire television production for 1946.

Member-companies produced 233,209 FM-AM sets in the third quarter to bring the year's total, through September, to 678,772 units of this type.

—30—

Robert L. Wells, of Citizens Radio Company, Leesburg, Florida, recently encountered this unusual phenomenon. A shorted input filter condenser caused the glass envelope of a Tung-Sol type 80 rectifier tube to melt. The heat caused by the short left the tube elements intact while burning a hole through the glass.



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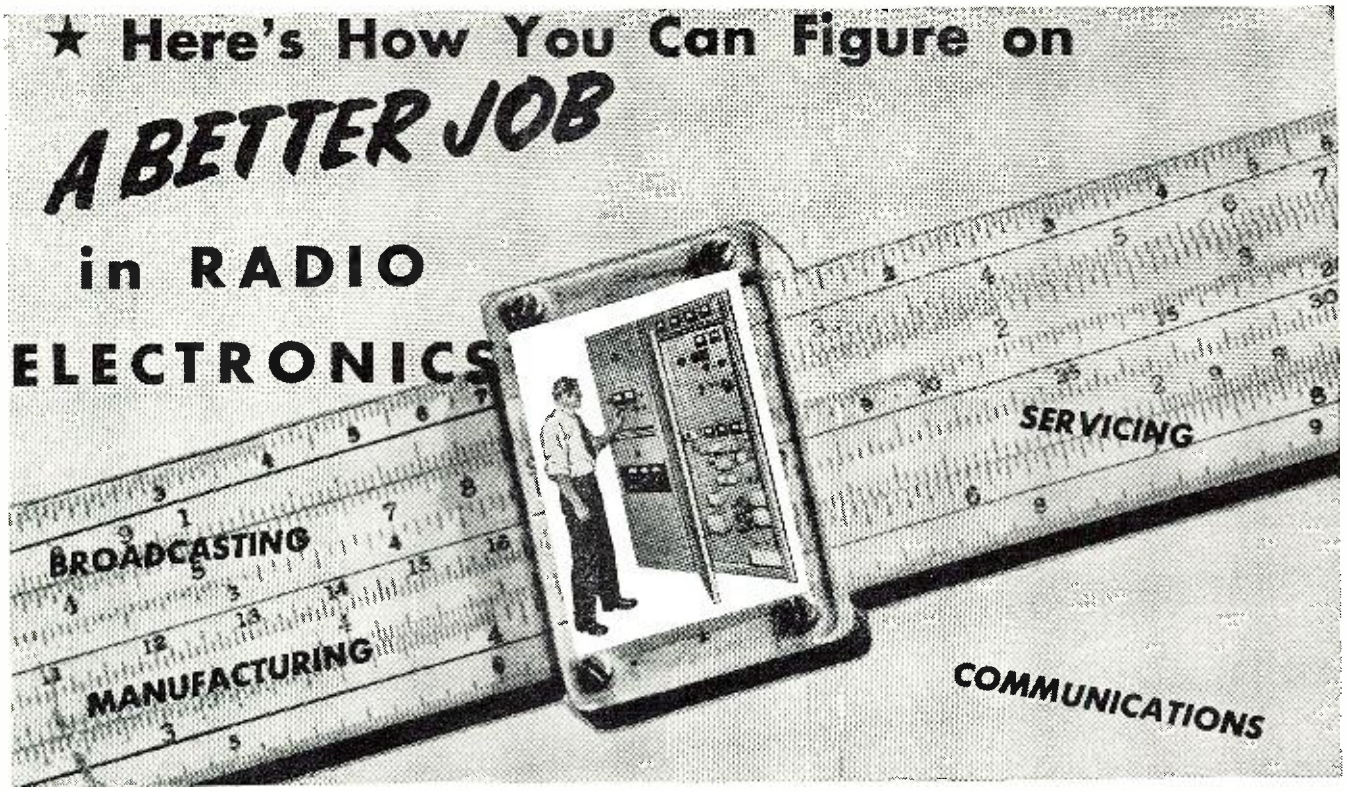

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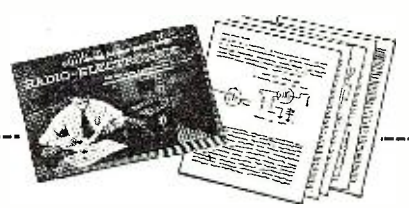

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Negative Feedback Compression

By
J. T. GOODE
Asst. Chief Eng., Packard-Bell Co.

Experimental reports on a simple compressor circuit. With slight circuit changes it can be converted into an expander.

THE use of compression in an audio amplifier increases the average operating level without exceeding peak overload. This allows a higher average of modulation percentage without overmodulating on the peaks. In recording, a higher level may be maintained without overcutting on peaks. In public address work, the amplifier may be operated at a higher level without causing increased distortion due to peaks.

The usual method of creating compression is to rectify an audio signal which originates in the amplifier and feed this negative rectified voltage back to the input stage. This causes the bias to vary and the over-all gain of the amplifier to change.

This type compressor has the following limitations: As the bias increases, the harmonic distortion increases likewise. Proper design will maintain this distortion at a low level. If improper values are used in the circuit, it is not uncommon to experience a distortion increase between 7% and 10%.

The bias-type compressor usually requires a rectifier tube and a pentode amplifier stage. If a high mu instead of a variable mu pentode is used, a higher level of harmonic distortion will result as compression voltage is applied.

The filter network creates a time delay problem. If the filter network is adjusted for a minimum of time delay, regeneration or actual oscillation may result. Regeneration will cause the over-all frequency response of the amplifier to change as the compression voltage is applied. Oscillation due to the filter network, of course, cannot be tolerated.

This method of compression is capable of creating compression voltages far in excess of practicability.

The negative feedback compressor has the following advantages and disadvantages: As compression is applied, the harmonic distortion content decreases instead of increasing. The over-all frequency response of the amplifier will change if the over-all frequency response is not reasonably flat. If the over-all response of the amplifier is flat, the amount of frequency response change will be minor and may normally be discounted.

As the compression is applied, the harmonic distortion decreases. After certain limits are reached, the distortion will increase and approach the normal distortion level at no compression.

The negative feedback compressor requires the addition of a 6SN7 type tube but does not require a pentode amplifier stage in the circuit.

The addition of this type of compressor circuit to an amplifier reduces the over-all gain of the amplifier by approximately 3 db. This characteristic is undesirable, but most amplifiers have reserve gain in excess of 3 db., and the loss of gain may normally be tolerated.

The amount of filter necessary for this type of compressor may be considerably less than that required for the negative bias-type compressor, therefore reducing time delay to a minimum.

Fig. 3 consists of a set of curves created by measuring power output, distortion, and frequency simultaneously at various levels of compression as well as without the compressor circuit. The top curve indicates the frequency response and distortion of the amplifier without the compressor circuit. The second curve indicates the same measurement with the compressor circuit attached but no compression applied. The third, fourth, and fifth curves indicate distortion and frequency response at 2, 4, and 5½ db. compression. The input level was maintained constant for all measurements.

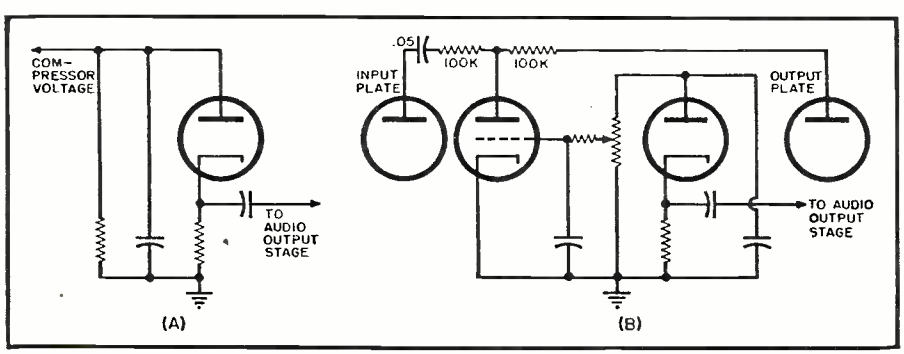
The audio amplifier consisted of a 6SQ7 driving a 6V6 with 3 db. of negative feedback being applied to the cathode of the 6SQ7. The frequency response of this amplifier was flat within .5 db. between 50 and 5000 cycles. When the compressor circuit was attached with no compression voltage applied, the frequency response improved to .2 db.

The distortion level increased by approximately 1% with the exception of 50 cycles and decreased 2.3% at that frequency. If the original negative feedback to the cathode of the 6SQ7 were removed, the addition of the compressor circuit would cause a decrease in distortion instead of an increase. Since the distortion increase was only 1%, no effort was made to determine what actually caused the increase.

The over-all gain of the amplifier will determine the amount of compression that may be obtained by this type of circuit. The circuit values indicated in Fig. 2 resulted in a maximum of 5½ db. compression. The over-all voltage gain of the amplifier was 580.

The operation of the compressor cir-

Fig. 1. (A) Simplified circuit of diode rectifier stage. (B) Fundamental circuit of the negative feedback compressor. Maximum available compression is 5½ db.



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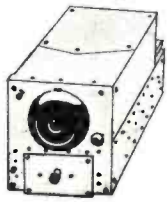

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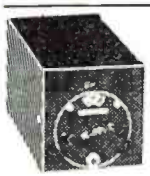

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Works on 6 volt or 12 volt battery Supplies 84 volts and 51 volts DC also 1.4 volts "C" bias. Size 7"x4"x 3¾". Fits BC-654 (SCR-284) exactly. Can be used to operate many types of receivers now on market.
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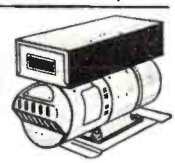

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140 MMFD MIDGET TUNING CONDENSER
Long shaft.
Lots of 3, each..... **44¢**

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Very Special Ham Value! 31 plates, Airgap .109" overall length 4⅛", ceramic insulation, normal list price $11.85..... each **99¢**

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ALLIANCE PHONO MOTOR, special.. **$2.75**

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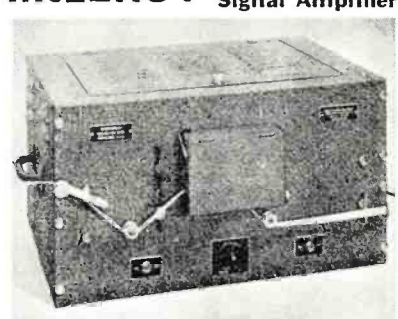


SR-900, SL-990 McElroy combination radiotelegraph ink recorder signal amplifier and leveler. Easily converted into a 20-watt amplifier. Consists of: 2—6L6 push-pull output; 1—6L6 driver; 5 tubes (3—6L6, 1—80, 1—117Z6). Has a speaker field voltage for a 2500-ohm speaker; stand-by switch. Sturdy grey crackle finish metal cabinet 11" x 19" x 13½". Complete, only..... **$14.95**

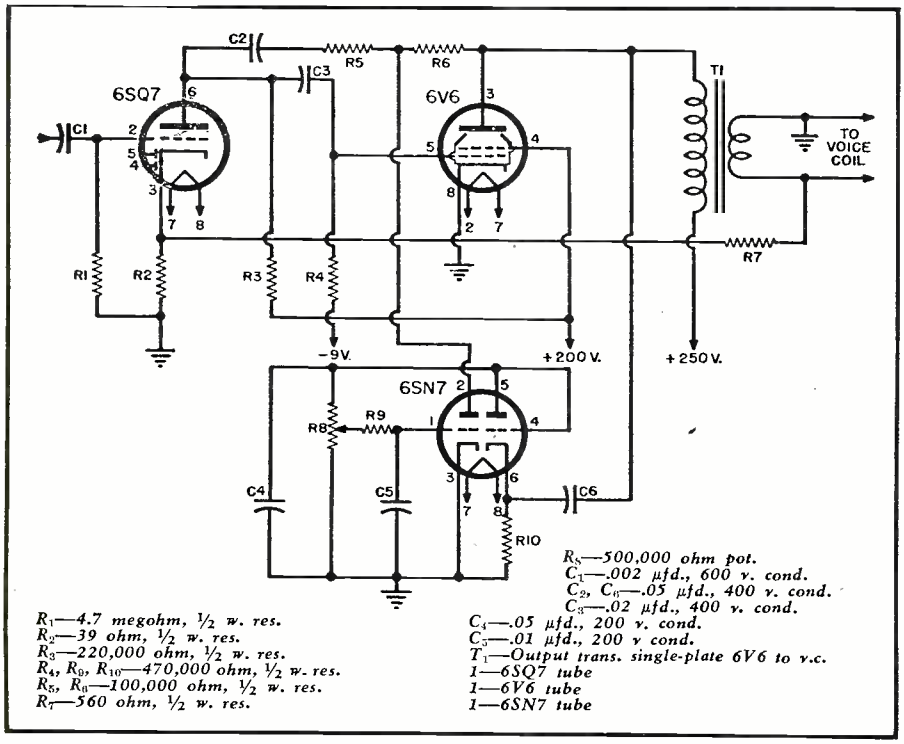
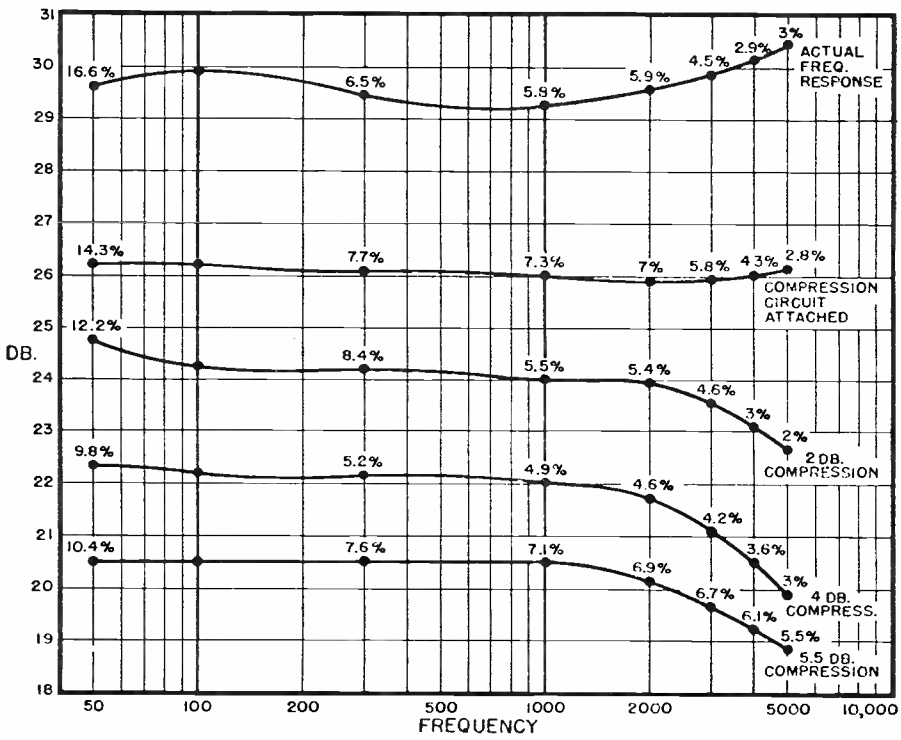


Fig. 2. A 6SN7 tube is used in the compressor. Circuit shows how it is wired into a two-tube amplifier. With slight revisions, compressor can be converted into an expander.

cuit is as follows: Fig. 1A consists of a diode rectifier which will supply negative voltage. The amplifier output is fed into the cathode of the rectifier. In a normal bias compressor circuit the negative voltage created by this rectifier would be filtered and fed into the grid of an amplifier tube, which would result in changing the over-all gain of the amplifier.

Fig. 1B is the fundamental circuit of the negative feedback compressor. Here the same type of rectifier is used and the bias created by the rectifier is connected to the grid of the control tube. The cathode of the control tube is grounded. The plate of the control tube is connected to the center tap of the two negative feedback resistors. The negative feedback circuit consists of a .05 μfd. condenser and two 100,000 ohm resistors all connected in series.

Fig. 3. Frequency response curves for various degrees of compression. Percentage figures indicate total harmonic distortion present. Input level was held constant.



This negative feedback circuit is, in turn, connected to the plates of the amplifier tubes. Positive voltage is applied to the plate of the control tube through the 100,000 ohm feedback resistor which connects to the plate of the output tube. The .05 μfd. condenser removes the d.c. potential from the amplifier input tube plate. The value of this condenser is not critical but must be large enough so a low frequency response increase is not created.

The control tube simply becomes a variable resistor. When bias is eliminated from the control tube grid, the tube draws a maximum current, reducing the negative feedback to a minimum. If negative voltage is applied to the control tube grid, the plate current drawn by the control tube is reduced which, in turn, increases the amount of negative feedback. When the bias is increased to cut-off, a maximum amount of negative feedback is applied. The potentiometer in the grid circuit of the control tube regulates the amount of bias applied, therefore controlling the amount of compression.

Since the control tube acts as a variable resistor, the grid filter network is not critical since a certain amount of rectified voltage can be tolerated. This makes it possible to adjust the time delay to practically any desired amount.

The .05 μfd. bypass condenser from the plate of the rectifier to ground completes the rectifier circuit as well as creates a certain amount of filter action.

The use of a 6SN7 type tube for this circuit makes it possible to accomplish rectification and control in one tube.

Fig. 2 is a circuit diagram of a complete amplifier and compressor with circuit values. Amplifiers using other type tubes will require different values of negative feedback resistors. The exact value of these resistors will be determined by experimentation.

If the compressor circuit is to be applied to an amplifier utilizing high-gain tubes, the value of the negative feedback resistors will increase. If the increase is in the order of 500,000 ohms or more, more control may be obtained by changing the compressor tube from a 6SN7 to a 6SL7 type tube. Socket connections for these two tube types are identical.

This circuit is not restricted to two-stage amplifiers, the only requirement being that the negative feedback circuit be capable of center tapping and supplying plate voltage to the control tube.

Another method of applying negative feedback to the same type circuit is to increase the cathode resistor of the 6SQ7 from 39 ohms to several thousand and connect the feedback circuit from the cathode of the 6SQ7 to the plate of the 6V6. Increasing the cathode resistance of the 6SQ7 results in reducing the over-all gain of the amplifier. On the other hand, it will

(*Continued on page* 138)

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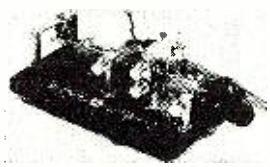

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Very slightly used, perfect..... **4.45**

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Johnson No. 213 for 304TL, 2 for $1.35; each.....**$ .75**
Johnson No. 211, 50 watt for type 211, 810, 811 tubes; orig. box; two for $1.00; each.....**$ .55**

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Good Used..... **5.88**

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CRYSTALS, fit FT-243 holder or octal socket; any freq. 5675 to 8650 kc in 25kc steps (channels 270 to 389 f/BC-659); 6 for $5; each.....**$ 1.00**

Complete set of 120 xtals covering 5675-8650 kc in metal cabinet..... **40.00**
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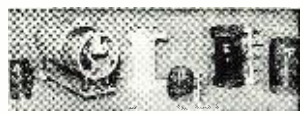

A. Coil Form 2"od x 3¼" lg. With brackets..**$0.19**
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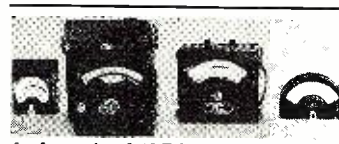

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First IF-Xtal, H'lund part SA-64.....**$1.50**
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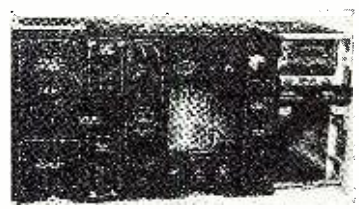

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Type BC-653-A, 2 to 4.5 Mc, 100 watts cw, 22½ watts phone. Tubes include 1613 MO, 807 buffer, two 814's in parallel for PA, 1613 modulator. Gov't cost $1227. Your last chance to get this fine set at such a ridiculous price, BRAND NEW w/tubes and diagram, less dynamotor.....**$29.00**; w/o tubes.....**$15.00**

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1J6G	.59	6L7	.73	77	.40
1LC6	.89	6SA7	.53	78	.40
3FB7	1.10	6SC7	.63	83V	.63
5GP1	2.75	6U7G	.44	VR/150-30.	.55
6AK5 blk.	.79	6V6GT	.45	884	.57
6B8	.47	10Y	.73	1635	.55
6D6	.43	12C8	.57	2051	.57
6H6	.43	25Z5	.43	9003	.65
6K6GT	.40				

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RM-12; good for commercial or amateur stations. Has handset, ringer, generator, Weston 301 (or equiv.) db meter. Contains EE-8 'phone. **Used**.....**$11.95**

RM-13; same as above but includes 115 V 60 cps power supply, one tube amplifier; w/2 tubes. **Used**.....**$14.95**

SCOPE TUBE VIEWER, 5"od x 12"lg, metal.....**$0.49**

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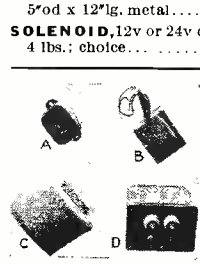

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D. Filament, 2.5v 10a oil-filled Lionel.....**$3.88**

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Postage extra. Minimum order $2.00. Free List. TERMS: Net Cash, 25% deposit on C.O.D.'s

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Guided Missiles

(*Continued from page 40*)

One guided missile may be used in two or more of the above classifications. For example, an air-to-ground missile may be successfully employed as an air-to-ship weapon. This does not necessarily mean that the same type may be used efficiently for both military and naval purposes because the launching conditions are often different and the tactical considerations present entirely different problems. Thus, a guided missile which can be launched from a heavy bombardment airplane may be too large and heavy to launch from a comparatively small carrier-based airplane. In the same manner, a missile which may be fired from the ground against airplanes may be too large and heavy for a ship to launch against enemy suicide airplanes. Furthermore, in many instances it would be a waste of valuable armament to launch a large guided missile against a relatively small or unimportant target when the same weapon may be needed later for an appropriate target.

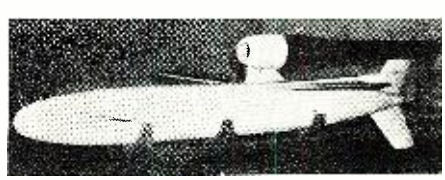
Classification According to Method of Propulsion

A missile may be dropped from an airplane like a rock, in which case it merely possesses the altitude and speed given to it by the flight of the airplane, and it is brought to earth by the force of gravity. It may be fired from a gun aboard an airplane, it may be launched from an airplane by means of a rocket, or it may be given an initial acceleration by means of a rocket motor and thereafter be self-propelled.

It is obvious that any of the methods used for launching a missile from an airplane can be used for ground launching except a method which depends on the force of gravity. Of course, in theory, a missile could be launched from a high tower erected on the ground but structural limitations make this foolish, although it must be remembered that this method was used in ancient times.

We now come to a method of propulsion which is suitable for missiles launched from either the ground or the air, and this is the use of self-propulsion, which simply means that the missile contains a power plant of some description. The power plant may be a reciprocating engine with a propeller, a gas turbine with a propeller, a turbojet motor, a ramjet motor,

The KUN-1 or "Gorgon IIC," a catapult-launched, jet-powered guided missile, is shown mounted on a movable rack.



an aeropulse motor, or any other kind of power plant which will drive the missile along its path through the air.

The missile may or may not have aerodynamic surfaces, that is, it may or may not have wings, ailerons, a rudder, an elevator and other surfaces

The "Glomb," Model LBE-1, a television-controlled glider-bomber which can withstand a speed of 300 m.p.h. in a 4G dive. This is one of a trio of pilotless craft of the same guided missile family, the others being the "Gorgon" and "Gargoyle."

for controlling its flight path. For example, glide bombs have been used, both with and without wings, and it is possible to use rockets, either with or without wings. Pilotless aircraft using conventional types of power plants are too slow to be effective and too large to escape enemy detection and destruction, hence they may be eliminated from our classification of modern, practical, guided missiles. Bullets, bombs, and artillery projectiles as we have known them in the past should be eliminated from our thinking because they are not adaptable to self-propulsion. In general, modern guided missiles fall into two principal classes: (1) Rockets, either with or without wings: and (2) Pilotless aircraft with some form of jet propulsion.

Classification According to the Method of Control

Before we approach the control of guided missiles, we should have a basic understanding of the control of conventional airplanes. The aileron is a hinged, movable portion of a wing, the principal function of which is to impress a rolling motion on the airplane. By raising one aileron and lowering the other, the pilot can roll his airplane to the right or left. The rudder is a movable surface hinged to the trailing edge of the vertical stabilizer, used to steer the airplane right or left. The elevator, usually hinged to the trailing edge of the horizontal stabilizer, is used to raise or lower the nose of the airplane in flight. These three types of control surfaces control the three fundamental rotational motions of an airplane.

In order to relieve the pilot of work, the autopilot was developed. In its simple form, it may be set by the pilot on a course and thereafter it operates the ailerons, rudder, and elevator to keep the airplane on a straight and level path. Autopilots used in World War II were either hydraulically or electronically operated and were used in flight but were not extensively used for take-off or landing. However, autopilots are now developed so highly that they may be set on the ground and used from take-off to landing

without the intervention of a human pilot in the operation of the control surfaces.

Coming back to guided missiles, in World War II, the Germans used the types known as V-1 and V-2 with considerable success. The V-1 was a pilotless aircraft and the V-2 was what is technically described as an elliptical-trajectory rocket. Both of these were guided by autopilots. The operators determined the location of the target with regard to the place of launching, estimated the wind drift, computed the required settings and then applied these settings before the missile was launched. The operator had no control over the flight of the missile after it was launched and the missile did not receive any information, intelligence, or guidance from the target. The accuracy of its fall upon the target depended upon the accuracy with which the autopilot was constructed, the accuracy of its setting, and the computation of wind drift by the operator, although the latter factor was not as important in the case of the V-2 missile as it was in the case of the V-1. The only electronic feature was the operation of the autopilot, assuming that it was not of the hydraulic type.

The next step in the development of guided missiles was to use an autopilot but control it remotely by the exercise of the judgment of a human pilot. The human pilot had to keep both the missile and the target under observation constantly and exercise his remote control by means of radio. During the night or during foggy weather, this method did not work, and even during daylight hours, under conditions of maximum visibility, the anti-aircraft fire of the enemy and the interception of enemy fighter airplanes reduced its effectiveness.

Having achieved some success with radio-controlled guided missiles under the observation of the remote pilot, the next step was to install a television transmitter in the missile so that it could "see" the target, that is, it would transmit its reactions to the emission and reflection of light from the target, and thus enable the human pilot to direct its flight by radio. Obviously, if the emission and reflection of light from the target was weak, or if there were light rays from objects other than the target, the accuracy was greatly lowered. This limited the effectiveness of this method so much that the scientists turned their attention to the use of radar.

In theory, targets which give good radar reflections can be attacked regardless of the visibility, thus overcoming the objection to the use of television repeat-back information, and enabling the remote human pilot who has the necessary information regarding the range and direction of the target to direct the guided missile on an accurate flight to the target. However, if the target does not emit or reflect radar signals, this method fails.

Another theory is that if the remote human pilot knows the exact location of the target on a map, he can track

the flight of the missile by radar, plot its course on the map, and then direct its course by radio so that it will dive at the proper moment and hit the target.

A third theory is that a radar beam may be directed along the path which the missile is to follow. In this case, the missile must carry equipment which will enable it to follow the radar beam. The advantage to this theory is that if the target, such as a ship, an airplane, or any other movable enemy object, changes its position, the radar beam may be directed to the new course of the target and the missile will still strike the target. Again, a human pilot must be on watch from the moment of launching until the fall of the missile on the target.

These theories based on the use of electronic equipment have been seriously considered by scientists for several nations, but the necessity for controlling the missile by the exercise of the judgment of a human pilot has not been as attractive as the possibility of developing a missile which would automatically seek the target.

Target-seeking guided missiles are sometimes called *homing missiles*, but this term suggests the return of the missile to its launching point, hence it is better to refer to them as "target seeking."

Although electronic engineers play a vital part in the development of guided missiles, they are broad enough in their thinking to consider all physical laws in searching for new methods. For example, they have discussed the possibility of guiding missiles to their targets by means of the emission or reflection of sound at the target. This depends upon the intensity and direction of the sound at the target. Battlefield noises, and even the ordinary industrial noises, reduce the effectiveness of this method, but the problem becomes hopeless of solution when it is realized that the missile itself produces noise, both internally and externally, as it travels through the air.

The emission of light from flares or searchlights, contrasts between light and dark areas, and similar light conditions at the target could be used as sources of guidance for target-seeking missiles but here again we would be faced with the obstacle of varying conditions of visibility.

The emission of heat rays from the smokestacks of ships, industrial plants, and similar targets, may be used as a source of guidance, but this method is limited because of varying weather conditions, and fluctuations in the generation of heat at the target.

Heat and light are both within the electromagnetic spectrum, hence they emit or reflect electromagnetic radiation, but they do not do either as well for our purposes as radar, which is reliable night or day, regardless of weather.

In the application of radar to the control of guided missiles, two entirely different systems have been tried. In

one, the missile contained only a receiver. The transmitter was on the "mother" airplane and emitted short pulses of high intensity. Mechanisms within the missile which kept it pointed toward the target were activated from the returning echoes.

In the other type of radar-controlled missile, the missile is set for a particular target, released, and then it automatically follows every movement of the target until it strikes, leaving the mother airplane entirely free to go on another mission.

The principle underlying the operation of this fully automatic target-seeking missile resembles that used by a live bat which gives out short pulses of sound and is guided by echoes from the sound, thus avoiding collisions in the dark. The missile emits pulsed microwave electromagnetic radiations and is guided by the radar echoes from the target. Since the missile can follow every movement of the target, it is possible to say that the radar robot pilot inside the missile can "see" the target under all conditions of visibility.

A missile of this type can be carried under the wing or fuselage of an airplane and released several miles from the target. The usual procedure is to first locate the target by means of the standard search radar carried by the airplane. The airplane is then flown toward the target and the radar transmitter and receiver in the missile are aimed in the same direction. Target information received and transmitted from the radar in the missile is displayed on a special indicator in the airplane and controlled by the operator. As soon as the radar equipment can be manually adjusted to the prevailing conditions, it is switched to automatic tracking and the missile is released.

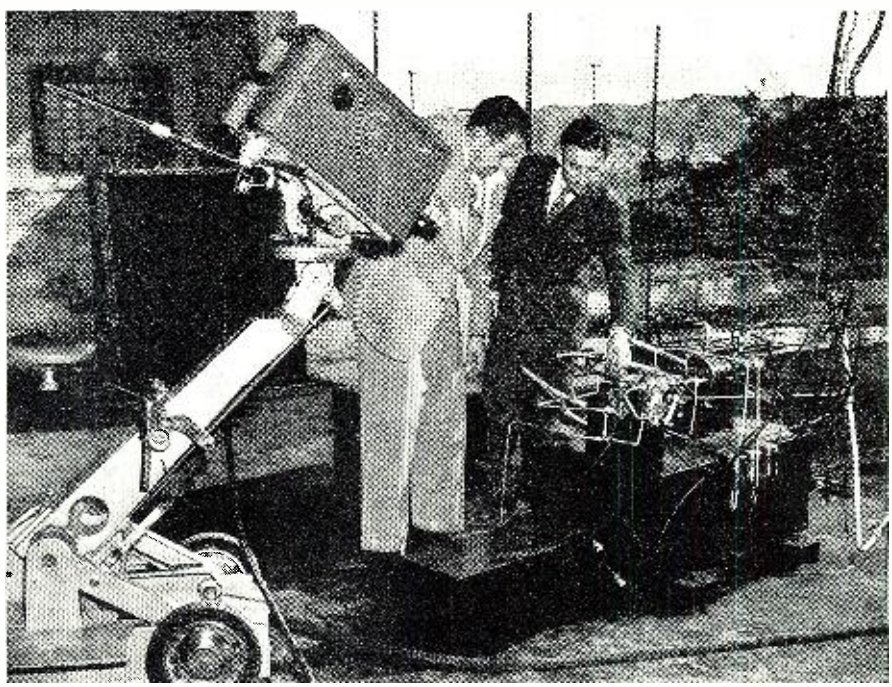
Echoes from the target are continuously detected by the radar receiver installed in the missile. The flight control units receive corrective signals from the output for the purpose of guiding the missile toward the target.

The advantages of this fully automatic, target-seeking missile are as follows: (1) The self-guiding feature enables the launching airplane to go on another mission and maneuver as desired: (2) The self-guiding or homing feature increases the accuracy: (3) Heavily armed targets outside the anti-aircraft range may be accurately attacked.

The system just described was installed in the "BAT," the first fully automatic guided missile successfully used in combat by any nation. It was one of several guided missiles developed by the National Bureau of Standards under the sponsorship of the Bureau of Ordnance of the Navy Department and has led to further research on advanced designs.

Statements in this article are the personal opinions of the author. They are not to be construed as necessarily reflecting the official opinions of the Navy Department or the naval service at large. —30—

C. G. Pierce of Los Angeles, electronics engineer for the General Electric Company, and B. L. Dorman, chief test engineer of Aerojet, view the television installation in the test pit prior to televising the test of firing high thrust rocket motors at Aerojet Proving Grounds. Developed by Aerojet engineers, this method of televising rocket motor tests was successfully demonstrated with the cooperation of engineers of General Electric Company who furnished the television equipment. This method, used for the first time anywhere, provides safety from the hazard area to observers located in a remote room who may view the tests with added advantages of better lighting and close-ups never before provided.



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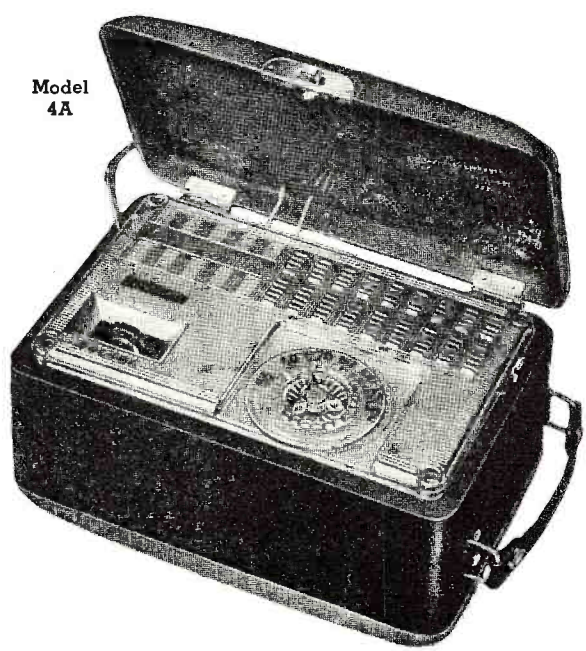

This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio, is line-producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched; all you do, is mount the parts and wire. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that those with a minimum knowledge of radio may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap on back. The lucite face of the receiver has an inlaid gold design. The circuit is the conventional two gang superhet type, with A.V.C. Receives the broadcast band, 540 to 1650 KC. Uses miniature tubes: 1R5 converter, 1S5 detector A.V.C., 1T4 amplifier and 3S4 power amplifier. Alnico V PM speaker. The loop antenna is built in the lid. Radio comes on automatically when lid opens. Operates on self-contained batteries. Priced complete with tubes and 67½ volt "B" battery and flash cell (Not AC-DC). Nothing else to buy. **Model 4A, Price $14.95.**

Send a $4.00 deposit; balance will be sent C.O.D. With full remittance, include sufficient postage for 5 pounds.

McGEE RADIO COMPANY, 1225 McGee St., Kansas City 6, Mo.

International Short-Wave

(*Continued from page 70*)

sible to send a follow-up after a reasonable period of time has elapsed without reply, or send an additional report. Sometimes mentioning that you are a member of a DX club may help in getting a verification. Above everything else, make your reports *constructive, accurate,* and *adequate.*

Codes

Here are a few international signal abbreviations and code symbols that you may find useful:

QSA/S (QSA1R) System Readability Scale

QSA1—Hardly perceptible; unreadable.

QSA2—Weak, readable now and then.

QSA3—Fairly good; readable but with difficulty.

QSA4—Good, readable.

QSA5—Very good; perfectly readable.

Strength Scale

S1—Unintelligible, barely perceptible.

S2—Weak signals; barely readable.

S3—Weak signals but can be copied.

S4—Fair signals.

S5—Fairly good signals.

S6—Good signals.

S7—Moderately good signals.

S8—Strong signals.

S9—Extremely strong signals.

"F" Code

F1—Speech distorted and badly over/under-modulated. Quite unintelligible.

F2—Distorted but 10 to 15 per-cent intelligible.

F3—General sense followed, but intelligibility low.

4F—Pronounced distortion; 30 per-cent intelligible.

F5—Speech breaking; poor quality but intelligibility 60 per-cent.

F6—Unnatural speech, but readable.

F7—Slightly distorted; 100 per-cent intelligible.

F8—Good, clean speech.

F9—Perfect, well-modulated telephony.

QRM and QRN Symbols

QRM indicates interference from electrical apparatus and other stations; QRN means interference or static (atmospherics).

X—Slight. XX—Rather bad. XXX—Very bad. N—None.

QSB (Fading) Symbols

F—Slight. FF—Fairly deep. FFF—Complete fadeout. N—None. SS—Very slow fading. S—Slow. R—Rapid. RR—Very rapid.

Type of Transmission

A1—Telegraphy on pure continuous waves. A2—Modulated telegraphy. A3—Telephony, voice. A4—Facsimile (wirephotos). A5—Television.

CW means "continuous wave," is the same as A1; sometimes is used "loosely" in reference to A2.

Teletype is high-speed automatic CW transmission.

Heterodyne is a whistling sound, sometimes resulting when two or more carriers coincide.

QRA means location (address); QRB is distance (miles); QSL is verification (of reception). QSO means communication. QTH is position (longitude and latitude, or town). DX refers to distance or distant radio reception. RX is an abbreviation for receiver, TX for transmitter.

* * *

Best Bets for Beginners

Here are some "Best Bets" for beginners. While they were chosen primarily for listeners in the United States and Canada, many of them can be heard well in many other parts of the world.

Australia—VLB, 9.54, VLC7, 11.84, 0800-0915; * VLA5, 15.32, VLC7, 11.84, 2345-0045; especially for West Coast listeners, VLA8, 11.76, VLB9, 9.615, 1000-1115; VLA6, 15.20, VLB10, 11.74, 0200-0315, 0900-1000.

Ceylon—Radio SEAC, 15.12, 17.77, Sundays in beam to Britain, 1330-1530.

China—For East U. S. listeners, XGOY, 9.663, at 0700 (news); XGOA, 11.835, around 0500-1000 (news, 0900). For West U. S., XGOY, 11.913, 0845-1040, news 0900, 1000; XGOA, 11.835, 0400-1030, news 0500, 0900.

Dominican Republic—H12T, 7.275, 0800-0000, and the 11.901 channel is excellent in East, mornings, announcing as "La Voz del Yuna."

Ecuador—HCJB, Quito, is usually good worldwide, most hours of the day and to after 0000 (EST); operates on 12.455, 15.1115, 9.964, 6.231.

England — GWH, 11.80, 0500-0600; GRP, 18.13, 0600-0900, 0915-1115; GST, 21.58, 1130-1600; GWH, 11.80, 1315-2145; GRH, 9.825, 1615-2300; GSL, 6.11, 2000-2300, and GRY, 9.60, 1615-2145. In addition, many other BBC stations are received with excellent signals.

France—Paris, 11.845, 9.55, 1915-2015.

French Equatorial Africa—Radio Brazzaville, 11.97, 0000-0225, 1700-2025; 9.44, 1830-2025.

French Indo China—For West U. S., *Radio Saigon,* 11.78, 6.165, 0400-1030, best on 6.165 from 0500 on; news at 0500, 0900. For East U. S., 11.78, 0500-0830.

French West Africa—For East U. S., *Radio Dakar,* FHE3, 11.713, varying, afternoons to 1700. For West U. S., same frequency, 0200-0230.

Holland—"The Happy Station Program," Sundays and Wednesdays, PCJ, 9.59, 2200-2330.

* (Note: Unless otherwise indicated, time herein is American EST; *add* 5 hours for GCT. Time is indicated on the basis of a 24-hour clock, that is. 1 a.m. is 0100, 1 p.m. is 1300, etc. All times indicated as 1200 through 2400 fall in the p.m. so in order to convert the times, subtract 12 hours from figures over 12 to get the p.m. time. "News" refers to newscasts in the *English* language. "V" following a frequency means that the frequency varies.)

India—For West U. S., AIR, Delhi, 15.16, 9.59, 0900-1100, news at 0930, 1030; and 15.19 from 2100 on. For East U. S. listeners, 15.19 at 2130; 15.19, 15.16, at 2230; 11.87, 9.67, at 0730.

Italy—For East U. S., *Radio Italiana,* 15.12, around 1910-2010.

Japan—For West U. S., Tokyo, 6.015, 0200-0900, relaying AFRS (WVTR) programs; 9.605, 0000-0330, relaying WVTR; JVW2, 9.505, JKC, 7.258, JKA, 7.285, 0330-0830 (Home Service). For East U. S., best possibility is the 6.015 outlet around 0400-0700.

Java—For East U. S., Radio Batavia, 18.600, 19.345, 1145-1200, and on 15.145 and 9.55 at 0530. For West U. S., 11.44, 0930-1000.

Korea—For West U. S., JBBK, 4.40, 0500-1000 (*no English*).

Malaya—For East U. S., Singapore, 9.69, around 0500-0715. For West U. S., 9.69, 0300-1200 (news at 0645, 0915, 1100), also on 6.77.

Philippines—"Voice of America in Manila," 11.84, 0430-1005 (is QRM'd by Australia's VLC7, 11.84, in period 0800-0915).

Sweden—For East U. S., SBT, 15.155, 1000-1100; and SDB-2, 10.780, 2000-2100. For West U. S., SBT, 15.155, 0140-0500 (Home Service).

Switzerland—HER5, 11.865, Berne, 1730-1815, 2030-2230; HER4, 9.535, 2030-2230.

U. S. S. R.—For East U. S., *Radio Moscow,* 15.17, 1820-1930 and 0745-0815. For West U. S., 15.17, 1820-1930; also 9.565, 0300-1000 (beamed to Orient).

Best bets for listeners in the mid-West (particularly the Chicago area) include Brazzaville, Quito, Manila, Nanking, Leopoldville, *Radio Italiana,* Paris, Berne, *Radio Australia, Radio Dakar,* Stockholm, Moscow (see schedules above and in "This Month's Schedules").

For more detailed information on the short-wave spectrum, short-wave reporting, amateur codes and abbreviations, identification of short-wave stations, and so on, readers are referred to the Shortwave Listeners' annual, published by the Amalgamated Short Wave Press, Ltd., 57, Maida Vale, Paddington, London, W.9, England.

In conclusion, our very best advice to the "beginning" SWL is to *tune carefully, report adequately, be patient,* and *persevere!*

* * *

Verification Data

Due to so many requests from U. S. listeners for information about the policy of the U. S. Department of State in verifying "Voice of America" reception, I quote below a letter from Kay Bailly, Chief, Listeners Relations Branch, OIE-IBD, Department of State, New York City:

"Concerning your question as to verifications for listeners within the U. S., you are correct. The activities of the International Broadcasting Division (The Voice of the United States of America) are confined by Congress to international broadcasting to other

nations of the world, and are not intended for the United States—although international frequencies and programs can be well received in many parts of the country.

"Our activities, therefore, must be confined (due to budgetary limitations) to those areas and audiences for which international broadcasting is specifically intended. The importance of verifying for listeners in the U. S. as well as internationally, is not overlooked, and it is our hope that some arrangements can be made to handle this activity within the next year."

Raymond Block, Antwerp, Belgium, writes: "I have just received a verification in form of a nice card (view of Moscow) from *Radio Moscow* with schedule of programs in *English*. I wrote to this QRA: Radio Moscow, Overseas Service, English Program, Moscow, U. S. S. R." Mr. Block said his report was sent in *English* and was verified in that language in 42 days; no IRC was used. (Has any one else received a reply from the U. S. S. R.?)

P-L-E-A-S-E !

They had a little radio
And the darn thing would not go.
Pop changes tubes and turns the screws,
And, finally, burns out the house fuse.
He sits and frets and blows his nose,
Then to the Radio Shop he goes;
"Nothin' wrong, it just went flop"
He says to the man in the Radio Shop.
Three new tubes, a filter; alignment, too,
The darn thing, then, is good as new.
Had not Pop tried his skill,
He would have had a smaller bill.

By Stan Clymer. Reprinted from PRSMA News

In verifying by QSL card and letter, *Radio Brazzaville* officials stated that "Whether return postage is included or not, we will always reply, by airmail if the listener specially wishes." *Radio Splendid,* LRS1, Ayacucho 1556, Buenos Aires, Argentina, QSL's by letter in *English;* VY7RB, *Radio Sucre,* Cumana, Venezuela, verified by a letter in Spanish, gave frequency as 3.470. *Radio Mediterraneo Valencia* says EAJ3 is "nonexistent"; says the station has no call letters. CXA-19, 11.835, Montevideo, verified with a picture postcard and beautiful folder, gave schedule as 0600-2200. (Kneitel)

* * *

This Month's Schedules

Albania—Doronthy Sanderson, Australia, reports ZAA, 7.852, Tirana, with news at 1615.

Algiers—The 11.835 outlet is heard on West Coast from 0130 on. (Balbi)

Angola—CR6RS, *Radio Benguela,* is heard in South Africa on 7.10 around 1400-1500; station can be identified by five tingling chimes at 1500, with the call, "Radio Club de Benguela, Angola." (Radio Week) CR6RL, 15.895, Luanda, gives program schedule at 1330. (Brownless)

Argentina—A letter from the Ministerio del Interior, Buenos Aires, states that power of LRA will shortly be increased to 50 kw. which is the maximum output of the transmitter. (Holmberg)

Australia—Widely reported (from Sweden, Chicago, Eastern U. S.) is VLH3, 9.58, heard to 0900.

Austria — Swedes report Dornbirn moved from 6.005 to 5.990. (Nilson)

Belgian Congo—Leopoldville, 9.745 (with 11.645 in parallel but not announced), beams to Britain, 1530-1645, news at start. (Pearce)

British Honduras—URDXC reports ZIK2, 10.598, Belize, as heard at 0830-0856; regular daily schedule is 1330-1345 or later.

Bulgaria—Sofia, 9.350, has news at 1650 now (formerly this was only radiated on medium-wave although was listed for short-wave transmission), in addition to the regularly heard newscast at 1530.

Celebes—Radio Makassar, YFA4, 9.265, is now being heard in Sweden to 0932 sign-off, gives call in Dutch and *English.* (Nilsson)

Ceylon — ZOH, 4.897, Colombo, appears to relay BBC news at 1100; signs off at 1200 with "God Save the King."

Radio SEAC, 15.12, 17.77, in the Sunday beam to Britain, is now scheduled at 1330-1530 since Britain returned to GMT.

China—Chinese stations have returned to standard time; thus programs are now 1 hour *later* than during summer and fall.

Dorothy Sanderson, Australia, reports a Chinese station with a call of XTRA as heard on 9.73 at 0545; *not* XGOA; she reports XGOA on this channel at 0445, however.

XGOY, 9.663, has improved signal mornings in East; news, 0700. On 11.913, now is scheduled 0500-0630 and 0845-1040; news, 0900 (relayed from XGOA), 1000; good signal in first transmission, last is marred by terrific CWQRM.

Best signal from China mornings is XGOA, 11.835, which has news at 0900; has some sideband QRM from Australia's VLC7, 11.84, but usually can be separated during the time Australia is beaming to North America (0800-0915). The evening transmission on this channel, beginning at 1930, appears to be inaudible throughout the U. S. due to Montevideo, Uruguay, occupying the same spot to 2300.

XRRA, about 10.260, Peiping, is still heard on this frequency. (Nilsson) Still audible in Eastern U. S. around 0700-0800.

URDXC lists XMAG, 4.275, Nanking, 2200-1000.

Czechoslovakia — OLR3A, 9.55, Prague, has fine signals in East afternoons; news at 1745; announces news to Europe at 1345 on OLR4A, 11.84. (Beck) The 9.55 outlet has news at 1545, 1645, 17.45. (Pelland)

The North American beam from OLR5A, 15.23, is now at .1900-2000, news around 1935. (Norris) At times appears to be jammed by Moscow. Have heard music on this one prior to 1900.

Dominican Republic—A verification

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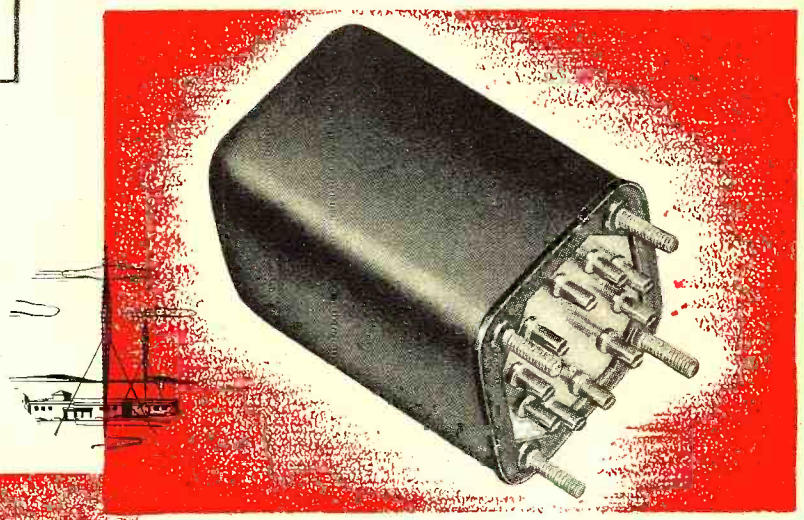
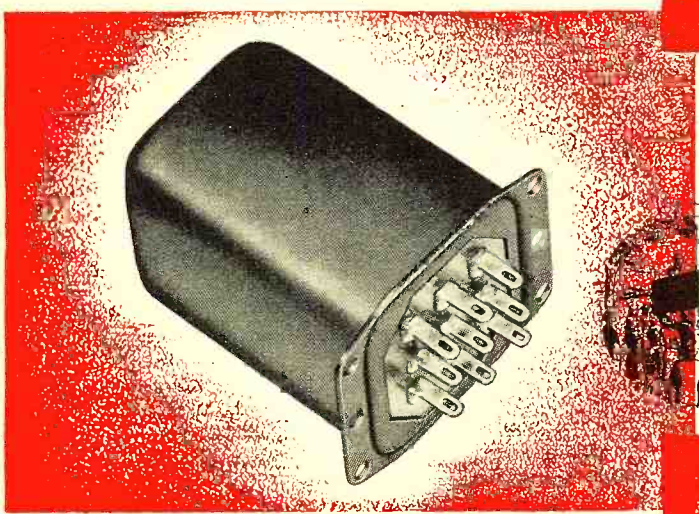


Full Frequency Range

30 to 15,000 Cycles, provides uniform response over this entire band with ± ½ db up to 10 watts of audio power, within ± 1 db over 10 watts. Standard RMA impedances. Hum balancing coil structures and nickel alloy shielding. Included are Input, Output, Driver, and Modulation Transformers; Modulation Reactors. *Sealed in Steel* construction, stud mounting, with pin-type terminals.



Public Address Range

50 to 10,000 Cycles, frequency response within ± ½ db up to 10 watts of power, within ± 1db over 10 watts, throughout this range. Secondary impedances match 600 and 150-ohm lines, 16, 8 and 4-ohm reproducing systems. Listed are Driver and Output Transformers. *Sealed in Steel* construction, flange mounting, with solder lugs or wire leads.

Communications Range

200 to 3,500 Cycles, affords response with variations not exceeding ± 1 db over the range of voice frequencies. For use with 600 or 150-ohm lines. Input, Output, Driver and Modulation Transformers offered. *Sealed in Steel* construction, flange mounting, with wire leads or solder lugs.

CHICAGO TRANSFORMER

DIVISION OF ESSEX WIRE CORPORATION

3501 ADDISON STREET • CHICAGO 18, ILLINOIS

card from "La Voz del Yuna," stated that H13T (1040 kcs.) uses 10 kw. and that H12T (7.275 and 11.900) uses 7.5 kw. (Holmberg)

Dutch New Guinea—Radio Biak, on approximately 7.98, has good signal in Australia with AFRS programs at 0600; also calls Batavia. (Sanderson) Reported by NNRC on 7.960 to 0830 after changing from 7.200 at 0705; works Makassar at conclusion of broadcast (duplex)

Egypt—SUX, 7.865, Cairo, is heard with good level in Newfoundland at 1515-1630 sign-off. (Peddle)

Finland — OIX4, 15.190, Helsinki, still has news, 0715. (Pearce) OIX2, 9.500, varying, may parallel.

France—Latest schedule announced by Paris is 1645-1700, 15.24, 9.55 (both 100 kw.); 2115-2215, 9.68, 9.55 (both 100 kw.), and 11.845 (25 kw.) to North America. (Beck)

Paris is heard on West Coast on 17.766 from 0900 on; outlets of 17.85, 15.35, 15.24, are heard there 0145-0230. (Balbi)

French Indo-China—Hanoi, 11.90, is heard in Australia at 0645 with news in French; another Hanoi outlet on 10.20 is heard at 0700 with news in French, fair signal despite much noise. Pnompenh, 12.364, is heard there at 0700 with news in Chinese. (Sanderson)

Saigon's FZS, 18.388, is being heard well in Eastern U. S., 1030-1100, beamed in French to France; signs off with "La Marseillaise." (Kary)

Germany—The British-Controlled SW outlet on 6.115, varying, is officially listed as "Northwest German Radio," location Cologne.

Swedes report a new station in Munich, operating on 6.180, Fridays at 0530-0830 and 1030-1730; Saturdays, 0530-1800, Sundays at 0200-1800. (Nilsson) Could this be *Radio Stuttgart,* listed on 6.179? Or it may be actually Munich (listed as 6.190).

Guadeloupe—NNRC reports *Radio Guadeloupe* on 9.410, signing off with "La Marseillaise" at 2010; may be new channel.

Honduras—"La Voz de Lempira," HRA, 6.048, Tegucigalpa, is a new station, heard evenings. (Legge)

India—AIR, Delhi, is being heard well evenings in the East; news at 0930 on 15.19; at 1030 on 17.83, 15.29, 15.19, 15.16, 11.87. (Beck) VUD3, 17.76, Delhi, heard on West Coast, 0900-1100, news at 0930, in dual with 15.16, 11.87, 9.59; VUD7, 6.19, heard there from 0800 to 0930 sign-off. The 7.29 outlet is heard at 0900-0945 with native programs; 15.19 operates 0400-0600, among other times; 11.85 carries native programs, 0800-1030. (Balbi) The 7.290 outlet is heard in East at 0730 with news; the 7.260 channel in parallel at that time may be Madras.

Iran—Radio Tabriz, 11.960, is heard in Britain to 0700, news in French at 0615, in *English* at 0630. The period from this station formerly on 12.180, is now on 6.090, 1200-1300; news in Persian at start, then western recordings. (Pearce)

Ireland—Swedes report *Radio Eirrean,* 17.84, at 1245-1300. (Nilsson)

Italy—Radio Italiana, 11.81, has English period now at 1430-1510, news at 1450. (Pearce) The North American daily beam on 15.12 is now at 1915-2010, news around 1950, good level; announces 6.085 in parallel. (Conley) So far no one in U. S. seems to have picked up the 6.085 outlet.

Java—PMW, 17.630, Batavia, is scheduled 1200-1245. (Alfred) Has news at start. (Miers)

Lebanon—Radio Beirut, 8.020, varying, is heard in Newfoundland at 1345-1600, but with bad CWQRM. (Peddle)

Madagascar — Radio Australia reports Tananarive on 10.615, 9.669, 6.063 as operating in parallel at 2245-0030, 0320-0545, 0920-1240. QRA is Office of the French High Commissioner, Tananarive, Madagascar.

Malaya—Singapore's new 21.73 (listed 21.72) outlet is heard in Australia at 0415 with British Far Eastern Service, says Dorothy Sanderson, who also reports *Radio Malaya,* 6.010, at 0600 with news and music for local listeners.

Radio Malaya, 4.825, Singapore, is heard in Britain signing off with "God Save the King" at 1533, except Saturdays and Sundays, when runs to 1104, and on which days has headline news at 1100. (Pearce)

Monaco—Radio Monte Carlo, 6.132, is heard in Britain as early as 1645, has news in French at 1700, then gives program summary and leaves the air around 1715; has short dance tune as signature. (Pearce)

Mozambique—CR7BJ, 9.654, varying, is heard in East around 1600-1700 sign-off (In *English*).

CR7IB, 7.155, Beira, reports that it has been recently heard by listeners in the U. S. A., Europe, and Australia; to ascertain possibility of a special broadcast to Europe, U. S. A., Australia, and the Far East, a test transmission was broadcast at 0200-0330 on November 2; as far as is known at the time this is written, it was not audible in the U. S. If anyone did pick up this test transmission, a report would be appreciated by CR7IB, Beira, Mozambique. Mervyn Laubscher, South Africa, informs me that officials of Beira say they will soon purchase better, higher-powered equipment.

Norway—LLG, 9.610, is still being heard afternoons in Britain with good level; in verifying, gave power as 8 kw., name (or location) as Fredrikstad Kortholgekringkaster. (Pearce)

LLN, 17.825, Fredrikstad, was heard testing mornings, but seems to be off now. LLM, 15.175, Tromso, verified by card giving this as location of transmitter; is heard afternoons in Eastern U. S. LLG, 9.610, Fredrikstad, is heard in New York well at 1400-1700 with Home Service; this may be the new 100 kw. transmitter that has been under construction. (Legge)

Ukesenderen NTH, Trondheim, short-wave transmitter of the Norwegian Technical University and of the Students Society in Trondheim, is

broadcasting on 7.240 and 9.610 daily at 0800-0830 and 1700-1730; output is 600 watts. (Skolder, Svensson, Nilsson) *Uses Norwegian only.*

Palestine—Jaffa's new 31-meter outlet on about 9.645 is a powerful signal in Britain afternoons around 1520, has news in Arabic at 1530, signs off around 1542, but more recently as early as 1532. (Pearce) The 9.645 outlet is heard on West Coast mornings around 1030. (Baxter, Dilg) In the afternoon period, 6.790 parallels. (Pearce)

Philippines—A station heard mornings on about 11.905 has been identified as KZFM, Manila, moved from 11.800 and before that on 9.515; poor signal and fades badly. KZPI is still on 9.500 "plus"; KZOK is now on high side of 9.700. (Dilg) "Voice of America in Manila," 11.84, appears to sign on now at 0430, instead of 0400 as officially listed; has short news at 1000 and leaves the air around 1005 with playing of "Star Spangled Banner." (Balbi)

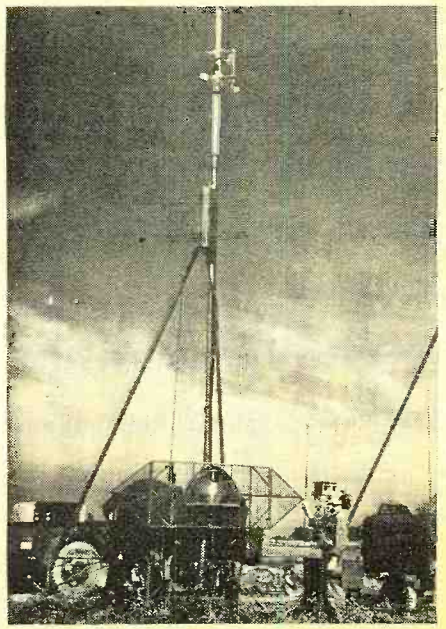
Poland—Warsaw, 6.100, now has news at 1550 (winter schedule). (Pearce) Swedes report Warsaw testing on 7.170 to 0530. (Nilsson) Tests begin at 0400. (URDXC)

Portugal—Call letters and frequencies of Emissora Nacional, Lisbon, are CS2MA, 6.374; CS2MB, 7.260; CS2MC, 9.635; CS2MD, 9.670; CS2ME, 9.680; CS2MF, 9.727; CS2MH, 9.740; CS2MI, 9.940; CS2MK, 11.027; CS2ML, 11.040; CS2MM, 11.840; CS2MO, 11.995; CS2MP, 12.749; CS2MQ, 15.100; CS2MR, 15.110; CS2MS, 15.120; and CS2MT, 15.320.

Rumania—*Radio Romana Libera*, 6.210, varying, has been heard in New

(*Continued on page* 162)

When the "Big Push" landed at the Clinton County Army airbase, this upright antenna served as the guide path to bring in the robot C-54. Sgt. R. M. McKinley of Kenton, Ohio, takes a look at the instrument which, combined with a localizer, brought plane to a landing.



Television Installation

(*Continued from page 59*)

rious but, in most cases, the pattern-effect is stationary. The only practical solution of this type of interference is removal of the antenna as far as possible from the source of trouble. This may require an increase in elevation, resiting, or both, to varying degrees. In one instance (Fig. 4), it was only necessary to raise the antenna to a position about 6 feet above "noisy" power lines in order to entirely eliminate all objectionable interference.

Power or electric cords left on or near the receiver chassis may sometimes create "hum" interference (Fig. 5) due to leak-through in the video output stages of the receiver. Only removal of the electric or power cord may be necessary to clear the picture image.

Other typical sources of television interference are electric signs, neon signs, traffic signals, air conditioning and refrigeration units, dial telephones, doorbell buzzers, many household appliances, and other electrically operated instruments and devices.

The *source* of interference must be determined before direct methods of elimination can be attempted, because different types of interference usually require specific methods of suppression or elimination.

Preliminary Steps

Any "noise" disturbances of a particular location will first be noticed on the picture screen during siting and orienting of the directional antenna. With the appearance of such an effect, an attempt should be made by both members of the two-man installation team to determine the source of the interference.

If the nature or intensity of the picture distortion changes with a movement of the antenna, then use the antenna as a "noise probe" to detect the direction—and thus the location—of the source of trouble. Usually, however, this is only effective for "noise" originating from external sources and having marked directivity.

Most sources can be identified through direct association with nearby electrical apparatus or equipment. For example, if picture reception is impaired only during operation of a neon sign, the sign is the source of interference. Similarly, the television picture may be rhythmically affected by periodic operation of an electric flashing sign. Interference only during periods when a nearby elevator is in motion is an easy source identification. In like manner, vacuum cleaners and other household appliances, refrigerators, air conditioning units, and even doorbells can be identified by this process of elimination.

Interference may be entering the receiver via the a.c. power cord; that is, the actual source is unknown but is introduced into the receiver by the

power and light distribution system for the particular area. This possibility can be tested by inserting any of the several commercial types of *a.c. line filters* or *line noise suppressors* between the power cord and the a.c. outlet socket in the room. These filters should be standard equipment in the television installation kit. If the filter is effective in suppressing the "noise," it should be more securely attached as a permanent part of the installation.

If the interference persists, however, with the *source* still unidentified, an effort can be made *during continuance of the installation* to minimize or possibly eliminate the "noise" disturbance. However, at any time the source is identified or strongly suspected, all work should be concentrated on elimination or suppression of the "noise" according to the prescribed methods (Table 1).

Further Attempts

Try different positions or paths for the loose "twin-lead ribbon" lead-in between the antenna and receiver. Often, by rearrangement of this lead-in, it may be possible to avoid certain "noisy" parts of a house or building. If necessary—that is, in order to achieve "noise"-free reception — the lead-in may follow a long and circuitous path; but the lead-in must be properly matched to the impedance of the receiver as well as the antenna, and possible *new* sources of "noise" must be avoided. If the "noise" persists, regardless of the route, the "twin-lead ribbon" should *not* be permanently installed.

Next, considering the important factor of *directivity* needed for strong signals and for ghost-free reception, change the location of the entire antenna to a new site—as high as possible and *as remote as possible* from any suspected source of electrical interference. Then, proper orientation of the resited antenna may help to minimize the unwanted "noise." If the source of the interference can be determined, refer at once to Table 1 for proper procedure.

However, if these attempts fail or are impractical, it is obvious that the interference is of a serious nature requiring considerable additional installation work. Return the antenna to its original or best site. It should then be reoriented for best reception of the two channels preferred by the customer—temporarily ignoring, as best possible, the extraneous "noise" effects on the picture screen. When this is done, disconnect and remove the "twin-lead ribbon" lead-in from the vicinity of the installation.

Although adequate for most suburban and many urban installations, "twin-lead ribbon" is *not* a desirable lead-in for "noisy" locations. Required for such work is *coaxial cable* of superior quality. Either of two types, RG-58/U or RG-59/U, or their equivalents, are recommended for television installations. Both types have a rubberized insulation *over* a flexible (copper-woven) outer conductor (Fig. 6A).

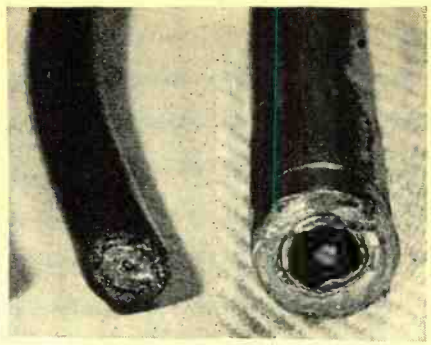


Fig. 6. Types of coaxial cable lead-in used to minimize possible "noise" pick-up. Rubber covered cable (left) is most popular. Lead-sheathed cable (right) is usually used only in large metropolitan or commercial type buildings.

For urban installations in extremely "noisy" commercial or industrial buildings, a heavier and more durable cable can be used (see Fig. 6, right). Bakelite spacers separate the inner conductor from the outer conductor, and the entire cable is enclosed in a heavy lead sheath. Normally expensive, several types of this cabling can presently be obtained through war-surplus channels at reasonable prices.

A coaxial cable is unaffected by nearby "noise" disturbances, and such a lead-in can follow any desired path between antenna and receiver. Since most types of cable are fairly heavy, it must be well secured at least every six feet and sharp bends should be avoided.

To be effective as a "noise"-free conductor, it is extremely important that the outer conductor of the coaxial cable be connected to a good ground at several, appropriate points along the lead-in.

When properly installed and matched to both receiver and antenna, such a lead-in will prove to be an almost perfect conductor. Since many types of "noise" interference reach the television receiver via the lead-in, use of coaxial cable is recommended for all "noisy" locations and will invariably minimize such effects on the screen.

After installation of this lead-in, all signals reaching the receiver are affected only by the elements of the antenna. If not already known through the above technical operations, the source of any remaining "noise" disturbance can be identified easily by orienting the antenna for *maximum* "noise" effect. This condition results when the principal dipole element is broadside to the source of interference.

Although "noise" disturbances can be minimized and suppressed *indirectly* by any of the means described, whenever possible and practicable such interference should be eliminated at its *source*—usually the quickest and easiest way. (See Table 1.)

However, *any* method is acceptable if it results in adequate reception of television signals, free of ghost interference, and free of "noise" interference.

(To be continued)

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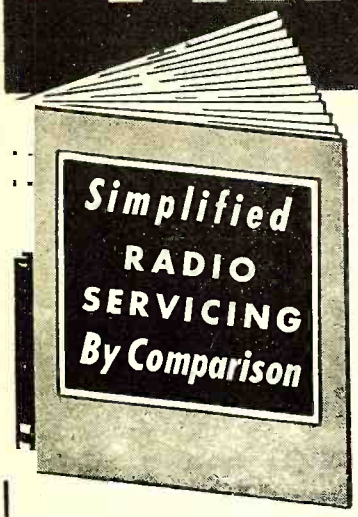

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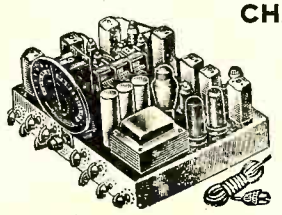

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Feedback Compression
(*Continued from page* 120)

result in a maximum compression of 10 db. instead of 5½ db. The resistor from the voice coil winding to the cathode of the 6SQ7 is removed.

Any compressor circuit will create distortion. This distortion should not be confused with harmonic distortion. Webster defines distortion as "to twist into an unnatural or irregular form." Although this negative feedback compressor actually reduces harmonic distortion, it nevertheless causes distortion as any other compressor circuit since it produces an unnatural condition.

Broadcast stations tolerate this condition to the extent of 2 db. average and 3 db. maximum. This amount of compression is seldom noticed by the untrained ear. Compression above this level under certain conditions can be tolerated without causing serious distortion.

Broadcast stations use compression to increase their average percentage of modulation and alleviate the possibility of overmodulation.

Compression is used in making recordings. Recording levels are governed by the difference between objectionable noise and overcutting of the groove. The use of compression here increases the average cutting level. The recording of symphonic orchestras requires higher compression levels due to the extreme variations between high and low passages.

The use of compression in home recorders increases the ability of an experienced operator to make a recording of reasonably good quality. It is not uncommon to use as much as 6 db. of compression in home recorders. The use of this amount of compression is noticeable in the recording, but results in a recording which is superior to either overcutting or undercutting. To a critical ear, this amount of compression is objectionable. On the other hand, a majority of people will not notice the distortion unless it is called to their attention.

In home recording, the compression level can be set so that a certain amount of automatic gain control is accomplished. Satisfactory recordings can be made by placing the microphone several feet from the source to be recorded and then changing this distance to a matter of inches. Such a recording procedure is not desirable; however, it is not uncommon when untrained operators make home recordings.

The amateur operator may use compression very much to his advantage. First, the compressor will alleviate the possibility of overmodulation. Second, the average percentage of modulation can be increased and third, a certain amount of automatic gain control can be accomplished with a slight amount of distortion being produced because of this action. If the operator

talks steadily, the level of distortion will be low and probably unnoticed. Slight pauses in conversation will cause the voice to become unnatural. A considerable amount of unnaturalness can be tolerated in an amateur transmitter.

The negative feedback compressor circuit can be used for expansion as well as compression by rearranging the circuit. Instead of obtaining negative voltage from the diode load resistor, positive voltage is available at the cathode resistor. By exchanging the rectifier cathode resistor for a potentiometer of approximately the same value and connecting the grid to the center of this potentiometer, the circuit becomes an expander. In conjunction with this, the cathode of the control tube should be removed from ground and connected to ground through a resistor. Another resistor should connect from cathode to "B+." The values of these resistors will require final adjustment so that the proper amount of bias is applied to the tube.

The bias adjustment of the control tube should be such that approximately 3 db. of control is maintained when the grid of the control tube is at ground potential. As the positive grid voltage is applied, the amount of feedback would be reduced producing expansion.

By a somewhat complicated switch arrangement, this circuit could be used for either expansion or compression.

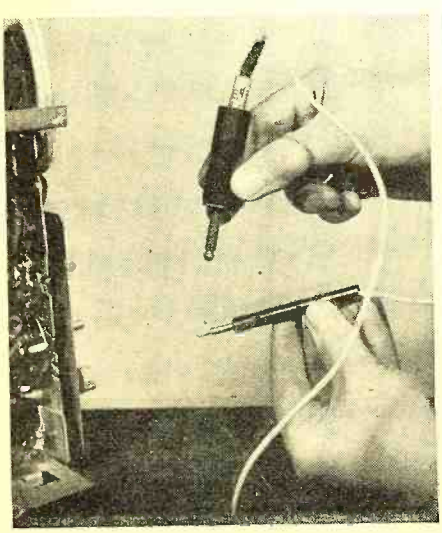
—30—

CHECKING OPEN BYPASS CONDENSERS

THE checking for open bypass condensers may be speeded up by arranging a .01 or .05 μfd. tubular condenser in a phone plug as shown.

The one terminal of the condenser is attached to the tip of the plug and the other terminal of the condenser is soldered to a test lead which terminates in a test prod.

With this assembly it is possible to reach almost any condenser—under the chassis and shunt the test unit across its terminals. . . . . H.L.



Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

QUALITY CONTROL

A 4-page folder on quality control is being offered free of charge by *North American Philips Company, Inc.* of New York.

Titled "Inspecting Incoming Material," the folder suggests procedures that may be followed from the time material arrives in a plant until it is finally accepted or rejected. The booklet also presents some requirements covering a typical inspector training course.

Those interested in receiving a copy of this folder should address their requests to *North American Philips Company, Inc.*, 100 East 42nd Street, New York 17, New York.

ELECTRIC PLANTS

D. W. Onan and Sons Inc. of Minneapolis has just issued a new 16-page catalogue covering the company's complete line of electric plants.

Electric plants ranging from 350 to 35,000 watts, a.c. in all standard voltages, frequencies, and phases, are illustrated and described in this new catalogue. To meet the requirements of users requiring direct current of the "direct service" type, a line of 115-volt models from 600 to 10,000 watts, and in 230-volt models from 3500 to 10,000 watts is also covered. Battery charging plants at 6, 12, 24, 32, and 115 volts, in sizes from 500 to 6000 watts are included.

When writing for copies of this catalogue please specify Electric Plants Catalogue, Form A-138. Requests should be addressed to Advertising Department *D. W. Onan and Sons Inc.*, Minneapolis 5, Minnesota.

ENGINEERED SOUND SYSTEMS

A new manual on the engineering and installation of sound systems has just been announced by the *Sound Products Section* of *Radio Corporation of America.*

Designed for use by architects, building engineers, and the construction industry generally, the new "Architects Manual of Engineered Sound Systems" is a complete guide to the installation of sound systems in industrial plants, stores, hotels, auditoriums, schools, hospitals, churches, and institutions of every kind.

The manual is divided into two parts. The first part defines and discusses the principal components of engineered sound systems and describes the engineering specifications used in installing the equipment. The second part is a work-a-day guide, including complete and detailed specifications on sound systems for the seven principal types of buildings in which sound is most commonly used. These specifications are sufficiently complete to be used as working templates in making actual installations.

The manual, which sells for $5.00 per copy, is available either from *RCA* sound systems distributors or direct from the *RCA Sound Products Section,* Camden, New Jersey.

TECHNICAL DATA

The Daven Company recently announced the availability of a new bulletin of technical data widely used in the design of sound equipment.

Compactly listed, the bulletin includes a table showing impedance vs. decibel loss, with values calculated for impedance mismatch, minimum "T" loss, and bridging pad loss. Also included is data on mixer circuits showing circuit diagrams and applications.

Requests for copies of this free bulletin should be made on your company letterhead. *The Daven Company* is located at 191 Central Avenue, Newark, New Jersey.

CONE AND COIL REPLACEMENTS

Waldom Electronics, Inc. is currently offering a copy of the new catalogue No. 48 covering the company's line of replacement cone assemblies and universal field coil replacements.

In addition to correlating the company's replacement part number with the model numbers of hundreds of radio receivers, the catalogue gives complete pictorial instructions on the proper cone installation, the method of ordering replacement cones, assemblies, etc.

A copy of this catalogue will be forwarded to those making their request of *Waldom Electronics, Inc.*, 911 North Larrabee Street, Chicago 10, Illinois.

TUBE PRICE LIST

A new receiving tube distributor price list, suitable for use either as a wall chart or in a price folder, has been printed by the *Tube Division* of *General Electric Company's Electronics Department.*

Covering 562 tube types, including many of those not in current production, the new lists are available to *General Electric* and *Ken-Rad* distributors.

Application for the new price list charts should be made to *Tube Division, Electronics Department, General Electric Company,* Schenectady, New York.

NEWARK FLYER

Hundreds of items, including p.a. systems, recording equipment, radio and electronic parts, receivers, kits, test equipment, television, surplus items, etc. have been included in the Bargain Flyer just published by *Newark Electric Company, Inc.* of Chicago and New York.

The company invites hams, servicemen, dealers, and broadcast stations to write in for a copy of this new publication. Requests may be addressed to *Newark Electric Company, Inc.* at either 242 West 55th Street, New York, 19, New York, or 323 West Madison Street, Chicago 6, Illinois.

ALLIED SUPPLEMENT

Allied Radio Corp. of Chicago has recently issued a 48-page supplement listing hundreds of radio and electronic items.

Designated Special Supplement No. 114, this catalogue covers home receivers, radio-phono combinations, wire recorders, p.a. systems, ham receivers, and component parts and tubes.

The company will forward copies of this new supplement on request. Address letters to *Allied Radio Corp.*, 833 W. Jackson Blvd., Chicago 7, Illinois.

THEATER DIMMER LINE

A complete line of "Powerstat" theater dimmers for control of lighting is fully described and illustrated in Bulletin 347, just issued by *The Superior Electric Company* of Bristol, Conn.

Dimmers to handle everything from a large auditorium or theater to a store window are described and illustrated.

Copies of Bulletin 347 are available upon request to *The Superior Electric Company,* 2168 Church Street, Bristol, Conn.

TYPE "DP" BULLETIN

A completely revised Fourth Edition of the Type "DP" Bulletin has just been issued by *Cannon Electric Development Company* of Los Angeles, California.

This 24-page catalogue contains application photographs, exploded views, dimensional sketches, tabular data, insert arrangements, junction shells, and mounting hole variations for the company's "DP" line of connectors.

This bulletin should be of especial interest to the radio industry because the "DP" line has been designed primarily for rack and panel radio, electrical and electronic equipment such as transmitters, instrument panels, television camera, radar, electronic timers, etc.

Copies of the bulletin may be obtained by writing the Catalog Department, *Cannon Electric Development Company,* 3209 Humboldt Street, Los Angeles 31, California.

"PROFIT GUIDE"

The Radolek Co. of Chicago has issued a "Preview" edition of its 1948 "Radio Profit Guide" listing hundreds of items of interest to the serviceman, hobbyist, and experimenter.

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OPPORTUNITIES *NOW* WIDE OPEN for Properly Trained Men

Latest reports estimate 400 MILLION new radio and television sets will be built in the next ten years . . . and more than 72 million dollars is being spent RIGHT NOW just for radio repairs ALONE! When you are thoroughly trained by RTA's Hollywood Experts—who have their fingers on the pulse of the Radio-Televisiion industry—you can imagine what undreamed of opportunities await you in Your Own Radio Sales & Service Business, Television, Aviation, FM, Manufacturing and Communications, etc.

EARN *EXTRA* MONEY *while learning* AT HOME

Under RTA's amazingly easy, practical home-training plan there is no need for you to quit your present job. You study in SPARE TIME ONLY and RTA's Hollywood Experts show you how to earn WELCOME EXTRA CASH, even BEFORE FINISHING YOUR TRAINING! In fact, when friends and neighbors know you are studying Radio-Television you may—like many RTA students—actually get MORE REPAIR WORK THAN YOU CAN HANDLE.

25 YEAR SUCCESS RECORD

Backed by more than 25 years of experience in the home training field, RTA's practical "learn by doing" methods assure you quick, step-by-step progress.

Begin preparing for your future in Radio-Television NOW, while the time is ripe. If you are at all mechanically inclined, and have a grammar school education, RTA can teach you how to MAKE GOOD as a Radio-Television technician.

R. T. A. GRADUATES SAY:

Thanks to R.T.A. I started my own radio store . . am making 220 percent more than when I enrolled.—W. E. Thon, Chicago.

Truly thankful for the day I enrolled for R.T.A. Course . . . it fitted me splendidly for my present position.—N. R. Hoffman, Radio Station WCOD, Harrisburg.

. . . R.T.A. sure opened my eyes to big money . . . thanks for all you have done for me.—Ernest Lancott, Cleveland.

Benefit by RTA's 25-year success record

GET FACTS! SEND FOR FREE BOOK!

telling all about RTA's streamlined home-training plan, developed by technicians in the heart of the booming Radio-Television field. Fill out the coupon TODAY and your FREE BOOK, entitled "How To Make Good In Radio-Television" will go out to you AT ONCE! No Obligation. RTA APPROVED FOR VETERANS.

APPROVED for VETERANS

RADIO TRAINING ASSOC. OF AMERICA, DEPT. RNA
5620 Hollywood Blvd., Hollywood 28, Calif.

Kindly send 30-page illustrated FREE BOOK showing how to make good in Radio and Television, through training by Hollywood experts.

NAME_____ AGE_____

ADDRESS_____

CITY_____

ZONE_____ STATE_____

Check box if VETERAN of World War II ☐

RTA TRAINING HELPS YOU BECOME *YOUR OWN BOSS*
QUICKLY — EASILY — AT LOW COST!

Included in this 32-page catalogue are radio tubes, transformers, condensers, volume controls, resistors, coils and chokes, servicing tools, shields and sockets, plugs, jacks, and terminals, packaged hardware, switches, shop equipment, test equipment, radio books, recording equipment, record changers, phonograph accessories and parts, sound systems, and radio receivers.

Copies of this catalogue may be obtained without charge from *The Radolek Co.*, 601 West Randolph Street, Chicago 6, Illinois.

TRANSMITTER FOLDER

Transmitter Equipment Mfg. Co., Inc. of New York have issued a folder covering their line of amateur transmitters which can be assembled from the company's unique "Temco Basic Chassis Unit."

Designed to eliminate the bugaboo of obsolescence, the company has designed sectionalized units and plug-in construction. From the 14 different chassis units, 16 different transmitters may be assembled.

This new idea in transmitter ownership is fully described in the booklet "Temco Series RA" which may be obtained by writing *Transmitter Equipment Mfg. Co., Inc.,* 345 Hudson Street, New York 14, New York.

RECORDING REPORT

The *Radio Manufacturers Association* has announced the publication of a new report "School Sound Recording and Playback Equipment" prepared jointly by the *RMA* and the *U.S. Office of Education.*

The new publication sets forth basic standards which school personnel may use in selecting equipment suitable to their needs. Copies are being provided to key school officials throughout the country, to manufacturers, and others interested in the development of sound recording techniques.

The three major methods of recording and reproducing sound are discussed in the report with recommendations for their proper use.

Single copies of this report are available without charge from either the Radio Section, *U.S. Office of Education,* Washington 25, D.C. or the *Radio Manufacturers Association,* 1317 F Street, N.W., Washington 4, D.C.

NEW MERCHANDISER

Insuline Corporation of America is now offering a new, deluxe, self-service merchandiser designed specifically to stimulate the sale of radio-electronic components.

The new merchandiser stands 70 inches high and is 34 inches wide. Constructed of wood and steel, the unit is smartly styled in blonde maple finish. The unit is designed to hold special *ICA* display cards upon which are mounted a variety of test tools, jacks, knobs, radio hardware, etc. Each side of the merchandiser holds 15 cards.

An eight page folder describing the new unit and giving details as to how

this merchandiser may be obtained free of charge will be sent upon request. Write *Insuline Corporation of America,* Long Island City 1, New York.

NEW TUBE MANUAL

A new edition of the *RCA* Receiving Tube Manual, RC-15, has been announced by the *Commercial Engineering Section* of the *RCA Tube Department.*

Long used in the industry, the new manual contains a great deal of essential technical data covering the field from elementary theory to descriptions of the latest receiving tube applications. This new edition is the first since 1939.

In addition to greatly expanded coverage in its regular sections, the new edition presents many new features, the result of rapid progress in electronics during the war years. These include information on new developments in FM, up-to-the-minute technical data on miniature receiving tubes, and valuable installation and application information on the latest model television broadcast receivers.

The sections on tube and circuit theory have been expanded to 55 pages. The "Circuit Section," illustrating a wide variety of electron tube applications, has been thoroughly revised. The complete "Receiving Tube Classification Chart" has been brought up-to-date. In this quick reference chart are receiving tube types classified by cathode voltage and tube function and types with similar characteristics are grouped. In addition, miniature types are also grouped in a separate listing for easy reference to these new tube groups.

The new manual sells for $.35 and may be obtained from any *RCA* tube distributor or direct from the *Commercial Engineering Section, RCA Tube Department,* Harrison, New Jersey.

RADIONIC CATALOGUE

Radionic Equipment Company of New York has prepared a 32-page catalogue supplement which is now available upon request.

Included in the catalogue are home receivers, combinations, consoles, amateur receivers and accessories, components, test equipment, transformers, television kits and parts, sound equipment, speakers, recording units, and tubes.

Copies of catalogue supplement No. 79 may be secured by writing *Radionic Equipment Company,* 170 Nassau Street, New York 7, New York.

PRINTED CIRCUIT DATA

Because of the unprecedented demand for technical information on printed electronic circuits, the National Bureau of Standards has just published the first comprehensive treatment of this subject in a booklet entitled "Printed Circuit Techniques" by Drs. Cledo Brunetti and R. W. Curtis.

The booklet consists of 10 chapters

totalling 43 pages and is illustrated with application photographs and diagrams.

This new circular, designated NBS Circular 468, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price is $.25 which sum must accompany the order in the form of cash or money order. Stamps are not acceptable.

-30-

PRINTED CIRCUIT USE

THE first commercial product utilizing the new printed electronic circuit was recently introduced to the press.

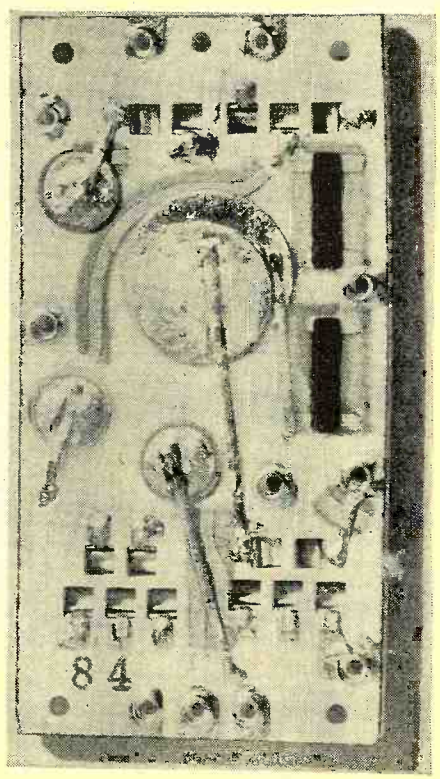
The Allen-Howe Electronics Corporation of Peabody, Massachusetts is currently in production on a hearing aid unit consisting of a miniature printed circuit three-stage amplifier. With 1 millivolt input, the circuit is said to deliver an output of 1.3 volts.

Included in the total number of standard items the circuit eliminates are 6 condensers, 7 resistors, 1 mounting panel, 3 tube sockets, 1 bracket for tube sockets, 33 pieces of wire of various lengths, and 17 sections of insulating tubing. In addition soldered joints and scores of small eyelets, washers, insulators, connectors, and flat machine screws have disappeared from the assembly.

The new hearing aid incorporates within its case a midget mercury cell "A" battery for filament heating. The new type of battery is said to furnish power at an almost flat and constant rate right to the point of battery exhaustion.

The printed circuit being incorporated in the hearing aid is a product of the Centralab Division of Globe-Union Corporation of Milwaukee. -30-

A 3-tube hearing aid amplifier circuit is printed on this ceramic base.



Sales Promotion

(*Continued from page 45*)

thing is to decide to have a policy. Here your policy will be that of promoting the fact that you know how to repair radios, and that you do an honest job. The next thing is to decide to appropriate a sum of money for that purpose. You say to yourself "I am going to spend some money advertising my business." The next thing is to find out all the different ways in which you can promote your business and how much each method costs. Then you try to figure out which method will be the best for your purpose and then you make and stick to an important resolution—to spend the necessary amount of money to accomplish your purpose.

Before we list some of the advertising devices that the radioman could use in promoting his business let us clear up one or two little items. All the rest hang on these items. One is that of the personality of a business man. His job is usually to sell something, i.e., to get people to part with money for some goods or services. People part more readily with their money if they deal with pleasant business men than with an unpleasant one. Even though you are a good workman and do an honest job, in your dealings with people be pleasant, conduct yourself so that they think of you as "the salt of the earth" type of individual and you will find it much easier *to get customers and keep them.*

The second little item is that of having a clean shop so that when people come to it to bring in or take out a job, they will have the feeling that here is a clean, efficient establishment in which they can have confidence and in which they would like to sit down and talk with you about their radio problems.

After these items are out of the way, what can be done to attract people to your business? Probably the oldest and cheapest advertising device is a sign. Put up a sign over your store and let people know who runs it and what is done there. But there are signs and signs. Use color that attracts attention and use letters than can be read from a considerable distance. Place the sign so that many people walking along the street or riding along the road will see it. Make widespread use of signs. Try to secure permission to place signs in other nearby locations so that many more people will see them than just those who see your store sign. Take a tip from, say, *Coca Cola,* or the *F. & M. Schaefer Brewing Co.* signs. These will cost only a few dollars apiece and may last for years.

Signs might be extended to announcements in the local telephone directory or in the classified columns of the local newspaper. Obviously this type of advertising is more suitable for a small town or country serviceman. In the large cities where the

serviceman does a neighborhood business both directory and newspaper advertising would be too costly because of the wasted circulation. This would not be the case in a small city or town.

Here is the cost for a small city in the State of New York. The local papers, day or evening, have a daily circulation of over 21,000. This covers the city and a lot of surrounding country. A four line ad covering name, address, phone, and type of business can be run daily for six months in both papers at a cost of 36c a day. In that same community one can place a one-inch informational ad in the phone directory with over 12,000 circulation for $8.25 a month for one year or at a cost of about 27c a day. This type of advertising has its limitations. It might be used by newcomers to a community, emergency buyers of your service, dissatisfied customers, and occasional buyers. Even so, one job a day, plus the word of mouth advertising from that job, would more than compensate for the cost.

For the radio serviceman a better method of advertising would seem to be direct advertising. This may be either by direct mail contact with prospects or by hand distribution of advertising material designed to make the necessary contact with prospects. This kind of advertising is more complicated than the above and requires that more attention be paid to it to do the job successfully. But it can be done by nearly all radio servicemen and their wives and can be extraordinarily successful in building a business of some size quickly.

Direct advertising requires the presence of three factors to make for success; one, either a definite territory marked out in which hand distribution is to take place, or use of a carefully compiled mailing list; two, something to advertise as, for example, start off with a special service offer, and follow this regularly by other offers, or advertising reminders; and three, develop the ability to write your advertising in an easy-to-read manner. Suppose you mark off an area with 3000 families or compile a mailing list of that number. You could have your offer printed on your letterhead for a few dollars. You could fold them and insert them in an envelope and either distribute by hand or by mail using 1½c stamps. The cost would be $45.00 for stamps and about $10.00 for printing and your own labor. A penny postcard suitably printed with the proper message at a cost of $35.00 could also be used. Advertising reminders in the form of monthly calendar blotters could be used at a cost of not over $60.00 by mail and something less when distributed by hand. A monthly penny postcard distribution could be used effectively. To make it interesting and sure to be read a recipe or some other important message could be printed on it below the advertising message. Various little and inexpensive advertising specialties such as pocket calendars, rulers, pencils and so on might eventually ac-

is better than 10 microvolts; selectivity for AM signals may be made either broad or sharp as desired. The AM circuit will operate from any antenna with a single lead-in wire. The FM circuit is designed for an antenna having a balanced 300 ohm transmission line. Both units are provided with phono input terminals so that they may be used with record players.

Meissner Division of *Maguire Industries, Incorporated,* 500 W. Huron St.. Chicago 10, Illinois, will supply full details on request. —30—

Thermistors

(*Continued from page* 49)

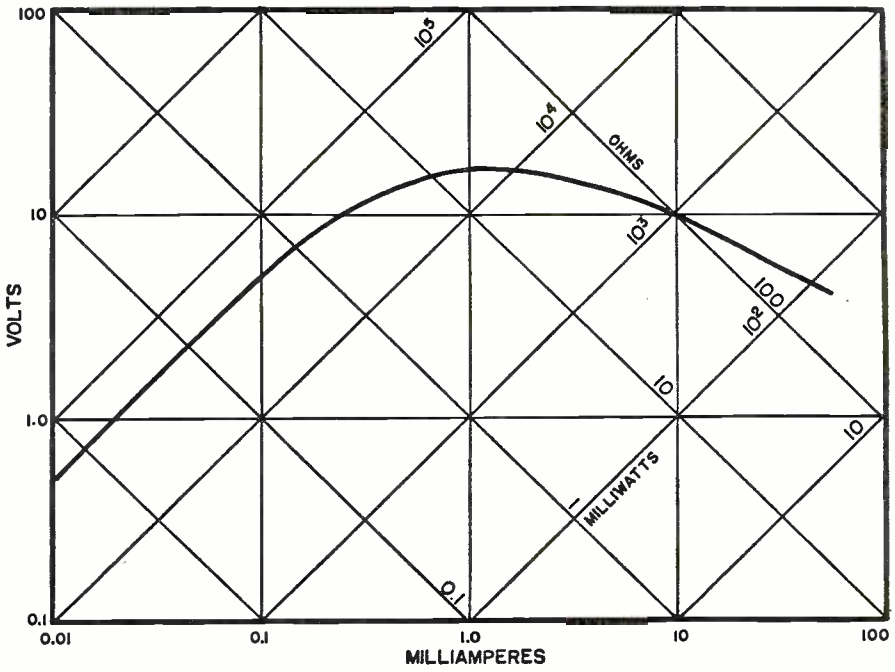
than 500,000 heating and cooling cycles have effectively demonstrated the stability of their thermal characteristics.

Basic circuit applications of Thermistors are divided into two broad categories depending on whether the element is controlled by ambient temperature or whether it is heated by the circuit with which it is associated. The first field includes uses such as temperature measurement, temperature compensation, and temperature control. A much larger number of applications is found in the second field in which the present and prospective uses for Thermistors grow out of various combinations of the voltage-current, resistance-power, and current-time characteristics. One group includes flow meters, anemometers, and vacuum gauges. Another class of application utilizes Thermistors as slow actuators for relay circuits, overload protective devices, and timing mechanisms. As power responsive, variable resistance devices, Thermistors have important uses in the measurement of small amounts of power, in automatic transmission regulating networks, and in signal and characteristic shaping networks, such as speech volume limiters, compressors, or expanders. In a related type of use they may serve as oscillation amplitude stabilizers and as voltage regulators.

In temperature measurement the Thermistor is used as a resistance thermometer. The measuring current is kept so low that it produces no appreciable heating and the Thermistor resistance is dependent solely upon the ambient temperatures. Because of their high resistance compared to other measuring devices, Thermistor elements can be located remotely from their associated circuits thus permitting great flexibility in their application. Numerous industrial and meteorological applications have been developed in which temperature indications can be transmitted automatically from remote locations to control points by wire lines or radio.

As temperature compensation devices, the negative temperature coefficients of resistance of Thermistors are

A typical W.E. Thermistor exhibits a static characteristic similar to this curve relating current, voltage, resistance, and power. Current passing through a Thermistor causes a self-heating effect which is readily shown by its static voltage-current curves. At low currents, the effective change in temperature is small and Ohm's Law is obeyed, i.e., the current is proportional to voltage and the characteristic is a straight line. With increasing current the effects of self-heating become evident and the temperature of the Thermistor rises with a resultant decrease in its resistance, thus, as the current increases, the points for the steady-value voltage deviate more and more from a straight line. At some particular current, the voltage attains a maximum value and for larger currents, the voltage actually decreases. At still greater currents, the voltage becomes of the same order as the voltage drop in the connecting leads and thereafter the voltage increases. Voltage and current range can be greatly extended by proper design. This voltage-current characteristic is of fundamental importance in the application of Thermistors to a great variety of voltage regulating networks.



used to offset the positive coefficients of resistance usually encountered in electrical circuits and components.

Temperature control by Thermistors is an obvious corollary to their use as temperature measuring and compensating devices. The principles of application are essentially the same except for the method of utilizing the changes of resistance to provide means of control. A Thermistor inserted in a simple relay circuit will automatically govern the rate of flow of a cooling medium as in regulation of air conditioning, heating, or refrigeration systems, wherein Thermistors can be made to respond to very minute changes in the surrounding element, thereby substantially reducing the size and complexity of their associated equipment, materially lowering operating costs.

Their time-current characteristics find numerous time-delay applications. The gradual lowering of resistance which results when a Thermistor is self or directly heated by the current passing through it, can be employed to delay the operation of a relay or any other electrically operated mechanical component. This same principle may also be used to prevent false operation of relays or other devices caused by transient voltages. They may be designed so that their thermal inertia, together with their high initial resistance, discriminate against high voltage surges of short duration. Closely allied to surge suppression is the application of Thermistors as overload protectors; one being inserted in the output circuit can provide the desired overload protection.

Thermistors may also be used to stabilize the output voltage in circuits in which the input voltage varies over a considerable range. The principle finds useful application in the voltage regulation of both a.c. and d.c. power supplies; it has definite advantages over conventional voltage regulator circuits using constant voltage transformers or cold cathode tubes, provides better regulation and substantially negligible distortion and is independent of the power supply frequency. Thermistors used as volume limiters in speech and other circuits utilize the same basic principles as in voltage regulation. Variations of the volume limiter also can be used for audio-frequency signal compression or expansion purposes.

The foregoing synopsis of basic control circuits affords ample evidence that the Thermistor, as a control element, is adaptable to almost every kind of industrial electronic requirement, there being little doubt that these and many other as yet unconceived uses for this "new tool" will ultimately emerge in response to industry's requirements.

Today the Thermistor is ready to play its biggest role in helping the industrial development engineer pave the way toward the electronic world of tomorrow.

—30—

New Rotary Beam

(*Continued from page 44*)

mounting made by the *Workshop Associates,* but any similar ones, homemade or otherwise, will, of course, be satisfactory. The boom for the antenna is made of 1" steeltube, as is the supporting upright, and referral to the sketch will show how 1" pipe "T's" are used to mount the boom, as well as the elements themselves, thus resulting in a strong light structure without the bother and expense of welding, etc. Everything is secured with No. 8 ½-inch metal screws, and the whole thing can easily be made and erected by one man in a single day.

Feed systems tried included 50 and 70 ohm coaxial cable, and both 75 and 300 ohm *Amphenol* line, with just about equal results. The best performance, from the standpoint of simplicity and ease, was achieved by Kilowatt *Amphenol* 75 ohm line, tapped directly onto the final tank of the author's 75 watt rig. While all the feed methods result in mismatch, it apparently has no net effect on the effective performance of the system. The given impedance of a W8JK-Beam is about twenty-three ohms, and the addition of parasitics will of course lower this, but from a practical angle, the 75 ohm line, when tuned of course, with series condensers at the rig, works beautifully.

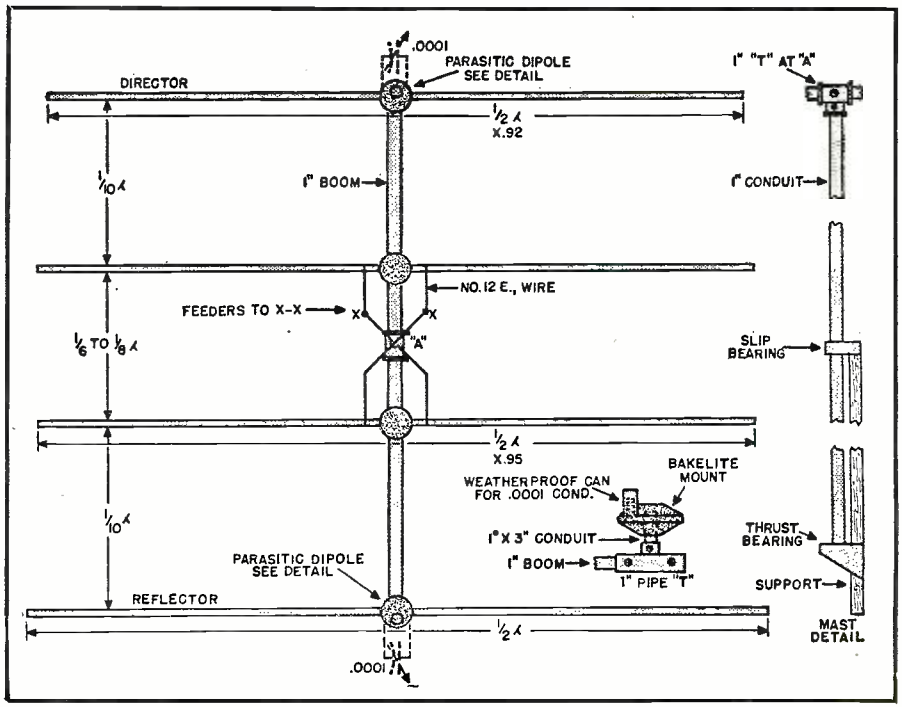
For a beam of sixteen feet elevation, with very good front-to-back ratio, with low vertical radiation, and featuring the ease of installation, manufacture, adjustment, and feed that the system offers, this new approach to antenna design will be the answer to many of the low-power (r.f. and pocketbook, both!) hams of the 10-m. gang.

Data in full on the W8JK section proper is widely available in handbooks, etc., so no detail need be given on it here. The parasitic elements, when condenser tuned, change physical length considerably from accepted formula. The best bet is to make the reflector about six inches longer than normal, and tune it to the right length with the shortening property of the condenser. The director was made about four inches longer than normal, and shortened in a similar manner.

The photograph and drawings will give an idea of the author's method of mounting and protecting the condensers, a method made ideal by the use of the *Workshop Associates* dipoles and mounts, but ingenuity and circumstance will, in most cases, dictate this. The protecting covers, incidentally, are the small ten-cent size baking powder cans! They are very light, inexpensive, easily obtained, and are ideal for the purpose. When installation is complete, they can be made waterproof by running a thin bead of solder around the juncture of lid and can.

All in all, this antenna has exhibited about the most satisfactory performance, everything considered, of any we have yet seen or used, and the author highly recommends it to anyone in search of an answer to "poor man's DX." A lean pocketbook, limited facilities and low power can all be whipped with it, as the reports from Europe, Asia, Canada, South America, etc., indicate. Given good conditions and a decent location, a reasonably clear of QRM frequency (if you find one, let me know!!) and intelligent use, it will make WAC for many of the boys in the 50-100 watt classification at a minimum of expense. —30—

Diagram shows mechanical assembly of rotary beam antenna.



What's New in Radio

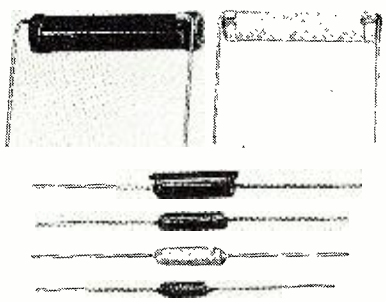
(*Continued from page 80*)

amplifier stage, an audio output stage and a b.f.o. coupled to the second detector to provide c.w. reception. A crystal filter is connected between the first detector and the first i.f. stage and a voltage regulator tube is used to regulate the plate supply to the high frequency oscillator tube.

National Company Inc., Malden, Massachusetts, will forward a catalogue sheet on this receiver to those requesting it.

R.F. PLATE CHOKES

To meet the requirements of high frequency equipment, *Ohmite Manufacturing Company* of Chicago has developed six new r.f. chokes.



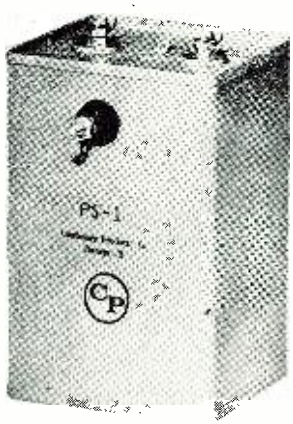
The recommended operating ranges are as follows: Stock No. Z-14, 7 to 35 mc.; Z-28, 20 to 60 mc.; Z-50, 35 to 110 mc.; Z-144, 75 to 190 mc.; Z-235, 160 to 350 mc.; and Z-460, 320 to 520 mc. The first two units are rated at 1000 ma.

These new chokes are single layer wound on low power factor steatite or molded plastic cores and are covered with a moisture-proof coating which protects the wire and holds each turn firmly in place. The units are mounted by means of their 1½" tinned copper wire leads.

This new line is described in Bulletin 133 which is available from *Ohmite Manufacturing Company*, 4954 Flournoy Street, Chicago, Illinois.

POWER SUPPLIES

Condenser Products Company of Chicago has recently introduced a new line of hermetically-sealed high voltage, low current d.c. power supplies.



The company is currently in production on the "HiVolt" PS-1 and PS-2 supplies, both of which transform 118 volts a.c., 60-cycles to 2400 volts d.c. The PS-1 is designed to charge Plasticon condensers for use in electronic photoflash and spectrographic analysis equipment. The PS-2 is intended for use in radiation counters, oscilloscopes, and television receivers.

A specification sheet covering these units may be obtained by writing *Condenser Products Company*, 1375 N. Branch Street, Chicago 22, Illinois.

AUDIO OSCILLATOR

The Model 200 audio oscillator, recently developed by *Barker & Williamson, Inc.*, consists of a modified Wien Bridge *RC* oscillator and a two-stage inverse feedback output amplifier with self-contained power supply. This

new instrument is designed for distortion or frequency measurements, or for any application where a stable, accurately calibrated source of frequencies between 30 and 30,000 cycles is required. No zero reset or line calibration is necessary with this instrument.

The unit measures 13¾"x7¼"x9½" and weighs only 12 pounds.

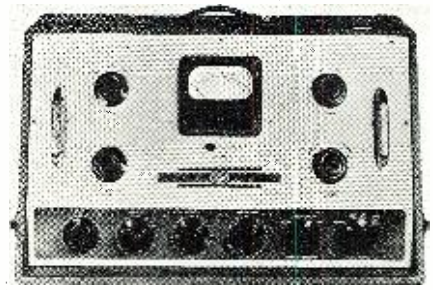
A bulletin describing this new test instrument is available from *Barker & Williamson, Inc.*, 237 Fairfield Avenue, Upper Darby, Pennsylvania.

RECORDING AMPLIFIER

The new *Presto* 90-A recording amplifier is a portable console containing all the facilities necessary for operation on remote assignments, but with an over-all performance usually found only in high fidelity studio equipment, according to the manufacturer, *Presto Recording Corporation* of New York.

The 90-A consists of three preamplifiers, mixer, master gain control, and recording amplifier. The selector switch provides a flat response, 30 to 15,000 c.p.s. ± 1 db., the NAB 33⅓ r.p.m. recording and playback characteristic complementing the NAB recording, and the present day 78 r.p.m. recording characteristic. The flat response can be modified by variable bass and treble controls giving emphasis up to 20 db. at 100 and 7500 c.p.s. or 20 db. de-emphasis at 7200 c.p.s.

A data sheet giving characteristics on the 90-A is available upon request



to *Presto Recording Corporation*, 242 West 55th Street, New York 19, N. Y.

FM-AM SIGNAL GENERATOR

The Triplett Electrical Instrument Co. has announced the availability of a new FM-AM signal generator, the Model 3433.

This new unit covers a frequency range from 100 kc. to 120 mc. in ten fundamental bands, plus an additional 50 mc. from a fixed oscillator which provides fundamental coverage to 170 mc.

Unique features of this unit include constant deviation by using fixed fre-

IMPORTANT SERVICE MEET

ALL branches of the radio industry will join in sponsoring the three-day "Town Meeting of Electronic Technicians" being held in Philadelphia, January 11, 12, and 13.

Designed to assist the radio technician, this meet is a joint undertaking of the Radio Manufacturers' Association, the Sales Managers Club, Philadelphia members of the National Electronic Distributors Association, the Electronic Parts and Equipment Manufacturers, and the Mid-Lantic Chapter, The Representatives, with the assistance and cooperation of the Federation of Radio Servicemen's Associations of Pennsylvania and the Philadelphia Radio Servicemen's Association.

Format of the meeting, which will be held in the Bellevue-Stratford Hotel, will provide radio technicians of that area with latest electronic technical information and with expert advice on various phases of small business management.

The Philadelphia program is in charge of Harry A. Ehle, chairman of the Coordinating Committee's subcommittee on the Town Meeting of Radio Technicians.

The program will open with a keynoting session on Sunday night, January 11th. All-day sessions Monday and Tuesday are calculated to give the technician the latest information on management and technical subjects designed to be most useful to him in his own shop. Extensive coverage of television and FM has been included to furnish the basic information necessary to the serviceman.

The program was developed on the basis of questionnaires circulated among technicians in the Philadelphia district.

—30—

TV CABLE SERVICE STILL FREE—A. T. & T.

THE American Telephone and Telegraph Company has called our attention to a statement appearing in the article "Networks for Television" by Jordan McQuay (November, 1947 issue) which is incorrect.

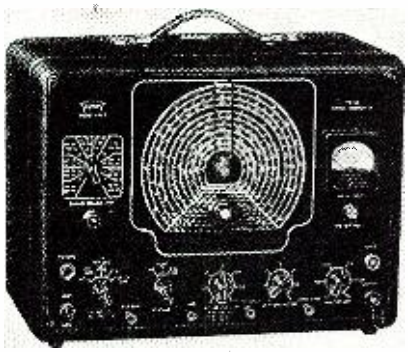
The article states, on page 41, that "Now, however, these facilities are available only on a commercial basis! Recent publications of the tariffs created a near-panic in the television industry. The charges averaged better than $40 per circuit mile of cable linking New York, Philadelphia, Baltimore, and Washington."

It was pointed out that A. T. & T. asked the Federal Communications Commission last summer for permission to withdraw tariffs previously filed covering rates for intercity television transmission, and this permission was granted. The Commission was also requested to approve withdrawal of the proposed rates without prejudice to the subsequent filing of tariffs for this service by the company.

The company stated that it was requesting withdrawal of the proposed tariffs to permit further studies of the technical problems. Present experimental television service over the New York-Washington coaxial cable, which has been given by the company without charge to the television industry, will be continued until final tariffs are filed. No definite plans have been made, as yet, for filing such tariff schedules.

—30—

quency reactance modulated oscillator; output meter for measuring relative r.f. output; double copper-plated steel shielding to minimize r.f. leakage; coaxial cable output lead; ladder attenuator; high r.f. voltage output jack; high a.f. output available; air



trimmer condenser and permeability adjusted oscillator coils; voltage regulated power supply; heterodyne detector; and external AM modulation.

Additional information on the new Model 3433 may be secured by writing *The Triplett Electrical Instrument Co.*, Bluffton, Ohio.

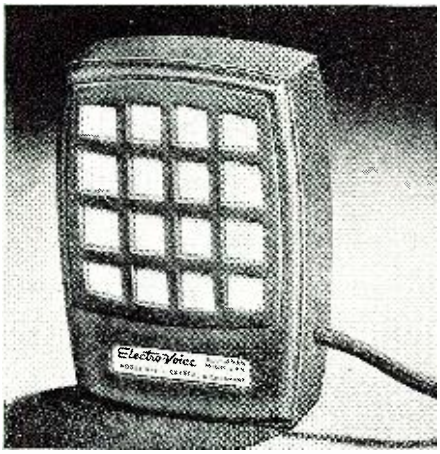
MULTI-PURPOSE MICROPHONES

Electro-Voice, Inc., of Buchanan, Michigan, has announced production on the new multi-purpose "Century" series of microphones for low-cost public address, paging, recording, and communications applications.

The line is available in a choice of crystal, dynamic, or carbon types. The microphones can be used in any position, on table or desk, mounted in the new Model 415 reclining desk stand, hand held, mounted on a floor or desk stand, overhead suspension, or dash mounted by means of a convenient hook for mobile applications.

The Century Model 915 crystal microphone has an output of —50 db. and a frequency response of 60 to 7500 c.p.s. The unit is housed in a metal case which provides ample shielding and stability.

The high impedance dynamic micro-



phone in the line has a —57 db. output and frequency response of 55 to 7500 c.p.s.

The single button carbon microphone is designed to provide speech

response (200 to 4000 c.p.s. with 48" cable) with highest articulation. The output level is 22 db. below 6 mw. for 10 dynes/cm².

Complete information on the new Century series is given in Bulletin No. 137 which will be forwarded upon request to *Electro-Voice, Inc.*, Buchanan, Michigan.

PHENOLIC TUBULARS

Climaxing four years of intensive research, *Sprague Electric Company* of North Adams, Massachusetts has just announced a complete line of phenolic-molded paper tubular condensers.

Features of this new line include high heat and moisture resistance, non-inflammable, and conservative operation rating for from —40 degrees C to + 85 degrees C.

In most instances the new molded tubulars are smaller, and in no instance, are they larger than ordinary *Sprague* paper tubular condensers of

SUPER CONSOLE MAKES BOW AT LONDON SHOW

DURING the recent Radiolympia exhibition held in London, a supersized console radio-phonograph, the "His Master's Voice" Model 1700, brought in over one hundred orders during the ten days the show was open.

The instrument is a 43-tube type, all-world radio receiver and record player housed in three large consoles and incorporating a remote control pedestal. One console houses the radio receiver and time switching apparatus, a second console contains the loudspeaker assembly, power units, and l.f. power amplifier, while the third cabinet houses the record playing mechanism, pickup amplifier, and storage space for records. In addition, a remote control pedestal, finished in polished walnut to match the console, can be situated some distance away, and the instrument operated thereby.

The radio unit provides reception from 10-2000 meters. A separate FM receiver covers the FM band from 90-94 mc. All the controls (with the exception of a few that are preset and require very infrequent adjustment) are mounted on the control panel under the lid or on the front. Some of these are duplicated on the remote control pedestal. The 12 waveband radio receiver has three i.f. stages, and signal frequency amplification on all ranges.

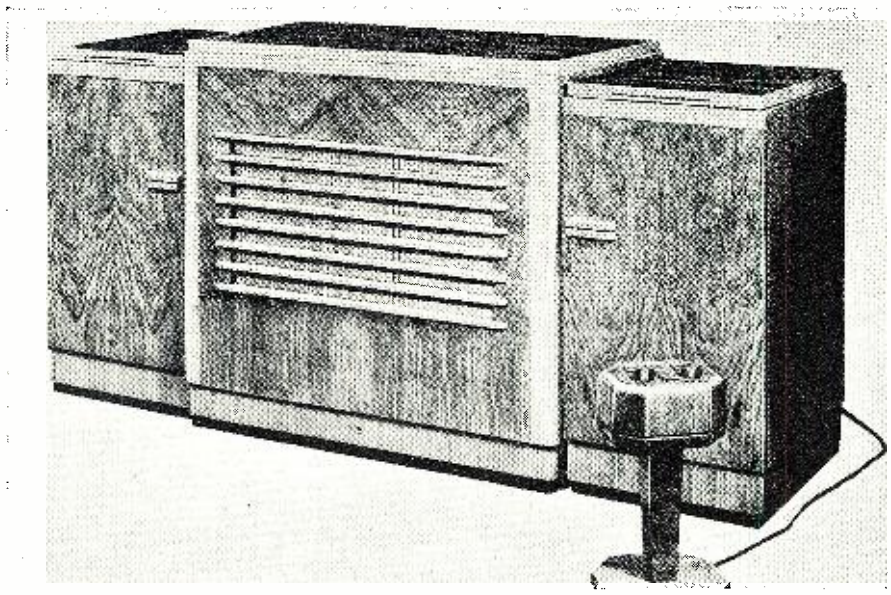
The center console houses four loudspeakers, the l.f. power amplifier, and the power supply units. The loudspeakers consist of two large and one medium high flux permanent magnet elliptical types, and one high frequency ribbon-driven horn speaker. A frequency dividing network distributes the appropriate frequencies to the speakers concerned and the over-all response of the system is remarkably linear over the audio frequency range. The output stage consists of four KT66 tubes operating as triodes in parallel push-pull giving a peak output of 50 watts. The other chassis housed in this console is the power supply unit containing three U52 rectifiers and appropriate smoothing circuits.

The record playing mechanism and pickup amplifier are housed in the third cabinet, the lower part of which may be used to store records. The record changer is of new design and handles ten 10" or 12" records intermixed. Records may be rejected or repeated as desired. A lightweight cantilever pickup with permanent sapphire needle provides wide frequency response and is completely free from resonances over the whole audio range, according to the manufacturer.

The remote control pedestal, which is connected by a length of cable to the radio unit, is put into operation by the local/remote switch. Remote operation of the radio and phonograph unit is then possible.

This unit is being retailed at 550 guineas. The guinea is worth about $4.20 in U.S. currency at the present rate of exchange. —30—

British-made "His Master's Voice" Model 1700 FM-AM-SW radio-phonograph combination.



equal rating. Their unique phenolic sealed construction assures maximum dependability under extremes of heat, humidity, and physical stress, according to the company.

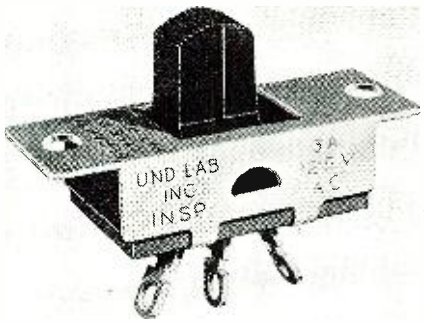
Available types include all popular capacities in 200, 400, 600, 1000, and 1600 volt types.

Sprague Engineering Bulletin 210 contains complete information on this new line. A copy of the bulletin may be secured from *Sprague Electric Company,* North Adams, Massachusetts.

SNAP ACTION SLIDE SWITCH

A new, Underwriters' Approved snap action slide switch has recently been introduced to the trade by *Elpar Company* of Camden, New Jersey.

Known as the Type RE, the new switch is rated at 3 amps, 125 volts a.c. Both s.p.s.t. and s.p.d.t. action is available. The unit is self-actuating beyond the center of the throw and is especially suited for mechanical op-



eration. The effective throw is .140" and the maximum travel is .160".

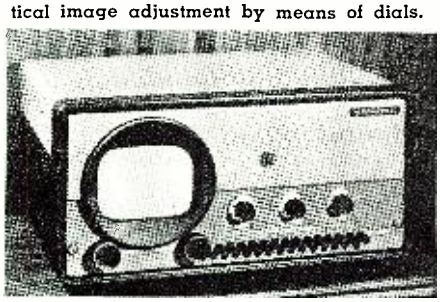
Over-all dimensions of the switch are 1.375" long, .550" wide, and .700" deep, excluding the knob. The two mounting holes are .136" in diameter with mounting centers 1.125".

A shield and insulating cover provide for terminal protection and efficient grounding.

Full details on these switches may be obtained by writing *Elpar Company,* Bank and Marlton Avenues, Camden, New Jersey.

—30—

Hallicrafters' new table model television receiver which has been designed to sell in the low-priced class. The new unit uses 22 tubes and provides 13 channel push-button selectivity. The receiver housed in a metal cabinet, finished in gray and silver, was designed by Raymond Loewy. It is equipped to accommodate a detachable lens accessory to bring larger images. This self-contained TV receiver features a 23 sq. in. image, push-button for fine tuning, simplified volume control, horizontal and vertical image adjustment by means of dials.



Noise Suppressor

(*Continued from page* 48)

Dynamic Noise Suppressors. In systems with extended low frequency response, the tendency toward oscillation as a result of acoustic coupling between the elements is greatly minimized by the dynamic action of the inductive reactance tube. In equipment where the design of the output amplifier stages and degenerative feedback circuits are not optimum for the speaker being used, the noise suppressor will reduce transient hangover effects at low frequencies. It is also true that the effects of harmonic and intermodulation distortion are actually reduced by the high frequency gate action. This is partially true because the high frequency range in which intermodulation products are likely to appear is attenuated a considerable portion of the time. Of equal importance is the fact that the tolerance of human hearing for distortion is much greater during high level passages than during quiet intervals in the music. The high frequency gates are rarely driven fully open except during fairly loud passages where the total tonal pattern is so complex that the ear is rarely able to resolve distortion components unless they are of considerable magnitude. This does not mean that it is desirable to take advantage of this effect in the design of really high quality equipment, but it does mean that radio-phonographs designed for manufacture in price ranges where economic compromises are necessary may be improved by the application of these principles.

It is extremely difficult to evaluate the noise reduction obtained with these circuits in terms that will be applicable to all conditions. In the first place, the amount of noise reduction effected by any attenuating circuit will depend upon the hearing ability of the individual listeners and their tolerance for noise of various kinds. Obviously a person with a high frequency hearing loss will not notice as much improvement, either in the noise reduction or in the extended frequency range made possible by the dynamic action. It is also true that some people have auditory peaks in ranges where noise exists, and they will observe the improvement as being especially effective. Psychological factors are also involved. Some individuals find noise more irritating than others. A curious effect is obtained with many engineers and other persons who have conditioned themselves to observing noise as a necessary associate of wide range reproduction. Often this conviction is so strong that they automatically reject the effectively noise-free reproduction obtainable with the Dynamic Noise Suppressor as being too limited in range. Only after listening carefully with the suppressor abruptly switched in and out of the circuits are they able to accept the evidence of their own ears. Another interesting effect, which is a minor limitation on the method, is the fact that the circuits will effectively reject the sound produced by scraping on gourds with a wire brush during some Latin American rumbas as being noise and therefore will not reproduce it.

It should be remembered that the Dynamic Noise Suppressor is limited to some degree by the surfaces available and the condition of the records. It is not possible with this, or with any other device, to produce sounds in the 10 kc. range unless they are engraved on the record. Neither is it possible to retain all of the frequencies available on the record and to reject all of the noise completely if the record has been used as an ashtray. It is possible to produce a maximum of wide range music with a minimum of noise from any one particular record, and the over-all improvement in most instances is almost miraculous.

These circuits are now out of the experimental laboratory stages and have proved their value in widespread application, both in home radio-phonograph equipment and in many AM and FM broadcast stations.

—30—

International Short-Wave

(*Continued from page* 134)

Zealand with news at 1445, closing down at 1500. (Milne)

Siam — HS8PD, 5.994, may vary, Bangkok, is heard in Australia at 0615 with news. (Sanderson)

South Africa—Call-sign of the new South African Air Force station is ZRB, *not* ZBB as previously reported; has been having trouble with transmitter but will probably be on the air by this time, operating on the hour with weather report and other data; frequency is 7.445, location is Waterkloof, District Pretoria, South Africa. (Laubscher)

Johannesburg, 9.523, is heard to 1040 on West Coast; weak but should be improving. (Balbi) The 9.870 outlet is also heard on West Coast around 0900-1110 during *English* period. (Dilg)

Capetown's 5.877 outlet has not been heard lately in the 2345-0130 period; may have moved. (Balbi)

Spain—Madrid, 9.368 (drifting lately as high as 9.39), begins late transmission now at 1845. (Beck) Still has news daily at 1500.

Sweden—SBP, 11.705, Stockholm, is heard in Ohio at 0140-0205. (Sutton)

Switzerland—HER7, 17.784, HER6, 15.305, heard on West Coast Fridays at 0100-0200 or later; HER5, 11.865, HE14, 11.715, heard 0200-0330, Mon., Tues., Wed., Fri., to Australia and New Zealand; HER6, 15.305, HER5, 11.865, heard 0900-1010 on Saturdays to Africa and the Orient. (Balbi)

Syria—Damascus is reported by NNRC as operating on 11.995 at 1230-1600; may be harmonic of the channel of approximately 6 megacycles.

Tahiti—NNRC reports FO8AA, 6.980, around 2330 until after 0030. Reported by Balbi, California, on Saturdays as late as 0025. (URDXC) Probably runs 2230-0030 on Tue.-Wed. and Fri.-Sat.

Tangier Zone—*Radio Internationale*, 6.200 (listed 6.199), has been heard in Britain with *English* at 1500 on Sunday; does not have *English* at that time every day. (Pearce) Heard in New York fairly well at 1600-1700 in Spanish and French. (Legge)

Turkey—TAP, 9.465, is being heard in Rhode Island late afternoons to 1645 sign-off; on Monday and Thursday has *English* (beamed to Britain) at 1630; usually is QRM'd by CW. (Pelland) The Sunday *Postbag* period on this channel is now at 1630, Turkey having returned to standard time. Daily news bulletin is now at 1245. (Pearce)

U. S. A.—For the benefit of readers overseas, here is a list of times of *English* newscasts from U. S. short-wave outlets:

0430—KNBA, 6.060, KCBR, 9.750; 0530, KGEX, 11.730, KNBI, 11.790, KNBX, 15.250, KRHO (Honolulu), 9.650, and Manila, 11.840; 0800, 0900, 1000, KNBA, 6,060, KGEX, 11.730, KNBX, 15.250, KRHO (Honolulu), 9.650, KCBR, 9.750, KNBI, 11.790, KWID, 9.570, and Manila, 11.840; 1100, WRCA, 15.150, WBOS, 15.210; 1200 and 1300, WGEX, 17.880, WNRA, 21.730; 1745, WRUS, 9.570; WRUA, 11.790, WGEO, 15.330, WGEA, 11.770, WNRE, 15.280, WNBI, 17.780; 2000, WRUS, 6.040, WCBN, 9.650, WLWO, 11.790, WBOS, 15.210, WLWK, 17.800, WRUW, 9.570, WRUL, 11.725, WCDA, 11.830, WRUA, 15.290; 2100, WRUS, 6.040. WCBN, 9.650; 2155, WLWO, 11.790, WBOS, 15.210, WLWK, 17.800, WCDA, 11.830, WRUA, 15.290. AFRS news is scheduled for 2215, KWIX, 9.570, KCBF, 11.810; 2300, 0000, KCBA, 15.150; 0100, KGEI, 9.530, KWIX, 9.570; 0200, KGEX, 11.730, KCBF, 11.810; 0205, KWID, 11.900; KCBA, 15.150; 0300, KNBX, 15.330; 0400, KGEI, 9.530, KCBF, 9.700; 0500, KWIX, 11.890, KWID, 11.900; 0600, KCBA, 15.330; 0700, KGEI, 9.530, KCBF, 9.700; 0800 and 0845, KWIX, 11.890, KCBF, 15.330; 1530, WNRA, 11.830, WBOS, 15.210, WRCA, 15.150, and WGEX, 17.880. (Legge)

U.S.S.R.—Although not announced, Sverdlovsk, 15.27, is being used to North America now, 1820-1950; has QRM from New York. (Beck)

Official schedules to North America daily are 0745-0815, 17.77, 15.17, 11.72, 9.65 with 11.88 and 11.75 especially for Pacific Coast; 1820-1930, 15.17, 11.72, 9.78, 9.5, and 15.23 and 11.88 especially for Pacific Coast; 1930-1950, 15.17, 11.72, 9.78, 9.5, 5.95. (Russian Embassy)

Moscow radiated in *English* for Europe at 0730 on 15.44, 11.63; at 1130 on 15.44, 11.63, 9.71; at 1330 and 1500, on 11.63, 9.71, 7.200, and 6.020. (Pearce) Most of these are heard well in the Eastern U. S.

The 9.565 outlet is being heard in

Massachusetts at 0745 with news. (Harris)

Tashkent, Usbek S. S. R., 6.825, is heard in Sweden with an *English* program at 1200-1230 on Sundays. (Holmberg) May be other days too.

Moscow beams to Latin America, 2000-2230, on 15.44, 15.17, 11.72 (Kiev), 11.63 (Leningrad), 11.83; also announces 30 and 31 meter outlets. (Beck)

Moscow's Home Service is being transmitted from 2000 on 9.72; 6.02 (Kiev), from 2300. (Beck) Frequencies most regularly heard on West Coast in Home Service after 2200 to as late as 0600, also some from 0800 on, include 15.17, 15.27, 15.34, 15.36, 15.39, 15.44, 11.72, 11.74, 11.87, 11.89; 11.88 is now used with 11.75 to Far East from 0200 or 0300 to 1000; Petropavlosk, 6.07, is heard 0145-0245 except Sunday, when schedule is irregular, usually heard from 0100. (Balbi)

Moscow is heard in Massachusetts on 7.360 and 11.630 at 1430-1500. (Simonian)

Vatican—HVJ, 15.095, 9.66, still broadcasts the news at 0900, and on 9.66 and 5.971 at 1315; for a while appeared to use 5.890 but more recently is back on 5.971. (Pearce) The morning news may soon be heard at 1000 instead of 0900 as is usually the winter schedule. Pearce, England, reports HVJ on 6.190 at 1400 with broadcast in Italian. The 15.095 channel is heard on West Coast Monday, Tuesday, at 1000-1015; on Mon. and Fridays, 0200-0215. (Balbi)

Venezuela—YV3RS, 4.990, *Radiodifusora Occidental,* Barquisimeto, ex-3.490, is now heard here; YV3RN, 4.940, *Radio Barquisimeto,* ex-4.990, is on this frequency now; YV3RM, 4.860, is a new Barquisimeto outlet, evenings. (Legge)

Yugoslavia—Belgrade, 9.418, is heard in Australia at 1615. (Sanderson). The 6.100 outlet is heard in New Zealand with news at 1530. (Milne)

* * *

Last Minute Tips

According to the *Daily Telegraph,* England, Pakistan, which was left by the partition of India with only three broadcasting stations, Peshawar, Lahore, and Dacca (all medium-wave), has decided to buy additional transmitters to give a coverage equal to that of the six stations in India. They will be bought in England if Britain can deliver them within six months. A technical expert in Britain, Riaz Ahmed, has already been in contact with the chief transmitter manufacturers and the BBC. Habib Rahimtoola, the High Commissioner, and G. A. Ahmed, the Trade Commissioner, have visited Radiolympia and also have contacted the appropriate firms. The provisional plan involves constructon of a 100-kw. station, possibly at Karachi, the equivalent of the big short-wave station of AIR at Delhi. Two 20-kw. and two 10-kw. stations are also required. At a rough estimate, this contract would approximate 200,000 pounds. At present, Pakistan's only telegraphic contacts with Europe are by means of lines that pass through—or transmitters in—Hindustan territory. (Brownless)

Official schedules from *Radio Tabriz,* Iran, are 0500-0700 on 11.960, news at 0630; and 0930-1300 on 6.090; on Fridays the first transmission runs 0130-0620, on 11.960. (Nankervis)

Late tips from Mervyn Laubscher, our South African monitor, include Salisbury, Southern Rhodesia, 6.12, 0430-0615 weekdays, 0330-0615 Sundays, news at 0430 (Sundays at 0330), BBC news at 0600; 3.700, 1100-1500 weekdays, 1300-1500 on Sundays, has BBC news at 1100 (except Sundays) and at 1300, 1315 (except Sundays). Bulawayo, 3.800, has a schedule similar to that of Salisbury. ZNB, 5.900, Mafeking, Bechuanaland, is scheduled 0600-0700 and 1200-1430 on weekdays, at 1300-1430 on Sundays; has SABC news at 0615 (except Sundays) and daily at 1200. CR7AB, 4.390, Lourenco Marques, is scheduled weekdays at 1100-1700, Sundays at 1000-1700, all music and sponsored programs; CR7BV, 4.90, same as CR7AB, no news; a frequency of about 9.715 appears in use on Sundays at 0200-0700. Lourenco Marques continues to change frequencies and schedules often; latest frequency is about 4.8 or slightly higher; 9.645 is strong, while a very weak parallel station is noted on about 9.655; schedule of these seems to be 0000-0100, 0430-0630, 1100-1500.

Horst Miers, Berlin, reports *Radio Stuttgart,* 6.190 (listed 6.179), testing Sunday afternoons; asked for reports to Radio Muenchen, ABT Technik (13b), Muenchen, Rundunkplatz 1, Germany. Hakansson, Sweden, reports this station at 0830-1100 when is buried by Oslo. Is probably *Radio Munchen,* Munich, listed on 6.190, and likely is relaying Stuttfart.

W. L. Harrison, chef engineer, National Broadcasting Service, Wellington, New Zealand, informs me "owing to the shortage of staff and material generally, the installation of our equipment has received several setbacks, and we are not yet ready to commence the Overseas Service." Watch for the new transmitters from this country, probably testing on 9.54 and 11.78 soon, around 0400-0500.

The Free Indonesian Radio, 11.001, Djokjakarta, Java, recently announced that the present 2-kw. transmitter would be increased to 100 kw. soon. (Anderson)

The Finnish Ronne Expedition, location given as the Margaret Bay area of the Antarctic, calls assigned are KQL, KICJ, and AYZH; frequencies available are 9.135, 12.862.5, 11.340, 17.310, 22.225, 22.250; these are crystal controlled; also may use about 16.210, and a 10-meter "ham" frequency on oscillator. (Arthur)

VS4S, 7.237, Jesselton, British North Borneo, 1 kw., is listed as operating on this frequnecy. (Legge) *Has any one heard this one?*

A station heard in Britain on 12.000

announcing "Huna Damash," good level afternoons but with bad CWQRM, is believed to be Damascus, Syria; usually has all-native programs although on occasion does play western recordings; closes at 1500 with a military march, after a short news bulletin in Arabic; generally gives a talk or news in Arabic at 1335-1350, prefaced and ended by a short piece of band music. (Pearce)

The BBC is using GSS, 26.550, in parallel with GSK, 26.100, at 0600-0900; strong signal on both. (Howe)

A station heard irregularly around 1700-1745 on 5.942 is believed to be OXI, Godthaab, Greenland; broadcast is in Danish. (Legge)

WFI-2, about 7.350, Virgin Islands, has been heard at 2050-2100 calling Southampton, New York, for frequency check; good level. (Pelland)

At last report, CR8AA, 9.254, *Macao Radio Club,* was off the air. (Pearce)

An Indonesian station operating on about 11.25 has news at 0700. (Sanderson, Milne)

XGOY, Chungking, was heard at 0525-0615 recently on 6.154. (Carter) May have been a test. This approximate frequency was used last winter.

ETAA, 15.070, varying, Addis Ababa, was recently heard in Ohio at 0300-0400 with western recordings. (Sutton) Not heard lately in Britain. (Brownless)

Pearce, England, reports a new station on approximately 6.240, heard from 1500 to 1600 some days, other days around 1400-1500; announcements by woman in what appears to be Nordic languages; plays all recordings, many of them *English,* but no *English* announcement is given; no anthem played at closedown. Has QRM from Russia. *Can anyone identify?*

Radio Omdurman, 13.320, Anglo-Egyptian Sudan, is heard in Ohio on Fridays at 1230-1300 with *English* program. (Sutton)

A Danish monitor, Thomas Langsig, reports HVJ, 15.095 and 9.66, with news at 0900 now. He also reports Belgrade, 9.503, heard at 0800; says Luxembourg is still testing on 15.350, 6.090, 9.527, and wants reports; latter confirmed by Yelitza Theodor, Rumania.

EPB, 15.100, Teheran, is being heard in Chicago at 0715 with news. (Hofert) Still good in East at that time, signs off 0730.

ZQP, 9.710, Lusaka, Northern Rhodesia, signs on at 1000; on Tuesdays has *English;* also is on 7.22, 3.914 but these are not heard in Australia, according to George Major, Manjimup, Western Australia.

The woman announcer at XNCR gives frequency as 7.500, gives XGNC as 6.570, and XGHT as 6.096; however, these Communist-controlled Chinese stations, vary greatly from announced frequencies, and from day to day; news now ends around 0755; XGHT leaves the air at 0900, others at 0930 lately; signature appears to be "La Paloma." (Dilg)

The BBC's New York office listed to

Tommy Kneitel, New York City, these five stations located at Royal Observatory (Greenwich), Abinger Magnetic Station, near Dorkin, Surrey, England: GKU4, 4.025; GKU2, 17.685, GYB8, 19.080; time tick services from 1255-1300 on GIC, 8.640, and GKU3, 12.45. It was also explained that BBC call letters are not used at the microphone but that announcers are instructed to specify frequencies either in megacycles per second in the appropriate meter band, or by reference to the meter band only.

Official QRA of "Voice of America in Manila" is The Department of State, Office of International Information and Culture Affairs, International Broadcasting Division, c/o The American Embassy, Manila, Philippine Islands. (Radio Australia)

VP4RD, *Radio Trinidad*, 9.645 (listed 9.625), Port-of-Spain, Trinidad, has been heard in England at 1700-1800. (Brownless) A Port-of-Spain station on 14.975 has been heard at 1415 contacting VRR4, Kingston, Jamaica. (Legge via NNRC)

KZRH, 9.64, Manila, is reported to recently have been heard announcing the call-sign of its alternate transmitter, KZMB. (Radio Australia).

Acknowledgement

Many thanks for all the FB reports received during 1947. Keep up the good work by sending your reports to Kenneth R. Boord, 948 Stewartstown Road, Morgantown, West Virginia, U.S.A.—K.R.B.

-30-

Recording of Sound
(*Continued from page* 56)

circuit, any signal developed by the tube will also appear across the resistance. This signal voltage is opposite in phase and in series with the voltage impressed on the grid and cathode of the tube. Degeneration takes place and the amplification of the tube is reduced. In this application the plate loading resistor, R_{17}, is made small and the cathode resistor, R_{14}, large so that a greater part of the voltage developed by the tube appears in the cathode circuit.

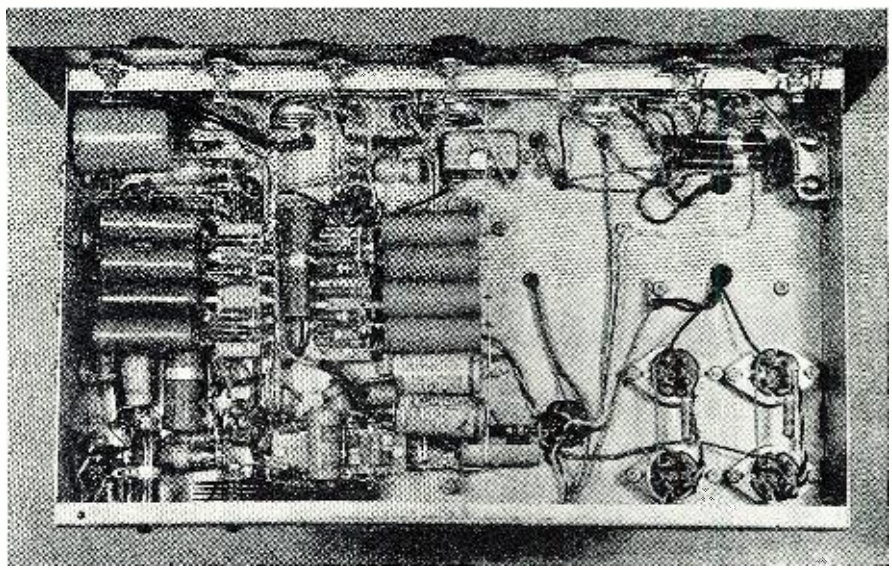
Since the circuit is resistive, there is little or no frequency discrimination at audio frequencies and all frequencies are degenerated in an equal amount. If the cathode resistance is shunted with an inductance of proper value, the resistance at low frequencies is practically shorted out due to the low impedance of the choke at low frequencies. Therefore, degeneration of the low frequencies is eliminated and the greater part of the signal developed by the tube appears across the resistor, R_{17}. The result is an increase in the low frequency response of the circuit.

On the other hand, if a condenser of proper value is shunted across the cathode resistor, the low impedance of the condenser at high frequencies reduces the impedance of the circuit. Degeneration of the higher frequencies is accordingly reduced and the high frequency response of the circuit is increased.

Attenuation of the low frequencies can be accomplished by shunting the grid circuit of the following stage with a choke or inductance. The value of the choke, CH_1, used in the bass boost circuit, also has the correct value for an attenuation circuit. The high frequencies can be attenuated by shunting the same grid circuit with a suitable condenser.

The function of control, R_{28}, is to introduce the choke, CH_1, into either the cathode circuit for bass boost or into the grid circuit for bass decrease. Control, R_{29}, applies condenser C_{21} to the cathode circuit for treble increase or C_{20} to the grid circuit for treble decrease. The controls are coupled to the cathode through condenser C_9 and to the following grid by a shielded lead. Shielding of the choke is ex-

Fig. 5. Bottom view of amplifier showing proper location of all components. The tone control choke is mounted in the upper left hand corner of chassis.



NEW YEAR SPEC ALS.

BC348 Receivers. 200-500, 1500-18,000 KC. Complete with 28 volt dynamotor & tubes. N-1 $64.95; N-2 $59.95; N-3 $54.95; U-1 $44.95; U-2 $39.95. Add $20.00 for conversion to 115 volts A.C.

BC224 Receivers. 200-500, 1500-18,000 KC. Complete with 14 volt dynamotor & tubes. N-1 $64.95; N-2 $54.95; U-1 $44.95; U-2 $39.95. Add $20.00 for conversion to 115 volts A.C.

115 V. A.C. ¼ hp. motor with 250v 600 MA amplidyne generator N-2 $18.75.
200FD Johnson var. cond. dual N-2 $1.19.

BC-1206C Setchell Carlson Beacon Receiver 28 volts D.C. 195-420 KC. 5 tubes. N-1 $4.95.

BC474 with tubes. N-1 $37.50 with manual; N-2 $32.50; U-1 $27.50; U-2 $22.50; U-3 $15.00.

BC342 Receiver. 1,500-18,000 KC 115 V. A. C. U-1 $59.95; U-3 $44.95.
BC312 Receiver. 1,500-18,000 KC U-2 $44.95.
BC654A Xmtr-Recv. tubes, xtal N-1 $19.95.
BC344 Receiver 150-1500 KC 115 volts A.C. U-2 $44.95.
BC357J Beacon Receiver. 75 MC. tubes N-1 $3.45.
BC645A Trans.-Rec. tubes 470 MC. N-1 $16.45.
TCS9 1500-12,000 KC trans-rec. tubes. 115 volts A.C. power supply U-1 $129.00.

GENERAL ELECTRIC 6RB6B17 Tungar Battery Charger. 12 battery, 12 amp.; 24 battery 6 amp. N-1 $67.50.

GIBSON GIRL SCR578B transmitter for sending distress signals from boats. Transmitter complete with balloon, hydrogen generator, kite and instruction manuals. N-2 $29.95.

Famous 16 mm G.S.A.P. camera with 1⅝" f 3.5 lens, speed 16-32-64 frames per second, 24 volts D.C. Standard 50 ft. magazines. $25.00 N-1 Postpaid.

EE-8 Telephone field sets with handset and ringer N-1 $15.00 ea. $28.00 pr; U-2 $10.00 ea.; $18.00 pr; U-3 $7.50 ea.; $13.00 pr.

SCOOP

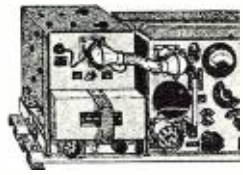
SCR522, two meter transmitter-receiver with tubes. N-1 $24.95; N-2 $17.95; U-1 $12.95; U-2 $9.95.
Sound Powered chest set N-1 $3.95 ea. $7.50 pr.
Sound Powered handset N-1 $14.00 ea. $25.00 pr.
Trimm Commercial 17,000 ohm headset N-1 $4.25.
HS-23 8,000 ohm headset N-1 $1.29; U-1 89c.
HS-33 600 ohm headset N-1 $1.29.
Extension cords. PL55 plug incl. U-1 $0.40.
HS-30 Ear plug headset N-1 $0.95; U-1 $0.50.
Matching transformer, HS-30 $0.50.
HS-23U Handsets N-1 $3.45.
TS-13 Handsets U-1 $2.50.

RG-8U Coax. cable 50 ft. min. (52 ohm) .06 per foot.
RG-8U Coax. 51 ft. with connectors N-1 $2.95.
BC375E Tuning units (TU) with case N-1 $3.50.
BC375E Tuning units (TU) without case N-1 $2.50.
CD501A Cable for connecting PE103A to BC654A N-1 $1.95.
PE103A 6-12 volt dynamotor for BC654A. N-1 $8.75.
PE104A 6-12 volt vibrapack for BC654A. N-1 $5.95; U-1 $4.95.

1 amp. Variac N-3 ..... $ 7.95
80VA Sola constant voltage xmtr. 115V. A.C. 60cy-U-1 ..... 13.50
Transformer 600-0-600 @ 300 MA 17V @ 1 Amp. N-1 ..... 5.95
Transformer 600-0-660 @ 350 MA 6.3 V @ 2.7A; 2.5V @ 1.75A; 5V @ 4A 115V AC input Sealed. N-1 ..... 9.95
Antenna. Solid steel, 4 meter ½ wave Voltage feed with ¼ wave matching section on bottom in alum. case. N1 ..... 3.50
Signal Box Kite Postpaid 2.50

LAST MINUTE SPECIALS

5BP1 Cathode Ray Tube N-1 ..... $1.15
5BP4 Cathode Ray Tube N-1 ..... 2.50
3AP1 Cathode Ray Tube N-1 ..... 2.25



SCOOP: The famous B-19, Mark II, [illegible] transmitter-receiver with tubes, dynamotor power supply, instruction manual, 12 ft. antenna & base, V.H.F. antenna and base, dummy antenna, mounts, 1 headset, microphone, key, junction boxes and interconnecting cables. N-1 $29.95.

B-19 Mark II complete tank installation with all spares. Packed for export. Instruction manual, etc. N-1 $44.95.

Headset & Microphone used with Mark II, N-1 Postpd. $1.95.

TUBES

12A6	$0.50	316	.90
4E27	6.00	9002	.75
829	2.75	717A	.69
815	1.95	1A5	.50
811	2.50	1L4	.90
75TL	2.50	6A6	.75
VT127A	3.00	6AK5	.80
872A	1.75	6AJ5	.50
211	1.00	6AG5	.90
2C34	1.00	6F7	1.00
3B24	1.25	6K7	.60
1625	.70	12SK7	.75
1626	.70	12K8	.90
304TL	2.50	10Y	1.00
957	.70	VT225	1.50
954	.70	726	4.95
2X2	.75	E1148	.95
EF50	.90	1629	.70

So that we may serve you better and avoid misunderstandings, we have adopted the following code for equipment condition. If possible, specify a second choice. Californians include 2½% State sales tax.

TERMS: F.O.B. Pasadena unless postpaid. No C.O.D.'s under $5.00. 25% deposit on ALL orders. All C.O.D.'s shipped by Rail Express. Save freight and C.O.D. fees by sending full price with order and we will ship by fast truck. Minimum order $2.00.

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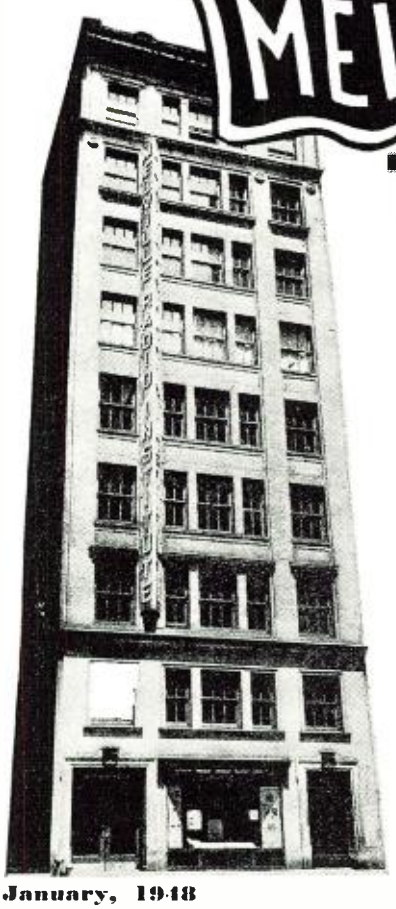
N-1 New, in original boxes.
N-2 New, repacked.
N-3 New, removed from new equipment.
U-1 Used, excellent condition.
U-2 Used, minor scratches and dents.
U-3 Used, rough handled, good working condition.



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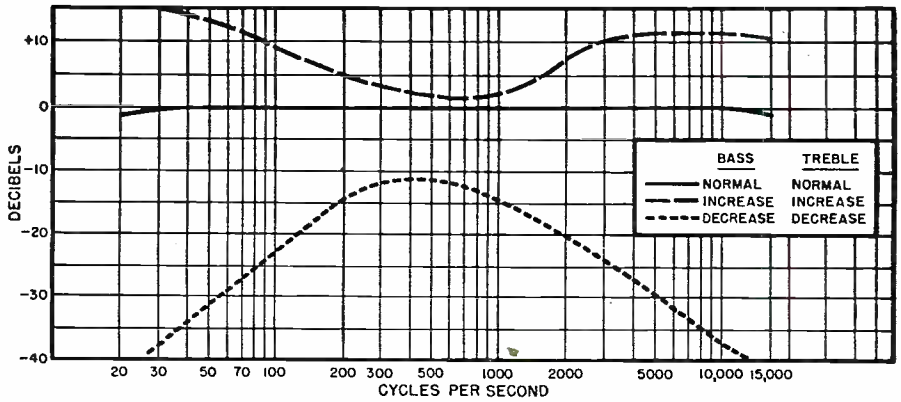
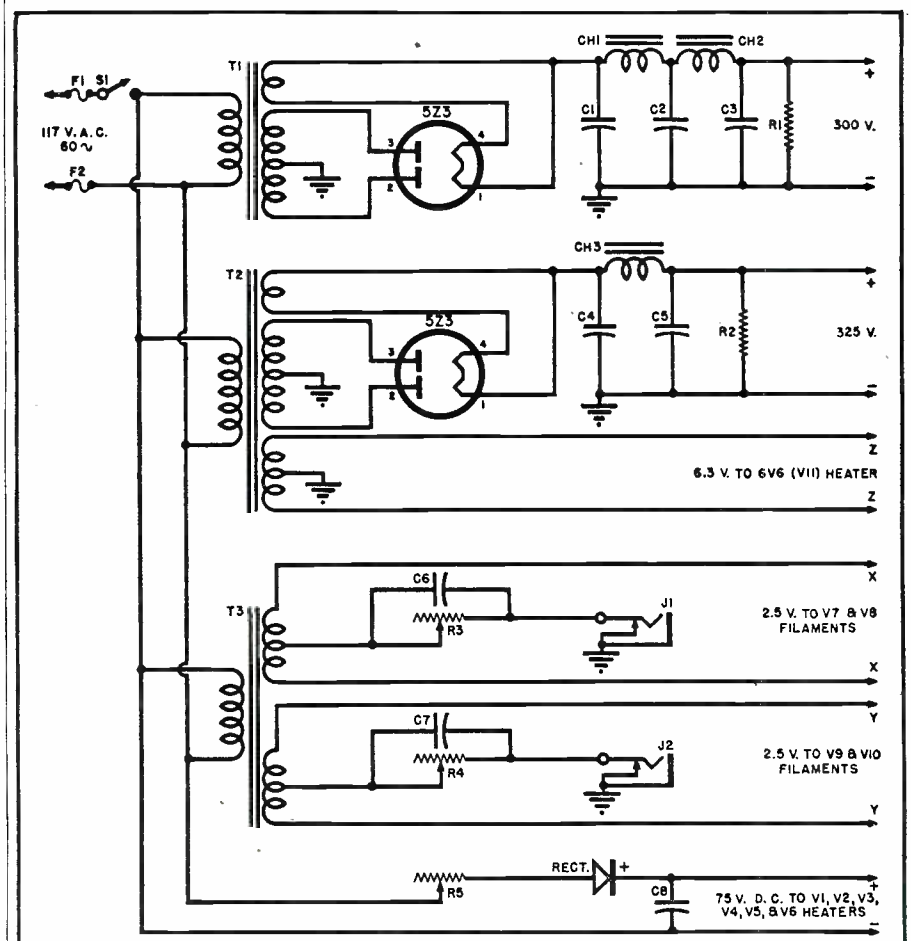


Fig. 6. Audio response curves for various combinations of bass-treble control settings.

tremely important. It must be oriented physically on the chassis for lowest possible hum pickup. In the amplifier described, the best location was found to be under the chassis directly below the tone controls. Shielding must run all the way to the bottom of the choke.

The low frequency control will boost 12 db. at 60 cycles (in the maximum boost position) or attenuate 28 db. in the cut-off position. The high frequency control will boost 12 db. at 10,000 cycles in the maximum boost position or attenuate 35 db. in the maximum cut-off position. This range permits complete tonal balance of the system for all audio applications.

Fig. 7. Schematic diagram of the power supplies. Outputs are fed to amplifier through heavy cable. Plate current may be measured at jacks, J_1 and J_2.



R_1—30,000 ohm, 50 w. res.
R_2—50,000 ohm, 50 w. res.
R_3, R_4—500 ohm, 20 w. pot.
R_5—150 ohm, 50 w. res. (with slider)
C_1, C_2, C_3—8 μfd., 450 v. elec. cond.
C_4, C_5—16 μfd., 600 v. elec. cond.
C_6, C_7—10 μfd., 150 v. elec. cond.
C_8—40 μfd., 150 v. elec. cond.
CH_1, CH_2—Filter choke, 25 hy. @ 100 ma.
CH_3—Filter choke, 10 hy. @ 200 ma.
J_1, J_2—Closed circuit jack
T_1—Power trans. 290-0-290 @ 90 ma.; 5 v. @ 3 amps.
T_2—Power trans. 350-0-350 v. @ 200 ma.; 5 v. @ 3 amps.; 6.3 v. @ 3 amps.
T_3—Fil. trans. 2.5 v. @ 5 amps. c.t., 2.5 v. @ 5 amps. c.t.
Rect.—200 ma selenium rectifier
F_1, F_2—117 v. line fuse
S_1—S.p.s.t. toggle sw.
2—5Z3 tubes

During "sound effects" recording, the author employs the treble-bass cut-offs to simulate the tonal qualities of a carbon telephone. In this position both high and low frequencies are severely attenuated and only the middle frequencies are amplified. Other applications similar to this will be obvious to the reader.

During recording at 33⅓ r.p.m., the high frequencies are greatly accentuated (boosted) to compensate for the reduced velocity encountered when cutting small diameters on a recording disc. This boost is reduced as the cutter travels away from the hub of the disc and approaches the larger diameters with a resulting increase in linear velocity of the whirling disc.

The bass control remains at its normal or mid-setting during recording. If an attempt were made to employ bass boost during cutting, there would be a tendency to over-modulate the record. The result would be distortion in adjacent grooves (crosstalk) or even a cutting through from one groove to the next.

During playback, the process may be somewhat reversed, i.e., a bass boost may be employed and high frequencies may be either attenuated or adjusted to suit the individual listener.

Shielding is of the utmost importance in keeping the over-all hum under control. All grid and plate leads should be shielded as well as the metal can type condensers C_6, C_9, C_{18}, C_{25}. All shielding should run as close as possible to the soldering lugs and the shields should be grounded near the source of signal.

It is highly important to use *only one ground lead* to chassis in the entire amplifier. The best point can be located only by experiment. In the amplifier shown in Figs. 1, 3, and 5 this was found to be at the cathode of the 12SL7.

Special attention should be given to the polarity of all coupling condensers. The outside foil (ground) should in all cases be connected to the point of lowest impedance. In certain cases it might be advisable to completely shield all coupling condensers. A heavy copper wire or braid is also desirable from amplifier to ground.

Bonding via copper bus is sometimes needed between amplifier and tuner.

One of the requisites for accurate recording is an excellent monitor amplifier and speaker so that sounds entering the cutter may be heard simultaneously. It is not considered good practice to shunt a speaker load across a cutter. The load presented by the speaker varies with frequency. This variation disturbs the normal impedance of the cutter. A separate channel is provided, employing a 6V6, which receives its signal from the 500 ohm output winding of T_2. Operating Class *A*, the tube draws no grid current and therefore does not upset or take power from the 2A3's.

A separate gain control, R_{19}, permits individual volume control setting of this channel. The output transformer,

T_5 terminates in the jack, J_8, so that a speaker or wire recorder may be readily connected. It should be pointed out that patch cords made up from standard shielded phone plugs are used to connect through the various jacks on the panel.

It is important to observe proper polarity in making up the cords. The outside shield in all cases should connect to the outer end of the plug, while all hot leads through the inner conductor terminate in the phone plug tips.

The two load resistors, R_{21} and R_{41}, provide a fixed load across the output transformer secondaries when external speaker or cutter leads are removed. This affords proper loading protection to the transformers.

The meter, M, is a standard −10 +6 decibel meter calibrated for use across a 500 ohm line. Suitable series resistors are arranged in conjunction with a multiplier switch to extend the meter range to +24 db. in steps of 6 db. The values of these resistors are dependent upon the individual make of meter used.

The top view of the chassis (Fig. 3) shows three miniature tubes lined up in back of the meter. These are used in the *Scott Dynamic Noise Suppressor* circuit described on page 46 of this issue. The toggle and rotary switches on either side of the meter are also required in the *Scott* circuit.

The reader is urged to follow the layout of all component parts carefully. Failure to do so may result in unsatisfactory performance. All filament wires should be tightly twisted and laced and kept clear of all grid and plate leads. The connector receptacle, shown mounted near the input connectors, was moved to the back edge of the chassis near the 6V6 because of a slight hum pickup caused by the close proximity of the cabling to the input channels. Metal shields were also found to be needed on the 12AH7's.

The chassis is mounted on a standard 7" x 19" steel panel. The jack panel measures 1¾" x 19". The decorative strip was added to enhance the appearance of the amplifier.

The results obtained with this amplifier more than satisfy the most critical listener. Quality comparable to fine broadcast equipment has been achieved and we feel that many readers will want to duplicate this unit.

(To be continued)

Engineers for WTMJ-TV, The Milwaukee Journal television station, were erecting the new RCA microwave relay transmitter on the roof of the South Side Armory in Milwaukee, Wisconsin the day this picture was taken. Used for the remote pickup of television programs, this "dishpan" is beamed to a microwave receiving unit installed on the tower at "Radio City" located five miles north of Milwaukee. From this point programs are televised to the Greater Milwaukee area. The new station, which began operation December 3rd, telecasts five days a week, Wednesday through Sunday, for a total schedule on the air of 20 hours per week.

Spot Radio News

(*Continued from page 20*)

actual saturation if we allow an average of four rooms to every home. Thus, if this goal of an average of four radios for every home is practicable and attainable, we've got a long way to go before we reach the saturation point." In terms of set sales, the radio-in-every-room campaign becomes even more significant. "At the beginning of 1947," says Mr. Balcom, "there were 38,128,000 families in the United States and an estimated 34,800,000 of them had at least one radio in their homes. If the prewar concept of saturation is used, this means a sales potential of only about three and a quarter million more home sets, plus replacements, to reach 100 per-cent saturation. But if the new concept of four sets per family is taken as a goal, the potential market for new home sets, not counting replacements, is close to one hundred million."

WHATEVER THE FUTURE sales totals, the RMA head is able to report that anybody buying a set today is getting a bargain in terms of current inflated values. "Everybody talks about high prices," he says, "and radio set prices naturally have risen above prewar levels, chiefly because production costs have forced them up. Factory labor costs alone are 69 per-cent higher than they were prewar, and component prices to the manufacturer are similarly much higher because of their own higher production costs. But today's radio receiver prices, when measured against current factory wages, are below what they were in the 1920's and in the 1930's up to 1938. In 1929, for example, a radio of average price cost a worker about three and a third weeks' wages, and in 1937 this price had dropped to two and a third weeks' wages. By comparison, a radio of average price today sells for the equivalent of less than one and a half weeks' work at present-day factory wages." He adds that this price, in terms of comparable factory pay, is less than at any time in the industry's history except for a few years before the last war, when all prices were at a record low level.

WHILE TELEVISION will make great forward strides in the near future, consensus of the industry would seem to indicate that straight broadcasting will never be supplanted by video. "Television alone will revolutionize broadcasting," Mr. Balcom believes, "just as the talking movie revolutionized the motion picture industry. But in my opinion there will always be an insistent public demand for certain types of radio programs which can be listened to without requiring that the listener sit down and watch a visual screen. The housewife, for instance, will want to tune in a musical program, perhaps a soap opera, or a program of household hints,

while she does her housework, and there will be many times during the day when she won't find time to watch television. School children, who in this generation have learned to do their homework while listening to the radio, will find it hard to watch a television screen and do their algebra or Latin simultaneously."

FACT IS, more and more school kids will be using the radio straight for educational purposes, putting their textbooks aside while they do it. This is implicit in the recent (and excellent) report on the use in schools of sound systems and recording and playback equipment, prepared by RMA and the U.S. Office of Education. Indeed, after reading the RMA-USOE report, it becomes clear that a modern youngster could get his entire education via sound, never opening a textbook. Three major methods of recording and reproducing are covered —mechanical, as typified by the phonograph and transcription disc; magnetic, in which the sound is recorded on wire, tape or other suitable medium; and photographic, such as is used in sound motion pictures. The report, which goes to leading educators in booklet form, features a series of drawings with the text. Although written expressly for school personnel, the report will undoubtedly be of value to audio equipment manufacturers and to industrial educators and training experts. The report is a community project, and scores of experts in radio and education share the honors for its excellence. Among these are Lee McCanne, of Rochester, N. Y., chairman of the RMA School Equipment Committee; Dr. R. R. Lowdermilk of the U.S. Office of Education; C. F. Gill of Rochester, N. Y.; M. U. Bildersee of the N. Y. State Education Department, Albany; C. E. Palmer, Dover, O.; Ellis Miracle, Zanesville, O.; A. K. Ward and S. B. Hughes, Camden, N. J.; Henry F. Kuhlman, New York; W. B. Levenson, Cleveland, O.; E. H. Andreson, Chicago; Paul Haeseler, Newark, N. J., and Charles P. MacInnis, Columbia, S. C. The booklet is titled "School Sound—Recording and Playback Equipment." Single copies can be had for free from the Radio Section, U.S. Office of Education, Washington, 25, D. C., or the RMA, 1317 F Street, N.W., Washington, 4. RMA, who published the booklet, will also quote bulk prices on request.

RMA HAS BEEN signally active on the booklet front recently. Another much-needed job has been done by them for apartment house owners harried by tenants with television sets. Pointing out that many an owner, especially of high-priced apartment houses, has been dogged recently by the problem of finding enough space on his roof for the antennas desired by tenants, RMA offers as a solution a distribution system which uses an antenna or combination of antennas, an amplifier, cables, and an

outlet box for each apartment. This solves the roof problem and assures each tenant good reception. "The antennas," the booklet explains, "are mounted on the rooftop and are oriented or sited at the time of installation so as to give the best reception for each station in the vicinity"—a great boon to the individual apartment renter, who thus can dismiss a major servicing problem. "Where strong signals for the transmitter are available—such as might be the case in the center of a city—or where there are only a few receivers drawing from the system, amplifiers may not be required." Cost of installation of the system largely depends on cost of the cable installation, but will take care of the landlord's television problems for years to come. "The maximum number of receivers that can be connected," RMA adds, "is unlimited." The RMA booklet was prepared under the direction of W. P. Short, of the *Federal Telephone & Radio Corp.*, New York, chairman of a special RMA subcommittee of the Association's engineering department committee on television receivers.

WHO WILL BE the permanent chairman of the Federal Communications Commission was still anybody's guess as this went to press. The post was made vacant by the resignation of Charles R. Denny early last fall. It was filled on a temporary basis by Paul A. Walker, one of the Commission members. Walker is a Democrat, and has been mentioned as a possible permanent chairman. So has another and more liberal commissioner—Clifford J. Durr; but the industry is inclined to regard his New Deal background with a somewhat jaundiced eye. Whether Mr. Truman might take a different view of Commissioner Durr could depend on political trends in the near future. Speaking of politics, it is understood that the President is determined to hold off appointing anybody permanent until after the special session of Congress. This is in line with general White House policy these days—to keep things political as quiet as possible until the special session cracks the hard nuts before it. Another New Deal candidate is Wayne Coy, FDR young man who figured during that regime and who has more recently gained some practical radio experience as manager of the Washington Post's station, WINX. Another candidate with FCC experience is General Telford Taylor, who was FCC general counsel before he went away to war and was succeeded by Mr. Denny. Denny later went on to become chairman. A candidate who, according to the experts, is not being considered in a big way is J. Leonard Reinsch, radio advisor to the President. Story is that Mr. Truman has had some bum steers from Mr. Reinsch and has scratched him from the list of prospects.

IF YOU HAVEN'T had time to look it up and look it over—speaking of

FCC—they came out recently with an analysis of factors for and against standard broadcasting prosperity. Of the factors favorable to an expanded broadcast industry, they list general prosperity, increased advertising efforts, a tendency to increase the size of radio audiences, and certain advantages of radio over other advertising media. Hindering prosperity would be a depression, sharper competition from other media, and the high cost of running a station, among other things. "That the outlook for broadcasting is one of increasing competition is an understatement," FCC concludes.

HAM HISTORY was made by the FCC in 1947 when they waived a long-standing and hotly-defended rule, the one that requires amateur call letters be assigned systematically to prevent partiality. Regardless of this rule, which FCC has stuck to through thick and thin in self-defense, they granted Ernest Melvey of Seattle, Wash., permission to change his amateur station call letters from W7HVS to W7HUX. Mr. Melvey didn't have any drag or friends in high places, but his reason for wanting the new letters was good enough for the Commission. They had been used by his late son, Robert, killed in action aboard the cruiser Nashville when the ship was hit by a Japanese suicide plane. His dad wanted the letters "in remembrance of the good times" he and his son had had on the air together. . . .

FCC HAS made another valiant sortie against government red-tape, simplifying its broadcasting application forms and cutting their number from twenty to seven. Applicants for new standard, FM and television stations all now use the same form, instead of three different ones. Applications for licenses and renewals, assignment of construction permits and licenses and transfer of control are likewise unified. Details have also been cut. For instance, if an applicant feels that it's too much trouble to furnish an unusually large listing of all parties involved, he may get a waiver and cut the list to the bone. FCC hopes that it will not only cut down applicant work, but the work of the Commission when processing the forms.

CLAIMING TO BE the most extensive airline-owned station in the world is a new one with a normal operating range of 3500 miles, now abuilding at Haneda airport, near Tokyo. Northwest Airlines is fathering the project. The station will serve planes over the north Pacific from the U. S. and Alaska to Tokyo, Seoul, Shanghai and Manila, and will eventually offer service to other international airlines operating into Tokyo. Future plans may result in the station being operated by Aeronautical Radio, Inc., on a cooperative basis for all airlines in the area. The station will have two five-channel, three-kw. *Wilcox* transmitters. A battery of rhombic anten-

nas directed toward Shemya in the Aleutian Islands, Manila, Shanghai, Wake and Guam will provide extraordinary range. The station is the first of a series to be set up in the Orient under a cooperative arrangement with other airlines. —30—

SERVICE ORGANIZATIONS

WE ARE pleased to add two more names to the growing list of radio servicemen's associations in the United States, Canada, and Scotland.

The following names and officers should be added to your list:

Association of Radio Technicians; Homer L. Davidson, President, 1726 Central Ave., Fort Dodge, Iowa; Don Sinclair, Sec'y, 405 O St., Fort Dodge, Iowa.

Orangeville District Radio Electronic Technicians Assoc., Orangeville, Ontario, Canada; President, Jim Musselman, Dundalk, Ontario, Canada; Sec'y-Treas., Victor Sharp, Box 414, Orangeville, Ontario, Canada.

Also the following correction should be made:

The name of Associated Radio Dealers of Columbus should be changed to Associated Radio Service Dealers (of Columbus), 2552 North High St., Columbus, Ohio; G. L. Riebel, President, Riebel's Appliance Shop, 1190 North High St., Columbus, Ohio.

New officers of the Akron Radio Technicians Association include: George Phillips, President; Harry Hess, Vice-President; Cliff Kehrle, Treasurer; and Del Bruner, 24 Byers Ave., Akron, Ohio, Secretary.

Radio Technician's Guild, Whaling City Chapter; Al Wobecky, President; James R. Shepley, Secretary, 110 Topham St., New Bedford, Massachusetts.

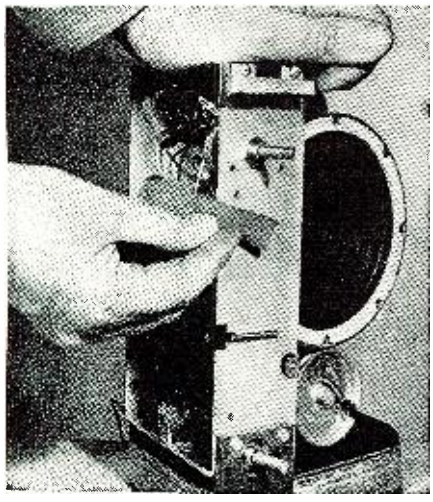
The November RADIO NEWS carried a complete list of servicemen's organizations on page 164, while several new organizations were listed on page 165 of the December issue. Any further additions or corrections for these listings will be welcome at any time.

DIAL POINTER TROUBLE

CERTAIN radios use a dial pointer arranged to slide along the chassis edge, behind a glass numbered dial.

Sticking often occurs due to rough spots or burrs on the metal edge.

Careful smoothing of the metal with emery cloth as shown will eliminate this trouble. . . . . H.L.



RADIO NEWS 1947

INDEX TO VOLUMES 37-38

BUSINESS MANAGEMENT

CIRCUIT PAGE

Fleapower Ham Portable

(*Continued from page 62*)

to a higher capacity. Just bear in mind that as the plates on C_{14} are unmeshed the loading is increased. It is a good idea at this time to listen in on a monitor or the main station receiver in order to hear the keying. Here again, the 20 meter band may be tricky. In extreme cases where the crystal stage is pulled out of oscillation it may be necessary to reduce the coupling condenser (C_{11}) to 100 $\mu\mu$fd. However, it was not found necessary with this rig as good keying was secured on 20 by using light antenna coupling, and no difficulty at all was encountered on the other bands.

With 135 volts on the plate of the amplifier tube and a current drain of 25 ma., the input power is about 3.4 watts on all bands. While this power isn't quite capable of bouncing a signal off the moon, we have bounced a couple of signals from New York to Ohio—this with an antenna slung out on the washline!

-30-

NEW ENGLAND DEALER SURVEY

PRELIMINARY reports covering the RMA-sponsored dealer survey have indicated several interesting facts regarding the status of the radio industry.

The spot check, which is being made in the New England States, although limited to 31 outlets, indicates that radio dealers in the cities surveyed are "living off their inventories" of some set models in that their sales exceed their purchases from distributors.

The survey also indicated a lively demand for FM-AM receivers, in excess of both dealer purchases and manufacturers' production rate, and the virtual disappearance of the straight console, without phonograph, from the market. It was also determined that these dealers reported large inventories of AM table models and that there is a steady demand for radio-phonograph consoles.

Chairman Frank Mansfield of the RMA Industry Statistics Committee has been authorized by the Board of Directors to continue and amplify the dealer survey.

-30-

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RADIO and Electronic Engineering and Service Company. Accounts show 90% gross profit. Take over established business. Excellent opportunity for independence. Sell walkout $5500, or complete inventory cost value. Ralph Page, 404 Godchaux Bldg., New Orleans, La.

RADIO Service shop. Complete stock and equipment to go to highest bidder. Phone 5921, Clyde, Ohio, H. D. Gregg, 122 Amanda St.

WIRING Diagrams, instructions AC operation BC-191, BC-375, BC-312, BC-342, BC-348, BC-624, BC-625. Each set in SCR-274, others. 50c in coin per set. No need to rip up filament circuits on above and other equipment. We have brand new 26 volt, ¾ amp filament transformers for only $1.35 ea. postpaid. Reactron Co., 422-B E. 138th St., New York 54, N. Y.

RHEOSTAT-POWER Control, large 4x7, metal and asbestos with bronze step contacts, for motors, machinery, etc. Price $2.00. Radioco, 1110 Marshall Bldg., Cleveland, O.

VEEDER Electric Counter. For counting electric impulses in connection with electric eye, etc. Value, $15.00. Price, $2.50. Radioco, 1110 Marshall Bldg., Cleveland, O.

BC-455B EASILY converted to hot 10 meter receiver, fixed or mobile. Instructions, Schematics, $1.00. Brown, 3327 Geronimo, Tucson, Arizona.

NAVY Wire Recorder Magazine, cost $50 new, never used. Will sacrifice to best offer. Norwood, 1432A N. 15th, Milwaukee 5, Wis.

RADIO Tubes, final clearance sale. Types 6V6GT, 25Y5, 1H6G, $.25 each. All tubes new and guaranteed. S & S Radio Co., 140 Derby St., Salem, Mass.

ROTARY Beam Antenna Motor. Reversible, geared-head. Will operate 200 lb. beam, torque 75 in. lb. 3 R.P.M. 12 volts D.C. relays and switches built-in. Government cost, $115. Price, while they last, $7.50. Radioco, 1110 Marshall Bldg., Cleveland, Ohio.

MICA (Gov. Surplus, just released), Clear and S.S. uncut, trimmed sheets, Grade A3, 1½ to 3 in. wide, by 3 to 4½ in. long. 21 sheets, $1.00 delivered. Scarce item. Limited supply. Carlton, 3837 Ulloa, New Orleans 19, La.

TELEVISION High Voltage R.F. Power Supply Coil. 10 K.V. at 750 microamps. Excellent quality. Guaranteed. Circuit included. $6.50. Coast Electronics Co., P.O. Box 891, Red Bank, New Jersey.

RECORDER for Sale. Includes two Presto 6-N turntables with 1-D cutters. 1:0 & 0:1 feed screws 112. Presto 90-A Amplifier, Hallicrafters SX-42, Hallicrafters speaker, Jensen JAP 60 with enclosure, Garrard changer, Sure 55 Mike EV stand. Piercway outlet strips. Built into beautiful grey and natural finished cabinet chrome trimmed. Farlite top. Produces top quality transcriptions and recordings. All equipment new. Price $2800, plus freight charges. No reasonable offer turned down. Address inquiries to Mr. E. Rundell, 2213 Red Rd., Coral Gables, Fla.

ERECO Beam Rotator: 110VAC, Heavy Duty, Variable Speed, Selsyn Indicator, weather-proofed. Complete indicator and rotator ready to operate, $49.95. Satisfied users all over the country. Write for free literature. Ereco, 2912 Hewitt, Everett 7, Washington.

$3.00. COMBINATION Directory. 600 Radio & Equip. Mfrs. 55 Radio Amplifiers Mfrs. 49 Radio Tube, tube parts mfrs. All $3.00. House of Butte, 60 East 42nd Street, New York 17, N. Y.

RADIO Tubes—Dealers, order your needs—be surprised at prices. Address Radio Tubes, Box 108, Elizabeth City, N. C.

NEW and used Hallicrafters, National, Hammarlund, Collins, Millen, RME, Sonar, Meissner, Pierson, other receivers, transmitters, amplifiers, test equipments, speakers, etc. Lowest prices. World's best terms. Reconditioned S38, $35.00; S20R, $49.00; S40, $59.00; RME84, $69.00; RME45, $99.00; DB20, $29.00; NC240D, $169.00; SPC400SX, $199.00; SPC400X, $249.00; KP81, $249.00; S22R, SX25, SX16, SX28A, SX42, HQ129X, NC173, HRO, HT9, other receivers and transmitters. Shipped on approval. Write. Henry Radio, Butler, Mo.

MICROPHONE Buttons, gold plated, many uses. High gain Phono pickup, etc. Supply limited. 40c each, 3 for $1.00. Scott, 341 Montross Ave., Rutherford, N. J.

FM TELEVISION antennas, ham parts, tubes. Bargain list. Wholesale Supply, 347 Lunenburg St., Fitchburg, Mass.

FREE wholesale bulletin. Tubes, parts. Bargain prices. Henshaw Radio Supply, 3313 Delavan, Kansas City, Kansas.

WRITE Dept. RN18 for our free wholesale list of Radio parts & accessories. R. C. Radio Parts & Distributing Co., 731 Central Ave., Kansas City 6, Kansas.

LOWEST Prices. Radio Tubes, parts. Bargain lists 3c. Potter, 1314 McGee, Kansas City 6, Mo.

SELENIUM Rectifiers, full wave, ⅛ ampere, $1.85; 1 ampere, $2.50. Half wave 5 amperes, $4.50; 2.2 amperes, $2.25; 1.5 ampere, $1.85. Bulletin Bursma Radio, Route 5, Grand Rapids, Mich.

CHOKES, swinging, rated 2-12 henries, 100-1000 MA. 5½"x7"x10½", heavy duty with porcelain insulators, $7.50; Filament transformers, 2.5 volts, 11 amps, cased, porcelain insulators, $2.50; with pair 866, $4.00. SKL Laboratory, Box 188, Lexington 73, Mass.

IMPEDANCE calculator, new, plastic and duraluminum. Solves vector triangle or unit circle in five seconds. $3.50. C.O.D. Triculator, 643 W. 109 Place, Los Angeles 44, Calif.

TELEVISION diagrams, 35c each. "Transvision", "Viewtone", "Electotech", "Certified", "RCA", "Philco", "Andrea". Any three above, $1.00. Others available. RadioVision, 2064 Ocean Parkway, Brooklyn 23, N. Y.

TELEVISION components for assembly of a modern 52-square inch screen receiver using the newest circuits and tubes. The only kit on the market featuring an aluminized cathode ray tube, A.F.C. on horizontal sync and a wired, pre-aligned r.f. tuner covering any combination from 1 to 13 television channels. Sound and Picture IF's are on one sub-chassis using new 6AH6 miniature tubes having a gm of 9000! The IF Strip and the 9000 volt RF Power Supply are sold in kit form. The main chassis is sold with all holes punched, or blank with suggested chassis layout print. All components individually priced. Our catalog lists television components exclusively and shows parts and circuits of the "hard to find items" you have been looking for. Send for it today. It's free! Television Specialties Co., 315 Madison St., Oak Park, Ill.

NEW Sylvania bulk tubes 69c, 1LD5, 2A4G, 5Z3, 6C5, 6K7gt, 6L7, 6SA7, 6SK7, 6SR7, 6V6gt, 7A4, 7A6, 7A7, 7B4, 7B6, 7C5, 7C6, 7E5, 7F7, 7H7, 7N7, 7Q7, 7S7, 7Y4, 7Z4, 12A6gt, 1235gt, 12K8, 12SA7, 12SK7, 12SG7, 12SH7, 12SL7gt, 12SN7gt, 12BE6, 12BA6, 14A7, 14B6, 14J7, 14Q7, 31, 35A5, 35B5, 35L6, 35Y4, 50A5, 50B5, 50L6, 56, XXL. One hundred blank tube cartons $1.39. Write for bargain flyer. Henshaw Radio Supply, 3313 Delavan, Kansas City 2, Kansas.

WE have the following portable electric generating plants: These are real buys. 3KW, 110 V. A.C. 26.1 Amperes, 60 cycle, single phase, 1800 RPM, perfect condition, $225.00. 5KW, 110V. A.C. .07 P. F. 7.2 KVA 62 Amperes single phase 1800 RPM, perfect condition, $450.00. 6.3 KVA New Wisconsin powered master generator set, 120/240 V. single phase, 60 cycle, $600.00. 15KW International powered unit 120/208 4 wire 60 cycle 3 phase, new, $1200.00. 25 KW Cummins powered unit, 220 V. 3 phase 60 cycle, like new $2450.00. 60 KW Cummins Diesel Powered unit, Delco Generator, 1200 RPM, 450 V. 3 phase, 60 cycle, complete with accessories, $5500.00. Many other units, in stock, are available. Porter Electric Company, 330 S. Sixth Street, Minneapolis 15, Minnesota, LIncoln 7531. Electrical Equipment coast to coast.

WANTED

TELETYPEWRITERS used or new, parts, accessories. Box 447, % Radio News, 185 N. Wabash Ave., Chicago 1, Illinois.

TRC7 RADIO Equipments. RT-53 Receiver-Transmitters, AS-12 Antennas. Box 448, % Radio News, 185 N. Wabash Ave., Chicago 1, Ill.

WESTERN Electric Carrier Telephone or Telegraph Filters, equalizers, repeating coils, etc. Also CF1 and CF2 carrier equipment and parts. Box 450, % Radio News, 185 N. Wabash Ave., Chicago 1, Illinois.

W E OR Kuthe Type 394A Grid Controlled Rectifiers. Box 451, % Radio News, 185 N. Wabash Ave., Chicago 1, Illinois.

ONE or more 12 volt power supply #211035 for T.C.S. #6 or #9. Charles Sackermann, 649 Thirty-eighth St., Union City, N. J.

AN/APR/4 Receiver and tuners 32MC, 10,000 MC; Scott RBO; High Frequency Standard; Linear Interpolating Oscillator, prefer GR; GE Electronic Switch; LM. Power Unit; 5MC, 10MC Crystal, metal tube case; Measurement's Griddipmeter. Wm. Hilchey, 5203 Hollywood Blvd., Hollywood, California.

HELP WANTED

INSTRUCTORS in Radio-Electronics and Television. Prefer former Navy Radio Technician Instructors with Teacher Training. Must be willing to locate in Detroit, Mich. Write to Box 452, % Radio News, 185 N. Wabash Ave., Chicago 1, Ill.

RAILWAY Telegraphy needs men. Complete training. Instruments furnished. Positions waiting. Bell Telegraph Railway Institute, 10 Parker Ave., San Francisco 18, Calif.

SITUATIONS WANTED

COLLEGE graduate, former Naval officer, 32, FCC phone license since 1934. Wartime experience in loran and radar maintenance, operation, and instruction. Desire position as sales engineer or instructor. Presently employed. Box 455, % Radio News, 185 N. Wabash Ave., Chicago 1, Illinois.

PATENT ATTORNEYS

LANCASTER, Alwine & Rommel. Registered Patent Attorneys. Patent Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Suite 414, 815 15th St., N. W., Washington 5, D. C.

CORRESPONDENCE COURSES

USED Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 bargains. — (Courses Bought.) — Lee Mountain, Pisgah, Ala.

AMATEUR radio licenses. Complete code and theory preparation for passing amateur radio examinations. Home study courses. American Radio Institute, 101 West 63rd Street. New York City 23.

BOOKS Astrological: Sold, rented. Write for catalog A-R. Library Astrolyte, 6531 West Blvd., Inglewood, Calif.

USED Correspondence courses and educational books bought, sold, rented. Catalog free. Educational Exchange, Henagar, Ala

MISCELLANEOUS

QSLs-SWLs on glossy Kromekote. Samples for stamp. WIHJI Press, P.O. Box 32, Manchester, New Hampshire.

ELECTRIC meter laboratory. Electrical instruments, tube checkers, and analysers repaired, checked and calibrated. Prompt and reliable service guaranteed. Hazelton Instrument Co., 140 Liberty St., New York 6, N. Y. Tel. Barclay 7-4239.

WHOLESALE Radio Service at reasonable rates, quick service, no job too big. Write for full information. Elkins Radio, Elkins, W. Va.

TESTING Equipment. All types and models. Expertly repaired and calibrated. Free estimates. Metropolitan Electronics, 42 Warren St., N. Y. 7, N. Y.

BUILD your own Radios, Phonographs, and Electronic Equipment. Send for our free gift offer and complete catalogue. McGee Radio, 1330 Broadway, Denver, Colo.

26 YEARS experience radio repairing at your fingertips. I've repaired 45000 radios. Have perfected simple system you can follow step by step. No calculations or formulas. Total price $2.00 postpaid or C.O.D. Money back guarantee. Ross Radio, 14615-C Grandriver, Detroit 27, Mich.

RADIOMEN, servicemen, beginners. Make more money, easily. $250 weekly possible. We show you. Information free. Merit, 216-32R 132nd Ave., Springfield Gardens 13, New York, N. Y.

ERRATUM

Leon Wecker has pointed out two errors appearing in his article, "Build Your Own Television Receiver," which was published in the August, 1947 issue of RADIO NEWS. C_{39} was erroneously indicated in the grid of the vertical oscillator. The correct position for this component is from the plate of the vertical oscillator to ground on the plate side of C_{40}. The second error concerned C_{55}. C_{55} is shown at the first grid of the horizontal amplifier. It should have been placed from the plate side of C_{54} to ground. We sincerely regret this error and trust that persons building the set will have no difficulty in rectifying the mistake.

* * *

Photo Credits

Pages	Credit
39, 40, 41, 122, 123	U. S. Navy
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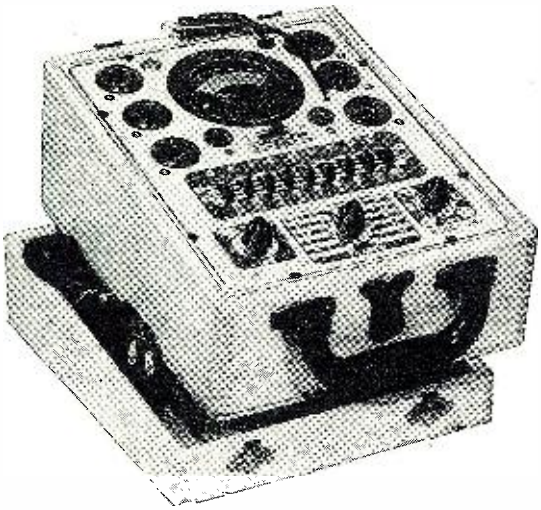
54, 55, 166	Arthur Haug, Staff Photographer
59 (Top left)	Philco Corp. Service Dept.
126	General Tire & Rubber Co.
134, 150	Acme
144	Allen-Howe Electronics Corp.
160	"His Master's Voice," London
170	The Milwaukee Journal

INDEX OF Advertisers

JAN. 1948

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

SENSATIONAL VALUES



THE NEW MODEL 247

TUBE TESTER

FEATURES: The Model 247 incorporates a newly designed element selector switch which reduces the possibility of obsolescence to an absolute minimum. Any pin may be used as a filament pin and the voltage applied between that pin and any other pin, or even the "top-cap."

The new free-point system described above permits the Model 247 to overcome the difficulties encountered with other emission type tube testers when checking Diode, Triode and Pentode sections of multi-purpose tubes, because sections can be tested individually when using the new Model 247. The special isolating circuit allows each section to be tested as if it were in a separate envelope.

The Model 247 provides a super sensitive method of checking for shorts and leakages up to 5 Megohms between any and all of the terminals. Continuity between various sections is individually indicated. One of the most important improvements, we believe, is the fact that the 4 position fast-action snap switches are all numbered in exact accordance with the standard R. M. A. numbering system. Thus, if the element terminating in pin No. 7 of a tube is under test, button No. 7 is used for that test.

Model 247 comes complete with new speed-read chart. Comes housed in handsome, hand-rubbed oak cabinet sloped for bench use. A slip-on portable hinged cover is included for outside use. Size: 10¾" x 8¾" x 5¾".

ONLY **$29.90** NET

The New Model 650

SIGNAL GENERATOR

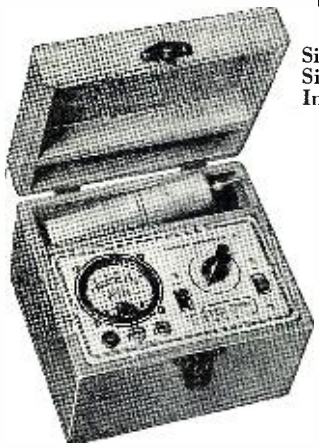
RANGES:

100 Kilocycles to 35 Megacycles on Fundamentals

25 Megacycles to 105 Megacycles on Harmonics

- ★ R F obtainable separately or modulated by the Audio Frequency.
- ★ Audio Modulating Frequency—400 cycles pure sine wave—less than 2% distortion.
- ★ Attenuation—3-step ladder type of attenuator (T pad).
- ★ Uses a Hartley Exciter Oscillator with a Buffer Amplifier.
- ★ Tubes: 6J5 as R. F. Oscillator; 6AS7 as modulated Buffer and Mixer; 6SL7 as audio oscillator and rectifier. Complete with coaxial cable, leads and instructions.....

$39.95



The New Model CA-11

SIGNAL TRACER

Simple to Operate . . . Because Signal Intensity Readings Are Indicated *Directly on the Meter!*

- ★ SIMPLE TO OPERATE—only 1 connecting cable—NO TUNING CONTROLS.
- ★ HIGHLY SENSITIVE — uses an improved Vacuum Tube Voltmeter circuit.
- ★ Tube and resistor-capacity network are built into the Detector Probe.
- ★ COMPLETELY PORTABLE—weighs 5 lbs. and measures 5" x 6" x 7".
- ★ Comparative Signal Intensity readings are indicated directly on the meter as the Detector Probe is moved to follow the Signal from Antenna to Speaker.
- ★ Provision is made for insertion of phones.

THE MODEL CA-11 comes housed in a beautiful hand-rubbed wooden cabinet. Complete with probe, test leads and instructions.

$18.75 NET

The New Model 670 SUPER METER

A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS.

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500.—A.C. VOLTS 0 to 15/30/150/300/1500/3000 Volts.—OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000.—D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps.—RESISTANCE: 0 to 500/100,000 ohms, 0 to 10 Megohms.—CAPACITY: .001 to .2 Mfd., 1 to 4 Mfd. (Quality test for electrolytics).—REACTANCE: 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms.—INDUCTANCE: 1.75 to 70 Henries; 35 to 8,000 Henries. DECIBELS: −10 to +18, +10 to +38, +30 to +58.

The Model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5½" x 7½" x 3".

$28.40 NET

AVAILABLE FOR IMMEDIATE SHIPMENT FROM STOCK—20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS

MOSS ELECTRONIC DISTRIBUTING CO.

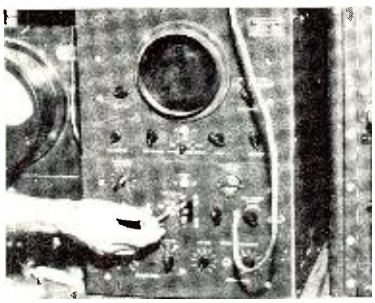
DEPT. RN-1, 229 FULTON STREET NEW YORK 7, N.Y.

Quiet as a Moonbeam Falling on Velvet

It's Impossible to Hear a Mallory Control Operate!

Ultra-sensitive sound testing meters built for the U. S. Navy prove that the noise level of the Mallory control in operation is so low as to be totally inaudible!

Contact with the talcum-fine carbon element is made by a special Mallory Alloy that passes over it smoothly and silently.



Meter used in the noise level test. Readings were taken on volume controls of all leading manufacturers. Mallory controls gave no audible sound, registered 22% below all others in inaudible sound vibrations.

The things you look for in a control are low noise level, long life, accurate resistance values and smooth, uniform tapers. Competitive tests prove that Mallory leads the field on all four points!

You can use Mallory Volume Controls, Capacitors and Vibrators with complete confidence. They are carefully built to assure ease of installation and complete customer satisfaction. Mallory's standardized range of sizes and types makes the Mallory line a profitable line to stock.

"Good Service for Good Business"

A Mallory plan to build business for radio-electronic service shops.

There's a unique customer follow-up system that will produce repeat business. There's a close tie-in with the Mallory trade mark. Ask your distributor about it!

P. R. MALLORY & CO. Inc.

MALLORY

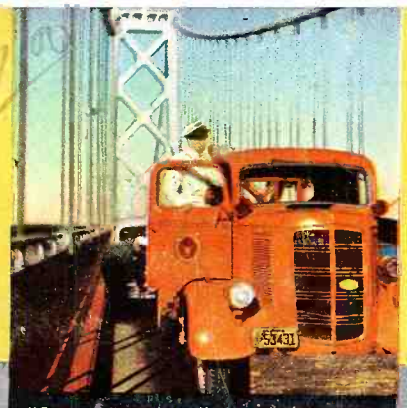
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Lock-In tubes in *Motorola* equipment maintain smooth flow of traffic on famous bridge



"Coming in with stalled car," radios tow truck operator. A mobile two-way FM radiotelephone permits instant communication with dispatcher.

View of San Francisco-Oakland Bay Bridge — over which 70,000 cars travel daily.

Motorola radiotelephone enables the dispatcher at microphone to direct movements of any mobile unit instantly.

THE famous San Francisco-Oakland Bay Bridge must be free of stalled cars at all times. A smooth flow of traffic is maintained with the aid of Motorola FM Radiotelephone equipment.

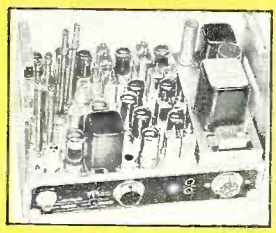
Tow cars, emergency roadside service trucks, electrician trucks, fire units and traffic engineer's sedan constitute the radio fleet. By means of this efficient system, a flow of 70,000 cars per day rolls with minimum delay over the great bridge.

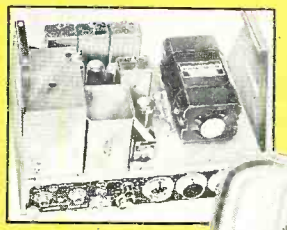
Securely locked in position in the Motorola equipment are *Sylvania Lock-In Tubes*, depended upon day and night to give superlative service under all conditions!

For full information about Sylvania Lock-Ins see Sylvania Distributors or write Sylvania Electric Products Inc., Radio Tube Division, Emporium, Pa.

SYLVANIA ELECTRIC

MAKERS OF RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS





High frequency 160,000 kilocycle FM two-way Motorola radiotelephone equipment permits 100% radio coverage regardless of electrical interferences or steel enclosing structure. Sylvania Lock-Ins handle very high frequencies with ease. Have short, direct connections, fewer welded joints . . . no soldered joints—less loss; getter located on top; shorts eliminated by separation of getter material from leads! Cannot be dislodged from sockets no matter how rough the way.