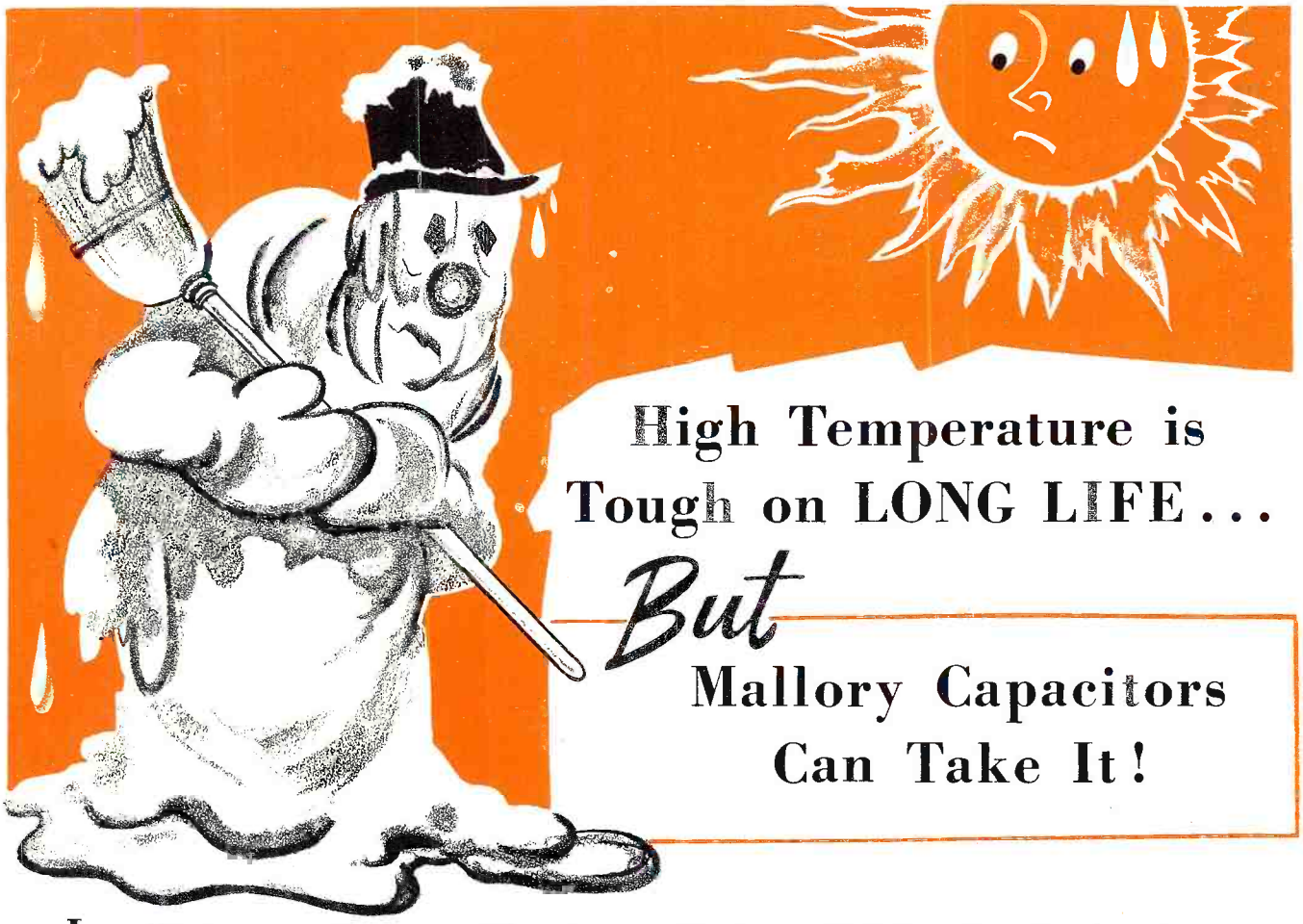
RADIO & TELEVISION NEWS

JANUARY
1949
35¢

CUSTOM-BUILT MUSIC REPRODUCING SYSTEMS PAGE 35



High Temperature is Tough on LONG LIFE...

But Mallory Capacitors Can Take It!

Long life in a capacitor is one thing—long life in high temperature is quite another matter. That's why the record of Mallory Capacitors is so impressive. Tests prove that the characteristics of Mallory Capacitors are practically unchanged after 2000 hours at a temperature of 185° F.

It takes materials of the highest purity to withstand heat like that. But purity control is one of the big points in the manufacture of Mallory Capacitors. They are untouched by human hands; production workers wear rubber gloves. Specifications on the chloride content of the gauze are even more rigid than on hospital gauze. This gauze is the base on which aluminum is sprayed to create the anode plate.

That's not all! Mallory Capacitors have longer shelf life—longer life in an inactive set—lower RF impedance—ability to withstand higher ripple current.

Mallory Capacitors cost no more than ordinary capacitors—they're easy to install, and when they're installed they're *dependable* . . . and that means the kind of service that satisfies customers. Order from your Mallory distributor.

New Improvements in Mallory FP Capacitors

. . . Feature stronger anode tabs—withstand higher discharge currents—improved high surge separators—still greater heat resistance—extra heavy rubber seal—heavier cathode tab—special etched cathode.

Buy Mallory Assured Quality At Regular Price Levels

P.R.MALLORY & CO. Inc.

MALLORY

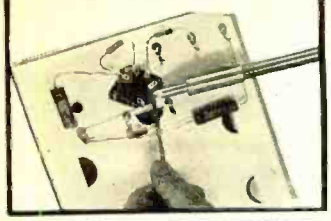
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

*Reg. U. S. Pat. Off.

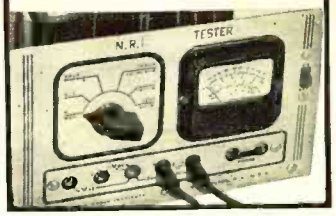
APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

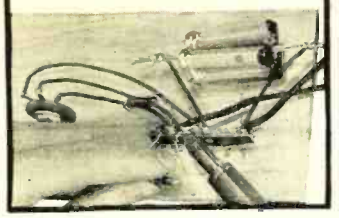
YOU PRACTICE Radio Soldering with Soldering Equipment and Radio Parts I send you. Get practical experience mounting and connecting parts.



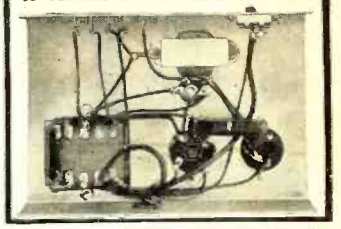
YOU BUILD this Tester with parts N. R. I. sends early in course. Soon helps you fix neighbors' Radios and EARN EXTRA MONEY in spare time.



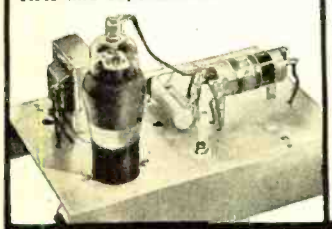
YOU TEST Radio Circuits like this built with parts I send. Build special circuits; learn how to locate and repair circuit defects.



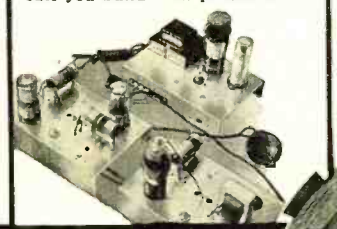
YOU BUILD Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds. Learn how to correct Power Pack troubles.



YOU BUILD this A. M. Signal Generator for more valuable experience. It provides amplitude-modulated signals for many tests and experiments.

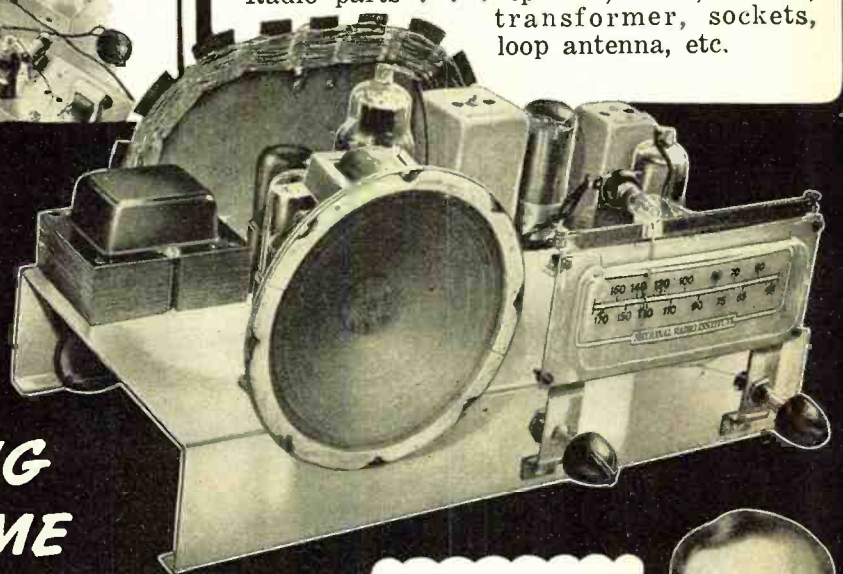


YOU PRACTICE FM (Frequency Modulation) experiments, get more experience with this Superheterodyne Receiver Circuit you build with parts I send.



You Get PRACTICAL EXPERIENCE With This Superheterodyne Receiver

YOU BUILD THIS complete, powerful Radio Receiver that brings in local and distant stations. N. R. I. gives you ALL the Radio parts . . . speaker, tubes, chassis, transformer, sockets, loop antenna, etc.



LEARN RADIO

BY PRACTICING IN SPARE TIME

WITH BIG KITS OF PARTS I SEND YOU

Want a good-pay job in the fast-growing RADIO-TELEVISION Industry? Want a money-making Radio-Television shop of your own? I've trained hundreds of men to be Radio Technicians . . . MEN WITH NO PREVIOUS EXPERIENCE. My tested and proved train-at-home method makes learning easy. Learn Radio-Television principles from illustrated lessons. Get practical experience with MANY KITS OF PARTS I send. All equipment yours to keep.

Make EXTRA MONEY in Spare Time

The day you enroll, I start sending SPECIAL BOOKLETS that show you how to make EXTRA MONEY fixing neighbors' Radios in spare time. From here it's a short step to your own shop, or a good-pay Radio-Television servicing job. Or get into Police, Aviation, Marine Radio, Broadcasting, Radio Manufacturing or Public Address work. Think of opportunities in the booming Television Industry. Prepare NOW.

See What N. R. I. Can Do For You

Act now! Send for my DOUBLE FREE OFFER. Coupon entitles you to actual lesson, "GETTING ACQUAINTED WITH RECEIVER SERVICING," absolutely free. Over 80 pictures and diagrams! You also get my 64-page book, "HOW TO BE A SUCCESS IN RADIO AND TELEVISION-ELECTRONICS." Tells how quickly, easily you can get started. Send coupon in envelope or paste on penny postal. J. E. SMITH, President, Dept. 9AR, National Radio Institute. Pioneer Home Study Radio School, Washington 9, D. C.

I WILL TRAIN YOU AT HOME

MY COURSE INCLUDES **TELEVISION** *ELECTRONICS*

I TRAINED THESE MEN

Has Own Radio Service

"I have my own Radio and Television sales and servicing business. I get enough repair jobs to keep me going right along."—ALEXANDER KISH, 34 Pershing Avenue, Carteret, New Jersey.

Good Spare Time Business

"I have been getting receivers to repair right along, and with N. R. I. methods I don't have to spend much time on them."—S. N. STRICKLAND, 191 Dale Homes, Portsmouth, Virginia.

VETERANS

You get this training in your own home under G. I. Bill. Mail Coupon.

GET BOTH 64 PAGE BOOK SAMPLE LESSON FREE

MR. J. E. SMITH, Pres., Dept. 9AR
National Radio Institute, Washington 9, D. C.

Mail me FREE Sample Lesson and 64-page book about how to win success in Radio and Television—Electronics. (No salesman will call. Please write plainly.)

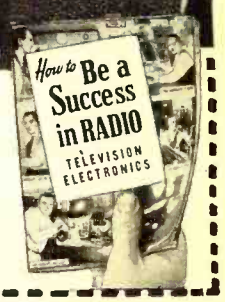
Age.....

Name.....

Address.....

City..... Zone..... State.....

☐ **Check if Veteran**



APPROVED FOR TRAINING UNDER GI BILL

RADIO & TELEVISION NEWS

First in radio-electronics

Average Paid Circulation over 185,000

Radio News Trade Mark Reg. U.S. Pat. Office No. 378427

CONTENTS

JANUARY, 1949

DEPARTMENTS

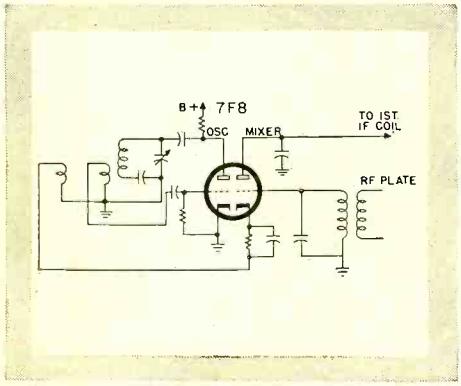
VOLUME 41 • NUMBER 1

Member Audit Bureau of Circulations

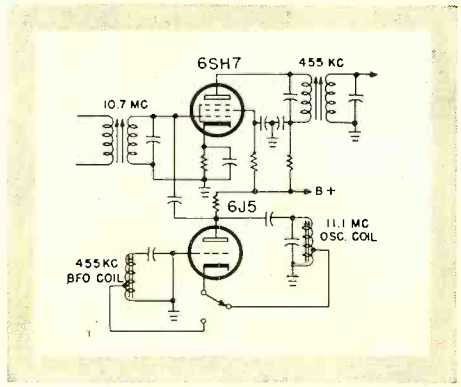
RADIO & TELEVISION NEWS is published monthly by the Ziff-Davis Publishing Company, 185 N. Wabash Ave., Chicago 1, Ill. Subscription Rates: in U. S. and Canada $4.00 (12 issues), single copies 35 cents; in Mexico, South and Central America; and U. S. Possessions, $4.00 (12 issues); in British Empire, $5.00 (12 issues)—all other foreign countries $5.00 (12 issues). Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter July 21, 1948, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Entered as second class matter at the Post Office Dept., Ottawa, Canada. Contributors should retain a copy of contributions and include return postage. Contributions will be handled with reasonable care but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions and by-line changes that are necessary. Payment made at our current rates, covers all authors', contributors' or contestants' rights, title, and interest in and to accepted material, including photographs and drawings.

COVER PHOTO: A Christmas present for the whole family! This entertainment center finds a television set, phonograph, and AM-FM receiver housed in several of Jensen's unique "Customode" cabinet units. (Photo by Braddy & Sigele)

Two Reasons Why the SX-43 Is Extra-Hot on 6 Meters --



TRIODE MIXING . . . in the first detector. This quieter method of conversion greatly boosts the signal-to-noise ratio because there's almost no first detector "hiss." Inductive coupling (rather than electronic) of the oscillator signal avoids multi-grid noise in the sensitive 50-Mc range.



DOUBLE SUPERHET . . . After two stages of IF at 10.7 Mc, this 6SH7 makes a second conversion down to 455 kc for ample selectivity, plus complete absence of images. The 6J5, which is used as BFO on other bands and otherwise idle on this band, acts as local oscillator. No extra tubes, yet plenty of extra performance!

SX-43 $189.50

Before you buy, see and try the SX-43. Compare its features . . . learn the thrill of its superior performance. At its price, it's the hottest thing available—by far.

Range 540 kc to 55 Mc plus FM Band 88 —108 Mc; other features include calibrated bandspread, one stage tuned RF, temperature compensated oscillator, crystal filter, two stages IF, tuning meter, two stages audio; 10 tubes plus rectifier.

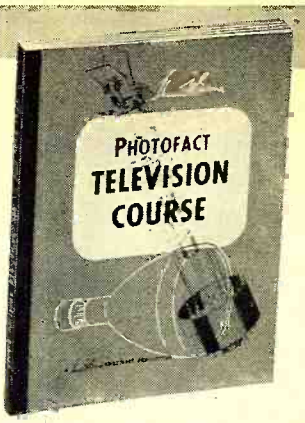
the hallicrafters co.

4401 W. Fifth Ave., Chicago 24, Ill.

Manufacturers of precision radio and television equipment.

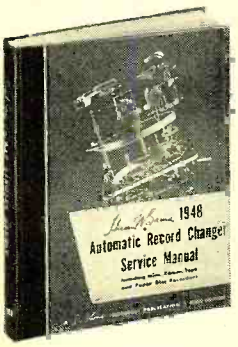
NOW! The Famous $500 Photofact TELEVISION COURSE in Book Form!

Previously available only to Photofact subscribers—now published to answer the insistent demand of the entire Radio Industry



Now you can own the book that gives you a *complete, clear* understanding of modern TV principles, operation and practice. Previously available only in PHOTOFACT Folder Sets, this superb course has been bound in unified book form to meet an overwhelming demand from radio men in every branch of the industry. Written in clear, easy-to-follow language, profusely illustrated, packed with valuable up-to-the-minute data. Covers every phase of television—gives you the groundwork you *must* have to become a successful TV service technician. Bring your television knowledge up-to-date this easy, economical way. The PHOTOFACT Television Course is available at your jobber—order your copy today! Over 200 pages; fully illustrated; sturdy binding, 8½ x 11". Only.. **$3.00**

A "Must" for Everyone in Radio!



NEW! 1948 Automatic Record Changer Manual

New Volume 2 covers 45 models made in 1948, including new LP and dual-speed changers, plus leading Wire and Tape recorders. It's easy to service record changers when you have the PHOTOFACT Record Changer Manual handy. Complete, accurate data—based on analysis of actual equipment. Gives full change cycle data, information on adjustments, hints and kinks, complete parts lists, exclusive "exploded" diagrams. Have this time-saving, money-making book in your shop. Over 400 pages; de luxe bound, 8½ x 11". Only..... **$6.75**

1947 EDITION. Volume 1, Automatic Record Changer Manual. Covers more than 40 different post-war changer models manufactured up to 1948. Includes full hard-to-get data on leading Wire, Ribbon, Tape and Paper Disc Recorders. 400 pages; fully illustrated; 8½ x 11", hard cover. Only.....**$4.95**

NEW! Specialized Photofact Volumes

POST-WAR AUDIO AMPLIFIERS and Associated Equipment

This is the book that's wanted by custom-builders, audio men and sound engineers. Covers a wide variety of well-known audio amplifiers and FM and AM tuners, *plus* data on important wire and tape recorders. Presents a complete analysis of each unit. A "must" for custom-installers and for sound service specialists. 352 pages; fully illustrated; in sturdy binding, 8½ x 11". Only..... **$3.95**

POST-WAR COMMUNICATIONS RECEIVER MANUAL

New! Invaluable to Amateurs and Short Wave Listeners. Complete technical analysis of more than 50 of the most popular communications sets on the market. An invaluable service aid, a perfect buying guide for purchasers of communications receivers. All data based on actual examination and study of each unit. 264 pages; profusely illustrated; durably bound, 8½ x 11". Only..... **$3.00**

NEW! Photofact Volume 5

Latest addition to the famous PHOTOFACT Volume series—brings your file of post-war receiver service data right up to December 1948! Most accurate and complete radio data ever published—preferred and used daily by thousands of Radio Service Technicians. Everything you need for faster, more profitable servicing. Order Volume 5 today—keep ahead with PHOTOFACT—the *only* Radio Service data that meets *all* your needs! In deluxe Binder... **$18.39**

- **Vol. 5.** Models from July 1, 1948 to Dec. 1, 1948
- **Vol. 4.** Models from Jan. 1, 1948 to July 1, 1948
- **Vol. 3.** Models from July 1, 1947 to Jan. 1, 1948
- **Vol. 2.** Models from Jan. 1, 1947 to July 1, 1947
- **Vol. 1.** All post-war models up to Jan. 1, 1947

Radio Industry Red Book

The RED BOOK tells you *in one volume* what you need to know about replacement parts for approximately 17,000 sets made from 1938 to 1948. Includes complete, accurate listings of all 9 major replacement components—not just one. Lists correct replacement parts made by 17 leading manufacturers—not just one. Covers original parts numbers, proper replacement numbers and valuable installation notes on: Capacitors, Transformers, Controls, IF's, Speakers, Vibrators, Phono-Cartridges. *Plus*—Tube and Dial Light data, and Battery replacement data. 448 pages, 8½ x 11", sewed binding. ONLY..... **$3.95**

TUBE PLACEMENT GUIDE. Shows you exactly where to replace each tube in 5500 radio models, covering 1938 to 1947 receivers. Each tube layout is illustrated by a clear, accurate diagram. Saves time—eliminates risky hit-and-miss methods. 192 pages; handy index. ONLY..... **$1.25**

DIAL CORD STRINGING GUIDE. The book that shows you the *one right* way to string a dial cord. Here, in one handy pocket-sized book, are all available dial cord diagrams covering over 2300 receivers, 1938 through 1946. Makes dial cord restringing jobs quick and simple. ONLY..... **$1.00**

FREE Photofact Cumulative Index

The easiest way to own the world's finest Radio Service Data is to subscribe regularly to PHOTOFACT Folder Sets. Send for the FREE Cumulative Index to PHOTOFACT Folders covering *all* post-war receivers up to the present. Helps you find the Folders you want in a jiffy. Get this FREE Index at your Jobber or write for it now.

ORDER THESE BOOKS FROM YOUR LOCAL JOBBER

HOWARD W. SAMS & CO., INC.
INDIANAPOLIS 7, INDIANA

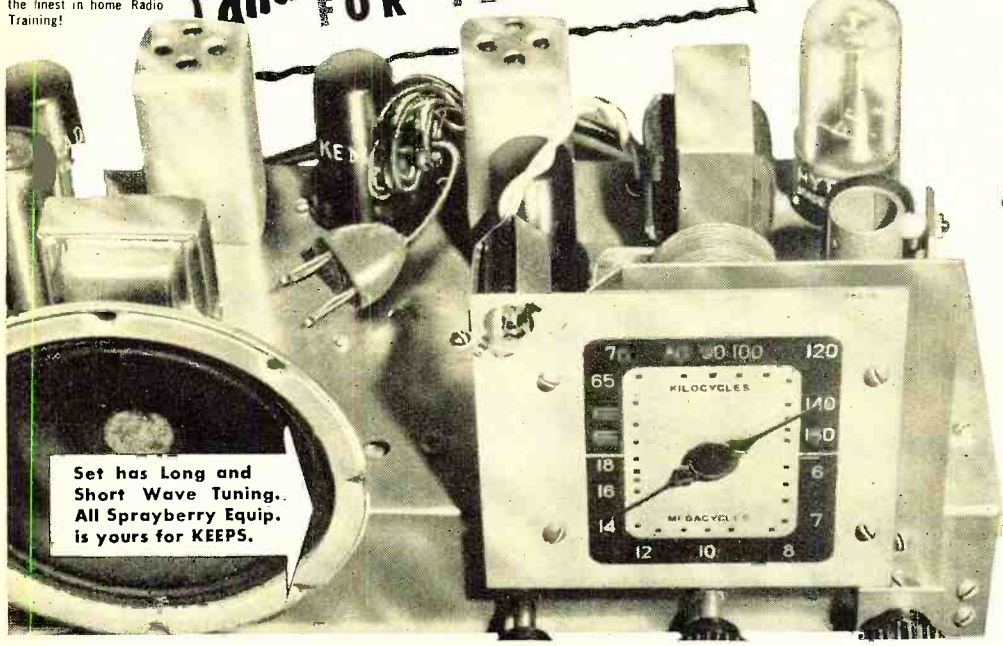
I Put You to Work with Your Hands to LEARN RADIO! You Build Receivers! You Make Typical Defects Occur and Make Tests to Prove the Theory!

F. L. SPRAYBERRY, PRESIDENT of the SPRAYBERRY ACADEMY OF RADIO. This is the man who directs your study. His years of experience and Radio "know-how" assure you of the finest in home Radio Training!

LEARN RADIO to MAKE MONEY!

LOW COST TRAINING — EASY PAYMENT PLAN!

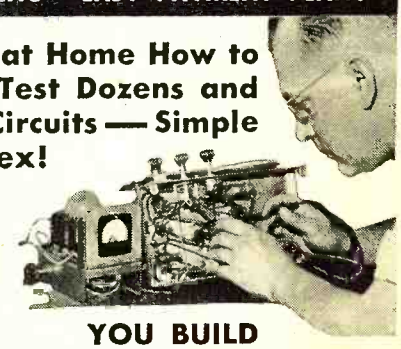
YOU GET 8 BIG KITS OF RADIO PARTS & EQUIPMENT including 2-BAND SUPER RECEIVER! and 16 RANGE METER FOR TESTING



Set has Long and Short Wave Tuning. All Sprayberry Equip. is yours for KEEPS.

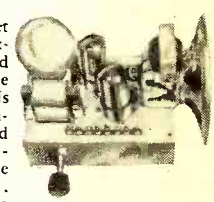
You Learn at Home How to Build and Test Dozens and Dozens of Circuits — Simple and Complex!

YOU DO OVER 175 INSTRUCTIVE EXPERIMENTS

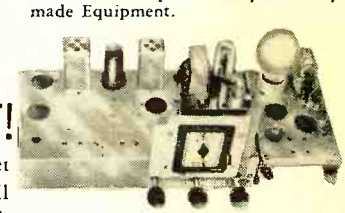


YOU BUILD ALL THESE TESTERS . . . . . AND MORE!

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.



You'll get valuable experience and practice building this Signal Generator and multi-purpose Tester. Makes a breeze out of fixing Radios and you don't have to spend money on ready-made Equipment.



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.

SPRAYBERRY HOME TRAINING is PLANNED to MAKE MONEY for you FAST!

I train you with regular professional Radio Equipment. I tell you exactly what to do . . . how to do it. You handle Radio Parts, see them operate, learn what they're for. With the fine Kits I supply, you learn how to build Radio Circuits, construct your own Test Equipment. I'll show you how to cause typical Radio defects so you can watch and see how they act. You learn the latest methods for trouble-shooting and repair. All this adds up to the finest kind of "bench" experience. And you get it right in your own home. In no time at all, you'll be ready for a business of your own or a good job in Radio, FM, Television, Radar, Industrial Electronics, etc. Now's the time to get started!

VETERANS! Approved for G. I. Training Under Public Laws 16 and 346

SEND FOR MY VALUABLE FREE BOOKS!

NOW! TWO LOCATIONS *To Serve You Better!*
Mail Coupon to Location Nearest Your Home

SPRAYBERRY ACADEMY of RADIO, Dept. 25-N,
SPRAYBERRY BUILDING, PUEBLO, COLORADO, Or
20 NORTH WACKER DRIVE, CHICAGO 6, ILLINOIS

Please rush my FREE copies of "How to Make Money in Radio, Electronics and Television" and "How to Read Radio Diagrams and Symbols."

NAME_____ AGE_____

ADDRESS_____

CITY_____ STATE_____

(Mail in envelope or paste on penny postcard)

For the RECORD.

BY THE EDITOR

AS PROMISED in our last month's column, RADIO & TELEVISION NEWS has provided a stimulus to encourage the training and licensing of new Ham blood in the form of a $10,000 amateur equipment contest to be conducted during 1949. The purpose of this contest is to increase the number of licensed amateurs from its present level of 80,000 to a minimum of 100,000 in 1949. According to Government statistics, amateur radio is showing a declining rate of numerical gain. Coupled with this is the fact that the age of the average licensed amateur has increased from the prewar average of 29-30 to a current average of 34.

Amateur radio needs new blood. To get it RADIO & TELEVISION NEWS is offering amateur radio equipment and complete Ham stations having a value of $10,000 as a reward for those contributing most to the increase and betterment of amateur radio during 1949.

The contest is designed on a point system; for the training and bringing to operator and station licensed status of any new amateur, 1 point for the individual trainer and 1 point for his club or association. Full contest rules will be announced next month. In the meantime, we urge all amateurs to select suitable prospects whom they can train to successfully secure an amateur license by next Fall. Now is the time to get started and we are giving you this advance announcement so that it will receive your careful consideration at a time when it is vital to the future security of our hobby.

Chances are that the majority of the new licensees will be teen-agers who have the time to study radio theory and to learn the code. Unlike the "busy breadwinner" these youths can be trained and ready to take their exams and to get their coveted radio operators license by next Fall. We sincerely hope that all amateurs will do their part to augment our unique hobby.

Our new series "The Beginning Amateur" starts in the next issue. This series will be ideally suited for basic study material and will help the contestant in training his new prospect. As previously mentioned, full contest details and entry blanks will appear in next month's (February 1949) issue. All amateurs will have an equal chance to win and the time to start the ball rolling is now.

SEVERAL months ago we sent a rather lengthy questionnaire to all of our readers. Seventeen major question classifications were divided into sixty-eight individual queries and these were subdivided into three hundred possible specific answers. The questionnaires were distributed to our 185,500 readers.

Many readers have written to us requesting information as to the results of this survey. Briefly, they are as follows; within three weeks of distribution 30% of all subscriber questionnaires and 11% of all newsstand questionnaires had been filled in and returned, at which time tabulation was begun. Quantities received since have raised this total to more than 32,000 or more than 17% of the entire net paid circulation. It was interesting to note that over 97% of these returns were filled out accurately and completely. We are told that this is a new record in useable response to a questionnaire as complicated as the one used.

All screening, tabulating, and statistical counting was done by the *International Business Machine Company.* Here are some of the highlights resulting from this questionnaire. There are more than 1,000,000 people employed in the Radio-TV-Electronic industry.

In the Radio-TV-Electronic industry there are 2015 rated Component and Equipment Manufacturers, 2526 rated Wholesalers and Distributors, 3874 unrated Wholesalers and Distributors.

There are now 18,280 rated Dealers and 8720 unrated Dealers. Radio Servicemen, both full and part time, now total 92,000. At the time the survey was tabulated there were 78,434 licensed amateurs and the number of estimated Short-Wave Listeners has now been established as approximately 80,000.

We asked our 185,500 net paid circulation, "Do you share your copy of RADIO & TELEVISION NEWS with others?" The average was 2.1 readers per copy or a total of 393,991.

Of particular interest is that the average reader earns more than 50% of his total income from employment in some phase of the Radio-TV-Electronic industry and indicates his preference for this magazine by a margin of better than 3½ to 1. Mr. Average RADIO & TELEVISION NEWS Reader is 29½ years old.

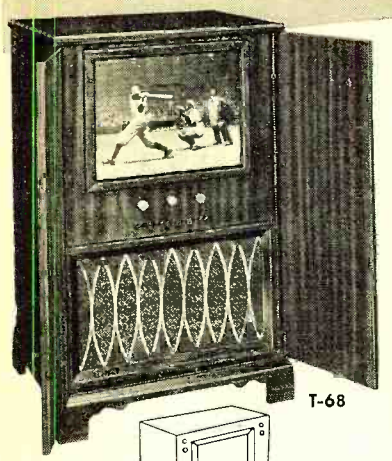
The above are only a few of the many questions answered and tabulated.

We would like to thank all of you for your cooperation in taking the time to fill out such a lengthy questionnaire. Your help makes it possible for us to satisfy your needs for specific types of material. RADIO & TELEVISION NEWS is designed as your book, therefore, such questionnaires serve as an indication of editorial material which will be of the greatest value to the majority of readers. Again, many thanks. . . . . O. R.

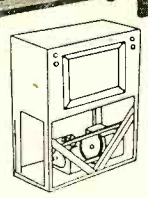
Get Your ALLIED Catalog Now

180 Value-Packed Pages Featuring Everything New in Radio!

FREE



IMMEDIATE SHIPMENT FROM STOCK



NEW! Projection Television by Hallicrafters—16″x12″ Screen Amazing 192 Sq. Inch Picture!

Develops a brilliant, steady, optically correct picture; glare-free for comfortable viewing both at close range or distance, day or night. Optical system stays in perfect, stable adjustment. Includes following features: 2½″ magnetic projection triode, sealed optical unit, 25 kv high voltage unit, 12 channel push-button selector, RF amplifier, 3 IF amplifiers, 2 video amplifiers, special synchronizing circuits, AGC and black level control, single picture control, inter-carrier FM system. Complete with 20 tubes, plus projection triode and 5 rectifiers. In handsome classic Chippendale mahogany cabinet. For 105-125 volts, 50-60 cycles AC.

97-805. Hallicrafters T-68 Projection TV in console. NET, f.o.b. Chicago **$695**

97-801. Hallicrafters T-60 Projection TV in rack (less cabinet) for custom installation. NET, f.o.b. Chicago **$595**

Send for the ONE COMPLETE Radio Buying Guide!

Get the Radio Buying Guide that's used by thousands of expert servicemen, engineers, amateurs, soundmen, builders and experimenters. Get every buying advantage at ALLIED—widest selection of equipment at money-saving low prices—speedy, expert shipment—personal attention—complete satisfaction on every order. Get your ALLIED Catalog today!

Short Wave Listeners! DX Fans! SX-62

HALLICRAFTERS' special SWL Receiver! Tuning range: 540 kc to 110 mc, continuous—world-wide Short Wave and special services; broadcast and all FM channels between 27 mc and 110 mc. Features: professional slide-rule dial; 500 kc crystal calibrator; single knob tuning, 60 to 1 ratio; bands illuminated separately; series type ANL; 4-position tone control; high-fidelity audio; 6-step filter; dual IF channels; crystal filter; 8 watts output, etc. In handsome steel cabinet. With tubes.

97-540. SX-62. NET, f.o.b. Chicago **$269.50**

97-780. R-42 Speaker to match. NET .. **$34.50**

97-568. B-42 Tilt-Base. NET **$7.50**

Hallicrafters 10″ Direct View!

Here's an unbelievably sharp picture, with excellent stability and truly photographic contrast. Priced amazingly low for the quality. Features include: 12 channel push-button tuning, RF amplifier, 3 IF amplifiers, 2 video amplifiers, improved sync circuits, AGC, static-free FM. Complete with 19 tubes, plus 10″ picture tube and 3 rectifiers. In rich mahogany table cabinet. For 105-125 volts, 50-60 cycles AC.

97-804. Hallicrafters T-67, 10″ TV wood table model. NET, f.o.b. Chicago **$299.95**

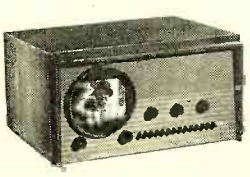
97-802. Hallicrafters T-61. As above, in black plastic cabinet. NET, f.o.b. Chicago **$289.95**

Famous Hallicrafters 7″ TV Receiver

An immensely popular TV receiver at low cost! Provides a brilliant 23 square-inch picture. Easy to operate; excellent sound; install it yourself.

97-803. Hallicrafters 505 in mahogany cabinet. NET, f.o.b. Chicago **$199.50**

97-800. Hallicrafters T-54, as above, but in gray furniture-steel cabinet. NET, f.o.b. Chicago **$189.50**



Radio's Leading Buying Guide... **FREE**

Everything in Radio and Electronics

ALLIED RADIO

ALLIED RADIO CORP., Dept. 1-A-9
833 W. Jackson Blvd., Chicago 7, Illinois

- ☐ Send FREE 180-Page ALLIED Catalog
- ☐ Enter order for Hallicrafters Model.....
  Enclosed $.. ☐ Full Payment ☐ Part Payment (Bal. C.O.D.)
- ☐ Send ALLIED Easy Payment Plan details and order blank.

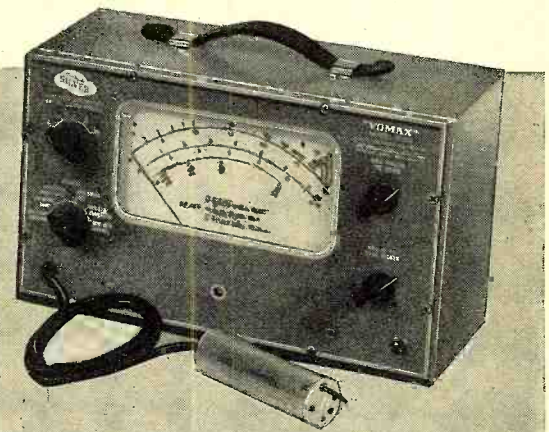
Name.....

Address.....

City..... *Zone*..... *State*.....

LOOK TO McMurdo SILVER FOR FM-TV SERVICE REQUIREMENTS

Here — at prices you can afford — are five Laboratory Caliber Electronic Test Instruments that you need to insure efficient and profitable **AM - FM - TV** *servicing.*



MODEL 900-A "VOMAX"

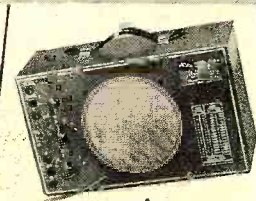
The new "VOMAX" is the truly universal v.t.v.m. — makes TV, FM and AM measurements accurately — at highest meter resistance. Giant meter, non-breakable glass; 45 ranges; new single probe for a.c., d.c., a.f., r.f., volts, ohms, db. and current measurements. "VOMAX" can be used for measuring TV power supply potentials up to 30 Kilovolts when used with our new High Voltage Adaptor Probe. Advancing far beyond its predecessor, choice of experts, "VOMAX" equips you with the world's newest and finest meter for only **$68.50 net.**

MODEL 911 TV/FM SWEEP GENERATOR

2 thru 226 mc.; electronic sweep adjustable 0 to 10 mc.; high output adjustable 0 to ½ volt Separate 1 mc. and 5 mc. precision crystal marker oscillators insure correct TV video i.f. curve shape and width; phasing control and 60 ~ sine-wave 'scope TV sweep voltage; 120 ~ saw-tooth FM 'scope sweep voltage All this only **$78.50 net.**

MODEL 906 FM-AM SIGNAL GENERATOR

Choice of the big engineering laboratories plus thousands of service technicians, 906 stands out as maximum value. 90 kc. thru 210 mc. in 8 ranges; ±1% accuracy; less than ½ microvolt, including strays to over 1 volt v.t.v.m.-metered output; multiple shielding; adjustable 0 to 100% amplitude modulation, adjustable 0 to 1,000 kc. FM sweep. Price only **$116.50 net.**



MODEL 905-A "SPARX"

Combining signal-tracer and universal test speaker, 905-A is amazingly sensitive yet free of usual tracer hum Vacuum-tube prod with r.f.-a.f. switching; high-gain high-fidelity amplifier, 6" PM speaker; 18-watt output transformer gives wide choice of impedances. Two essential instruments in one, 905-A is a value far exceeding **$44.50 net.**

904 C/R BRIDGE

A condenser resistor tester of precision caliber. ¼ mmfd./1000 mfd.; ¼ Ω/1000 meg Ω; variable d.c. polarizing voltage leakage current; 0/50% power factor. Laboratory accuracy of ±3%. Measures all condensers with 0/500 V. rated d.c. volts applied. Only **$49.90 Net**

MAIL POST CARD *for new catalog showing complete line of Laboratory Caliber Electronic Test Instruments.*

OVER 37 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McMurdo Silver Co., Inc.

EXECUTIVE OFFICES: 1240 MAIN ST., HARTFORD 3, CONN.
FACTORY OFFICE: 1249 MAIN ST., HARTFORD 3, CONN.

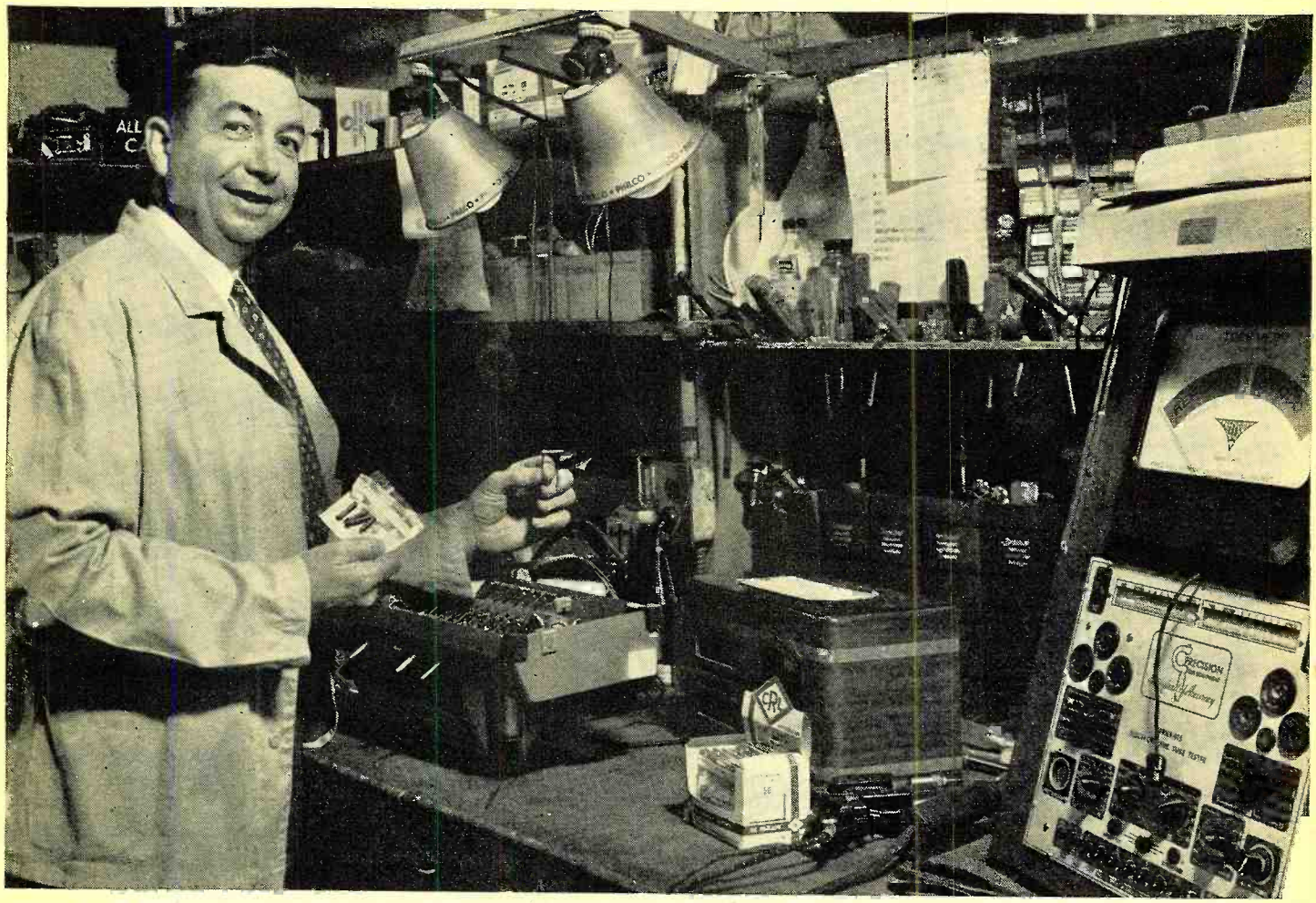
WARD Magic Wand ANTENNAS

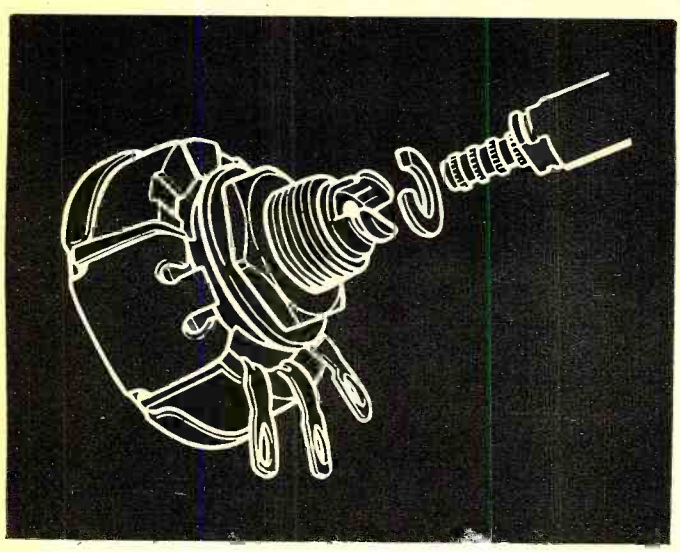
THE ONLY BROAD BANDED, HIGH GAIN, STACKED ARRAY ON THE MARKET

Many times more sensitive for TV reception in fringe areas and poor signal locations, the WARD TVS-6 STACKED ARRAY achieves maximum forward gain by stacking two high gain folded dipoles and reflectors with effective ½ wave spacing rather than the ordinary ⅛ or ¼ wave which materially reduces sensitivity. THE ONLY STACKED ARRAY ON THE MARKET THAT IS BROAD BANDED, it will give excellent results with MANY CHANNELS where others are too selective. The advanced engineering and PRE-ASSEMBLED design of the WARD TVS-6 is only one of the reasons why WARD is the largest exclusive manufacturer of antennas in the world. See any leading parts distributor or write for catalog.

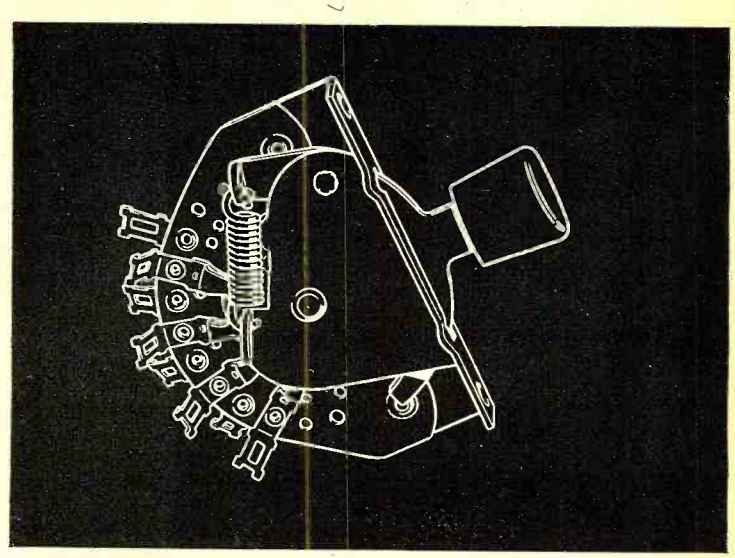
THE WARD PRODUCTS CORPORATION · 1523 E. 45TH STREET, CLEVELAND 3, OHIO

Build profits 3 ways





Controls: With CRL's improved *Adashaft* Radiohms you can carry a small stock of controls, yet be ready to handle almost any kind of control replacement problem. No wiggle, no wobble, no slip. Just insert shaft pilot in control stub shaft, and slip "C" washer into place. Available in all sizes for all model "M" volume control applications. Six types of shafts.



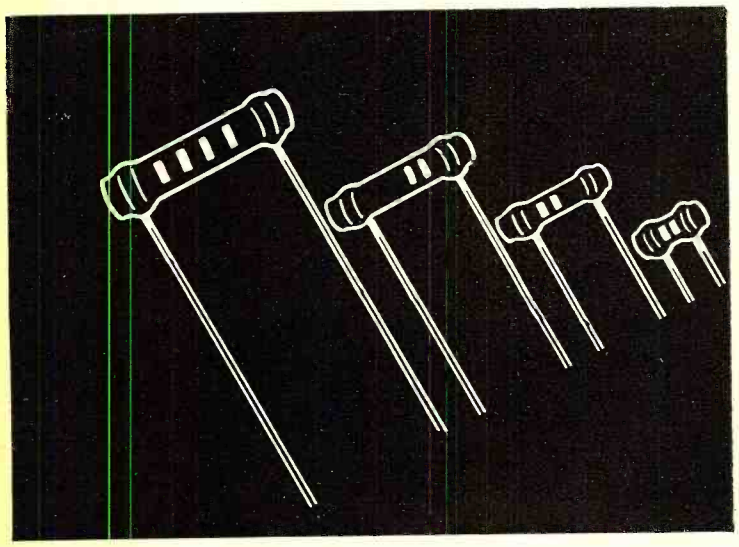
Switches: Centralab offers you a complete line of Tone, Rotary Selector, Lever Action and Medium Duty Power Switches, which features a wide variety in both laminated phenolic and steatite insulation. Available with shorting or non-shorting contacts. See your Centralab Distributor for further information, or write direct for new Catalog 26.

with Centralab parts

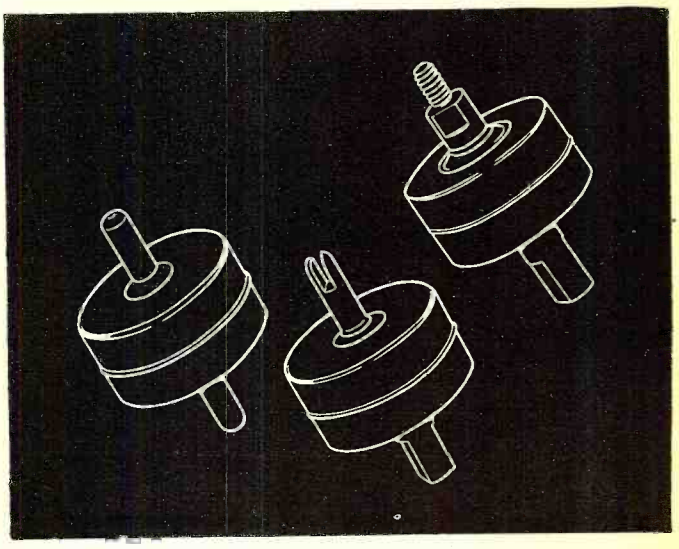
Three real advantages are yours when you use dependable CRL replacement parts in your shop. That's the word of successful servicemen everywhere. These men report — 1. Centralab parts are easy to stock . . . easy to identify. Many CRL components are packaged to give you more shelf space . . . neater displays. All are clearly labeled for quick identification. 2. Centralab parts are easy to use. CRL design speeds repairs by eliminating tricky bending or fitting operations. 3. Centralab parts provide performance that insures repeat orders . . . invites new customers. Yes — Centralab parts can help you build up your service business. Get the complete story from your CRL distributor.

— Phil A. Smith, owner of the Smith Radio & Appliance Company, Shorewood, Wisconsin, says, "I've been in the radio-servicing business 21 years — using Centralab replacement parts from the beginning. During this period I've had plenty of opportunity to prove just how dependable CRL parts are."

Centralab
CRL
Division of GLOBE-UNION INC., Milwaukee



"Hi-Kaps": CRL line of ceramic By-pass and Coupling Capacitors gives you ceramic dependability and permanence at a new low price! Packaged in a convenient envelope of five, *Hi-Kaps* are clean, easy to stock and handle. Wide range from .000050 to .010000 mfd. Rating — 600 WVDC, 1000 VDC. flash tested. Ask your Centralab Distributor for all the facts.



"Hi-Vo-Kaps": Just out! Centralab's new high voltage capacitors for television and high voltage applications. Made of Ceramic-X, *Hi-Vo-Kaps* combine high voltage and small size to give you convenient, dependable performance. 10,000 WVDC, flash tested. 20,000 VDC. Capacity — 500 mmf. See your CRL Distributor, or write direct.

Spectacular Bargains

RECORD-BREAKING SALE OF MOBILE EQUIPMENT FOR HAMS!

PREPARE FOR SUMMER OPERATING FUN NOW!

Here's hot news for you budget-minded fellows who have your hearts set on owning a first class mobile installation. A gigantic special purchase of famous Harvey-Wells Aircraft Communication Equipment makes these super values possible. Truly, they're the greatest bargains we've ever offered! Look at the prices and you'll agree that the savings are terrific!

PLACE YOUR ORDER NOW FOR IMMEDIATE DELIVERY

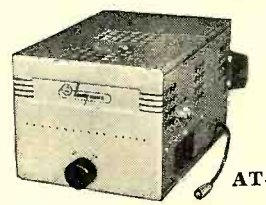
AR-3-A

HARVEY WELLS RECEIVER

A 5 tube super-het with 1 stage of R. F. designed for Aircraft, but with many Ham applications. Operates from dry batteries. Freq. range, 195 Kc. to 405 Kc. and 550 Kc. to 1500 Kc. in two bands. Has fixed freq. position at 278 Kc. for tower reception and 1020 Cy. filter for Range voice reception. Ideal for use with a converter or modified for portable or mobile work. Tube line-up: 1LC5 R. F. Amp., 1LC6 Converter, 1LC5 I. F., 1LD5 2nd det and 1st A. F., 1LB4 Output. Brand new and at a bargain price. Complete with tubes, battery, connecting cable and instruction manual.

Stock No. 4-F-7 Model AR-3-A. Shpg. Wt. 13½ lbs. Regular price $79.50. Our Price

ONLY $24.95 DELIVERED



AT-3-B

HARVEY WELLS TRANSMITTER

A crystal controlled transmitter designed for aircraft, but easily adapted to Ham applications with slight modifications. Operates from 6 Volts D. C. 10-12 watts R. F. output. Crystal freq. 3105 Kc. Completely self contained including power supply. Push to talk operation. Internal antenna tuner. Tube line-up: 7C5 xtal osc., 7C5 final amp., PP 7C5 Class AB modulator. Brand new and at a price that is right. Complete with tubes, Xtal, 6 Volt D. C. vibrator power supply, connecting cables and instruction manual.

Stock No. 4-F-4 Model AT-3-B. Shpg. Wt. 17 lbs. Regular Price $74.50. Our Price

ONLY $24.95 DELIVERED

ATR-3

HARVEY WELLS TRANCEIVER

This unit is a combination transmitter and receiver of the same general description as the AT-3-B xmitter and the AR-3-A Rec. except the receiver utilizes 6 volt tubes for use on 6 volts D. C. and vibrator pack operation. Completely self contained. An ideal set-up for Ham portable or mobile operation by modifying circuit. Brand new and at a price that can't be passed up. Tube line-up: 7A7 R. F. Amp., 7A7 Xtal osc., 7Q7 convertor, 7R7 I. F. and Det., 7F7 1st A. F., 7C5 R. F. output, PP 7C5's A. F. output and Modulator. Complete with tubes, Xtal, 6 volt D.C. vibrator power supply, connecting cables and instruction manual.

Stock No. 4-F-2 Model ATR-3. Shpg. wt. 14½ lbs. Regular Price $159.95. Our Price

ONLY $49.95 DELIVERED

SHIPPED PREPAID ANYWHERE IN CONTINENTAL U. S.

NOT SURPLUS BUT BRAND NEW, POST-WAR DESIGN and MANUFACTURE!

YOUR **TRADE-IN'S WORTH MORE AT**

THE WALTER ASHE STORE

"SURPRISE" TRADE-IN ALLOWANCES ON YOUR USED, FACTORY-BUILT TEST INSTRUMENTS AND COMMUNICATIONS EQUIPMENT

Use the coupon below

Save on these wanted items of

WAR SURPLUS

All prices F.O.B. St. Louis

Filter Condenser, 2X2500 vdc. Aerovox, oil filled. Shpg. Wt. 3 lbs.	$ 3.25
Headphones, Type HS-16, 2000 ohms impedance. Shpg. Wt. 3 lbs.	1.47
Hand Mike, T-17B. S.B. carbon with plug. Shpg. Wt. 3 lbs.	1.25
Transmitting Key, Type J-38 with base. Shpg. Wt. 3 lbs.	1.25
Coaxial Cable, Type RG8/U per foot .06 per 100 ft. 5.00 per 1000 ft.	45.00
Filter Choke, No. 8056. 8 Hy. X 500 Ma. 55 ohms D.C. Res. Shpg. Wt. 28 lbs.	11.85
Filter Choke, No. 6317. 4 Hy. X 300 Ma. 40 ohms D.C. Res. Shpg. Wt. 13 lbs.	4.95
Filter Choke, No. 10062. 10 Hy. X 250 Ma. 110 ohms D.C. Res. Shpg. Wt. 13 lbs.	3.49
Modulation Transformer, RCA 1 KW. Pri. up to 10,000 ohms P to P. 1:1 ratio. Sec. No. 1, 450 Ma. Sec. No. 2 80 Ma. for beam tube screen. Shpg. Wt. 55 lbs.	14.95

WALTER ASHE RADIO CO.
Bill DuBord, WoQDF, Mgr., Amateur Div.
1125 Pine St., St. Louis 1, Missouri R-49-1

☐ Rush Harvey-Wells Communication Equipment as follows: ☐ AR-3-A, ☐ AT-3-B, ☐ ATR-3. Remittance for $_____ is enclosed.

☐ Quote bigger-than-ever "Surprise" trade-in allowance on my _____ for
(describe used equipment)

_____
(show make, model of new equipment desired)

☐ Send Bargain List of Reconditioned, "Good-As-New" ☐ Test Instruments, ☐ Communication Equipment *(check one or both)*.

☐ Rush my FREE copy of your new 1949 Catalog.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

FREE!

Big, new 1949 Catalog of Radio, Electronics and Television. The treasure chest of values. Order your copy today!

PHONE

CHestnut 1125

USED, RECONDITIONED, "GOOD-AS-NEW" TEST INSTRUMENTS AND COMMUNICATION EQUIPMENT AVAILABLE AT AMAZINGLY LOW PRICES. SEND FOR COMPLETE LIST OF THESE BARGAINS.

Walter Ashe RADIO CO.

THE HOUSE OF "SURPRISE" TRADE-INS

1125 PINE ST. • ST. LOUIS 1, MO.

CHICAGO TRANSFORMER
the Complete Line

No. BO-6
List Price $23.00

Response within .2 db 30 to 20,000 cycles
Full Frequency Range Output Transformer

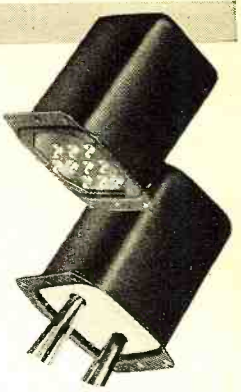
No. BO-6. For use in high fidelity amplifiers. Couples push-pull 6L6's (7500 ohms, C-T) to 6/8 or 16/20-ohm voice coil. Center-tapped tertiary winding provides 15% inverse feed-back to reduce harmonic distortion to a minimum. In drawn steel case, 4 5/16" x 3 7/8" x 3 11/16", with mounting studs and convenient pin-type terminals.

HIGH Q CHOKES for Dynamic Noise Suppression Circuits

Two precision-built chokes with inductance values of .8 and 2.4 henrys respectively—accurate to within ± 5% with up to 15 ma d-c. Units have a minimum Q of 20. Remarkably compact, 1 11/16" x 2 3/8" x 1 7/16".

No.	Inductance	List
NSI-1	.8 h	$10.00
NSI-2	2.4 h	10.00

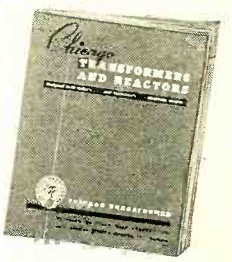
Famous "Sealed in Steel" New Equipment Line
The "Engineer's Transformer"



Chicago Transformer's New Equipment Line offers transformer engineering *ahead* of the trends in circuit design. It's the transformer line preferred by experts in the P.A., ham, communication and experimental fields, and by broadcast stations and manufacturers.

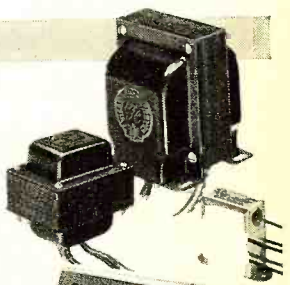
Check these features—*drawn steel cases* to provide compact, streamlined mounting; *conservative ratings* that meet all RMA and FCC recommendations; *precision characteristics* for stable, uniformly excellent performance—these and many others. Check the prices—and you'll learn how little more these advanced units cost over conventional transformers.

Included in the New Equipment Line are Power Transformers and exactly matched Chokes, Filament and Bias Transformers, and complete listings of high fidelity audio units to meet the requirements of the three important frequency ranges. Get the complete facts now on the "Engineer's Transformer."



Write for Complete "New Equipment" Catalog Today

New Replacement Transformer Line
Premium Quality—Yet They Cost No More



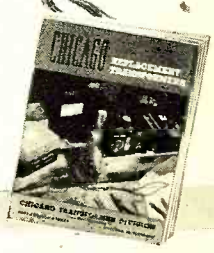
The new CT Replacement Line provides servicemen with a wide range of standard ratings that fit the most frequent power and audio transformer requirements. These units are backed by CT's 20 years of manufacturing experience. Yet CT quality *costs no more.* Just check these typical listings:

Power Transformer No. PH-70B. 350-0-350 v. a-c, 70 ma d-c; filaments 5 v., 3 amps and 6 v. C-T, 2.5 amps; horizontal shield mounting.....List Price, **$7.30**

Filter Reactor No. R-650. 6 henrys, 50 ma d-c, 300 ohms d-c resistance; clamped frame mounting.....List Price, **$1.65**

Universal Output No. RO-303. Single or push-pull plates (2500 to 14000 ohms) to 2/4/6/8/15-ohm voice coil; 40 ma pri. d-c; 8 audio watts output; clamped frame mounting.....List Price, **$2.75**

Write for Complete Descriptive Catalog and Prices



Television Transformers *to fit today's leading TV circuits*

Because Chicago Transformer is the largest single supplier of transformers to the Television industry, you gain the advantages of "Original Equipment" components when you buy Chicago TV Transformers. Available now, the three units described here are part of a complete new line, soon to be announced.

Vertical Blocking Oscillator Transformer No. TBO-1. 60-cycle unit for creating the vertical sweep "saw-tooth" voltages required in conventional circuits.

Pri. Inductance: 1.15 hy ± 20% at 3 v., 1000 cycles
Pri. Leakage Inductance: 8 mh + 25%, −15%
Ratio, Primary to Secondary: 1 to 4.2

Exact equivalent to R. C. A. Part No. 208T2. List Price, **$3.10**

TV Power Transformer No. TP-365. Designed to supply 405 volts d-c with two 5U4G's to an 80 mfd condenser input. Copper shorting band around core reduces external magnetic field; cuts image distortion to a minimum.

Pri.: 115 v., 60 cycles
H.V. Sec.: 362-0-362 v., a-c, .295 amps d-c
Fil. No. 1: 12.6 v., 5 amps, C-T
Fil. No. 2: 5 v., 2 amps
Fil. No. 3: 5 v., 6 amps

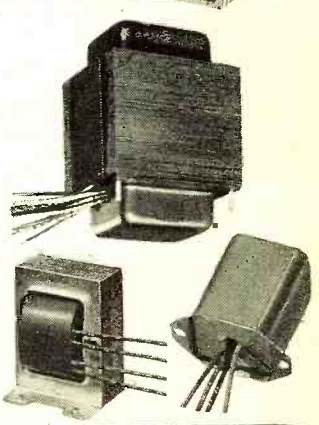
Exact equivalent to R. C. A. Part No. 201T6. List Price, **$26.00**

Vertical Scanning Output Transformer No. TSO-1. Couples vertical output tubes to picture tube deflection yoke.

Pri. Impedance: 19,000 ohms at 30 v., 60 cycles, 13 ma d-c
Ratio, Primary to Secondary: 10 to 1

Exact equivalent to R. C. A. Part No. 204T2. List Price, **$5.90**

Write for Descriptive Literature



CHICAGO TRANSFORMER
TRADE MARK REG.

CHICAGO TRANSFORMER
DIVISION OF ESSEX WIRE CORPORATION

3501 ADDISON STREET • CHICAGO 18, ILLINOIS

Millions of nationally-known receivers produced annually are equipped with Chicago Transformers

Spot Radio News

★ *Presenting latest information on the Radio Industry*

By RADIO & TELEVISION NEWS' WASHINGTON EDITOR

THE STRIKING ROLE which radio communication plays in *public safety* and industries was dramatically revealed during the recent Washington hearings involving the changes of the *rules and regulations governing public safety radio services* (formerly called *emergency radio services).*

An intriguing illustration was the motion picture industry, where it was learned radio setups are essential at remote locations and between various units at locations. Detailing these features at the hearings, attorneys for the Motion Picture Research Council, who presented the case for the movie makers, said that radio provides communication between remote locations and the nearest commercial communication facilities for the safety and protection of life and property and for the conduct of essential business, and, in addition, provides communication between the various units of a location in order that action and sequence of action can be timed, not only for successful photography, but to prevent or minimize loss of life in the event of a miscarriage of planned events. Describing a typical instance where radio played a major part, the movie producers' counsel said that during the making of the picture *Fort Apache,* which was photographed primarily in Monument Valley where the nearest telephone was twenty-eight miles away, radio provided not only instant means of outside contact but saved the life of one of the actors who had suffered a bad fall from a horse and required immediate hospital attention. The attorneys also reported that there have been numerous instances where actors and actresses have become violently ill and only through radio communication has it been possible to make instantaneous contact with the studio or with their doctors to prevent permanent or fatal injuries. For example, they pointed out, during the filming of *Happy Times,* Danny Kaye dislocated a vertebra which could not be treated by the first-aid personnel who were present. By means of radio, Kaye's own doctor was contacted and arrived at the location in time to prevent further and serious injury.

In view of the vital services which radio provides, the film makers requested that the FCC reconsider its proposed ruling which would eliminate specific frequencies for the motion picture industry. The film attorneys reported that the FCC proposals could "have been reached only because of a lack of understanding and appreciation of the dependency that motion picture producers have on the use of radio as an essential means of communication in the filming of pictures. In addition, this exclusion of the motion picture industry from the radio spectrum ignores its paramount importance as a means of education and information not only for the American people, but for the people throughout the world, an importance certainly not claimed by those who lay pipes, drill oil wells, and cut trees."

At present four studios are licensed and operate their own equipment: Columbia Pictures, Warner Brothers, Paramount, and 20th Century-Fox. Facilities for other companies are supplied by private carriers, such as the Red Starr Sound Systems. Frequencies used include 1652 kc., 30.62 mc., 31.06 mc., 33.54 mc., 152.75 mc., 162.99 mc., 153,11 mc. and 153.47 mc.

Twentieth Century-Fox representatives also appeared to describe the need for radio, stating that they do not ask for equal consideration with power, petroleum, or forest products radio services, since the great importance of these services to our national economy cannot be disputed. The only effect the film producers request for frequencies would have on these services, the attorneys said, would be "to deny them the use of the twelve frequencies earmarked for the motion picture stations after the exhaustion of their assigned frequencies, and this, if prejudicial at all, is so remotely so as to justify no serious objection thereto."

PRESENTING THE VIEWS of the radio committee of the International Municipal Signal Association, Herbert A. Friede, committee chairman, said that the allocations in the 152-162 mc. band are not adequate to care for the needs of the Fire Services, since it is not possible to engineer and install a complete system within the allotted channels.

Friede reported that this condition was very evident when the city of New York attempted to equip its fire department. He pointed out that the

Our GREATEST OFFER in 17 YEARS

Amazing New EQUIPMENT Helps Prepare You FASTER, EASIER for . . .

TELEVISION
Radio...Electronics

Here's good news . . . big news . . . our BIGGEST NEWS in 17 years. The equipment pictured at left gives a partial idea of D.T.I.'s remarkable, new combination of shop-method training aids . . . to prepare you AT HOME for your start in Television-Radio-Electronics.

Get 48-Page Book FREE

Mail coupon today for D.T.I.'s big new 48-page *OPPORTUNITY GUIDE BOOK*. See how this amazing *newer method* helps you get started toward a *GOOD JOB* or your *OWN BUSINESS* in one of America's most promising, thrilling fields . . . that includes Television . . . F.M., Train, 2-Way Taxi, Aviation, and Broadcast Radio . . . Industrial Electronics . . . and other fast-developing branches.

In addition to well-illustrated lessons, you work over 300 instructive experiments from 16 shipments of Radio-Electronic parts. Among these projects you build and keep a commercial-type CATHODE RAY OSCILLOSCOPE . . . that helps you get practical Television circuit training. You also build and keep a double-range R-F SIGNAL GENERATOR, a jewel-bearing MULTI-METER and a quality 6-tube SUPERHET RADIO.

OSCILLOSCOPE

MULTI-METER

R-F SIGNAL GENERATOR

6-TUBE RADIO RECEIVER

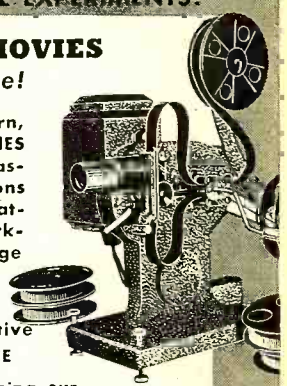
YOU BUILD AND KEEP ALL OF THE EQUIPMENT AT LEFT . . . MAKE OVER 300 HOME EXPERIMENTS!

MODERN CHICAGO LABORATORIES

If you prefer, you can get ALL your preparation in our new, Chicago training laboratories . . . one of the finest of its kind. Ample instructors . . . modern equipment . . . Write for details!

You also use **HOME MOVIES** . . . *a D.T.I. Exclusive!*

D.T.I. alone includes the modern, visual training aid . . . MOVIES . . . to help you learn faster, easier at home. You see electrons on the march and other fascinating "hidden action" — a remarkable home training advantage that speeds your progress.



You Get D.T.I.'s Effective EMPLOYMENT SERVICE

When you complete your training, our effective Employment Service is available to you without extra cost, to help you get started.

MAIL TODAY!

DeForest's Training, Inc.
2533 N. Ashland Ave., Dept. RN-F1
Chicago 14, Illinois

Send me FREE your 48-page OPPORTUNITY GUIDE BOOK showing how I may make my start in Television - Radio - Electronics.

Name_____ Age_____

Street_____ Apt._____

City_____ Zone_____ State_____

DeFOREST'S TRAINING, INC.
CHICAGO, ILLINOIS
Affiliated with the De Vry Corporation
Builders of Electronic and Movie Equipment

city is . . . "divided into five boroughs, each comparable to a city and in addition the marine service, plus a channel necessary for coordinating purposes, are very essential to provide an adequate radio service. . . . If a system properly engineered to meet the needs of this department should be installed in the 152-162 mc. bands those cities adjacent in New Jersey could not hope to operate in the same part of the spectrum as all usable frequencies as allocated would be used in New York City."

Friede also covered the Civil Defense aspect of the problem. He said that a completely independent network of these services, in cooperation with the military, is very desirable and necessary. It was learned that the Fire Services are establishing completely equipped disaster mobile units or field headquarters with an independent source of supply for all purposes. These will be assigned to battalions or groups of fire fighting units and will respond on all multiple alarms of fire. They will also accompany fire fighting equipment when responding to mutual aid calls, and act as field headquarters or communications unit during the time such units are in service at the scene of fire, and in case of war or other serious abnormal conditions would be in the affected area to constantly maintain contact with headquarters, keeping those in command in contact with all operating mobile units and those using pack sets, messengers and perhaps citizens radio apparatus.

IN ANOTHER APPEAL for reconsideration of the public safety frequency proposals, the United States Independent Telephone Association attorneys declared that the assignments are "woefully inadequate to permit common carrier telephone companies to carry out their responsibility of rendering adequate and efficient service. . . . In fact if these present assignments stand, services now rendered by telephone carriers will have to be curtailed and persons now served on an experimental basis will be deprived of these services because of the reduction of channels."

The association representative declared that analyses made by some of the independent telephone companies have indicated the need for at least eighty frequencies or twenty usable alternate channels in the foreseeable future for general public purposes.

Eighteen classifications of persons or groups now using the mobile radiotelephone service were cited: Ambulance; doctors and physicians; security services such as burglary, fire, and protection agencies; public health; food distribution services, including dairies and other perishable commodity handlers; fuel distribution services; automobile repair and towing services; aircraft transportation; taxicab operation; railroad transportation; small police and fire departments; protection services, including armored cars; pick-

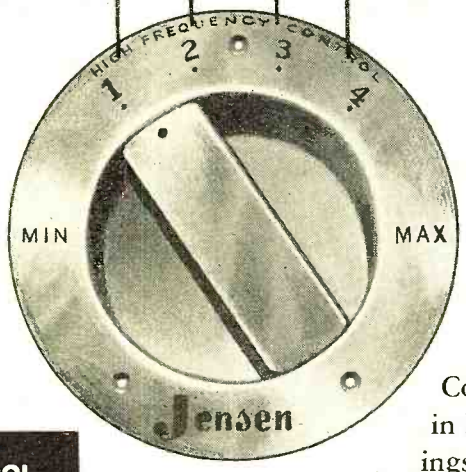
(*Continued on page* 148)

2. for average "AM" Broadcast

3. for High-quality "AM", "LP" Records, and Transcriptions

1. for some Phono Records and "SW" Broadcasts

4. for "FM" and Television Sound

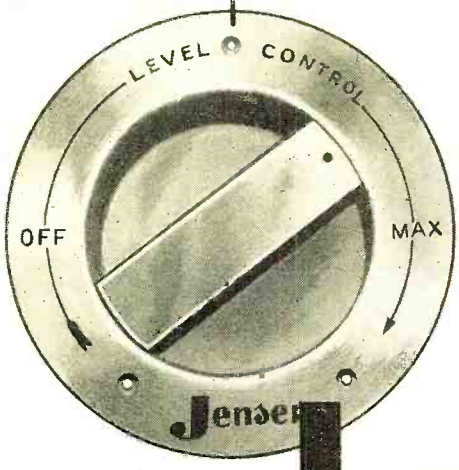


FOR GREATER LISTENING PLEASURE

—MATCH YOUR SPEAKER RESPONSE TO THE PROGRAM

Complete listening enjoyment of the quality inherent in FM broadcasts and high-fidelity phonograph recordings may require loudspeaker response up to 12,000 cycles or more. AM broadcasts may demand response of 5,000 cycles or less, while other program material may call for other high-frequency cut-off points. Matching loudspeaker response to today's wide range of program material is essential for real listening pleasure. Jensen Coaxial speakers (Models HNP-51, JAP-60 and JHP-52) meet this need simply and positively. A 4-position high-frequency selector switch adjusts the speaker response to suit listener preference and a level control adjusts the overall volume of the program. These two controls are exclusive JENSEN features.

OVER ALL LEVEL CONTROL



Jensen Coaxial SPEAKERS

JENSEN MANUFACTURING COMPANY, 6625 S. LARAMIE AVE., CHICAGO 38, ILL.
IN CANADA: COPPER WIRE PRODUCTS, LTD., 11 KING ST., W., TORONTO

Model HNP-51 Coaxial

Without doubt the finest existing 15-inch Coaxial loudspeaker regardless of price. Compression-type h-f unit contributes to an exceptional polar pattern and realistic "presence". Frequency response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 25 watts maximum speech and music signal input. Input impedance 500-600 ohms.

List price $125.00

Model JAP-60 Coaxial

A superior quality 15-inch Coaxial loudspeaker with excellent polar pattern. Response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 20 watts maximum speech and music signal input. Input impedance 500-600 ohms.

List price $85.00

Model JHP-52 Coaxial

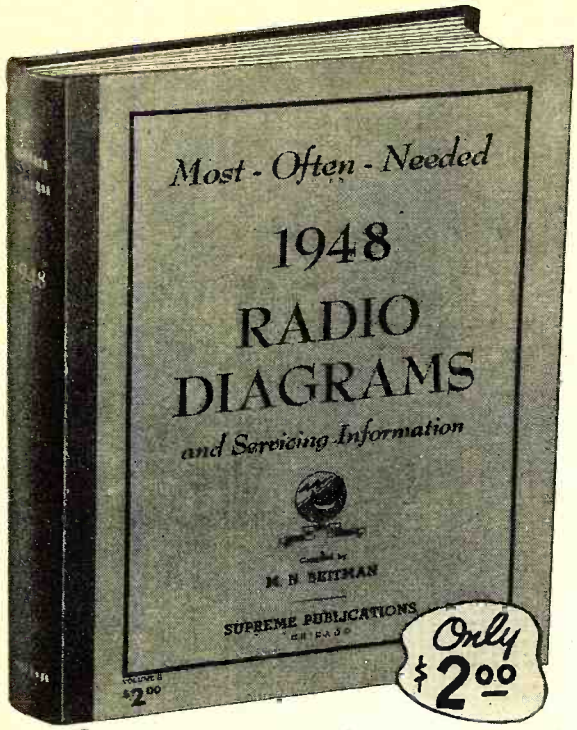
A high-quality 15-inch Coaxial loudspeaker at an economy price. Frequency response, in a Bass Reflex enclosure, extends through the entire useful frequency range. Power rating 16 watts maximum speech and music signal input. Input impedance 500-600 ohms.

List price $72.00

Model JRP-40 Coaxial

The ultimate in 12-inch Coaxial value. Frequency range, in a Bass Reflex enclosure, from 50 to 12,000 cycles. Power rating 12 watts maximum speech and music signal input. Input impedance 6-8 ohms. "Bridging" type network. H-F range control not included but "shelving" type control (ST-606) may be added by user.

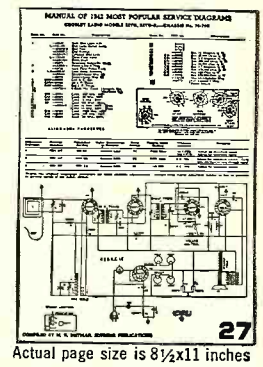
List price $30.00



Supreme Publications
Popular Diagram Manuals

Compiled by M. N. Beitman, radio engineer, teacher, author & serviceman.

Here is your money-saving source of service data and diagrams for all popular sets. Let these easy-to-use manuals guide you to quick fault finding and simplified repair of any radio. Eliminate guesswork, cut hour-wasting jobs to pleasant moments. For 15 years, radio servicemen expected and received remarkable values in **Supreme Publications** service manuals. The new, giant-size, 1948 manual covers all recent radios. Like the previous volumes listed below, it sells at the bargain price of only $2.00—nothing else to buy, nothing else to pay, covers a whole year of radio diagrams. Only a publisher who sold over a million of various radio manuals can offer such values based on tremendous volume-sales. **No-risk** examination granted to servicemen.



Actual page size is 8½x11 inches

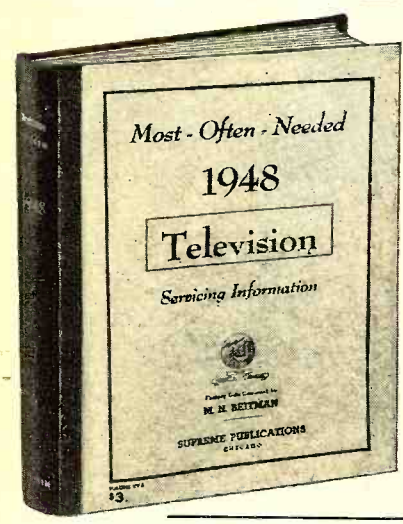
Amazing Bargain in Service Data

NEW MANUAL OF ALL POPULAR 1948 SETS

Be prepared to repair quickly all new 1948 receivers. In this big single volume you have clearly-printed, large schematics, needed alignment data, replacement parts lists, voltage values, and information on stage gain, location of trimmers, and dial stringing, for almost all recently released sets. A worthy companion to the 7 previous volumes used by over 120,000 shrewd radio servicemen. New manual covers models of 42 largest set manufacturers. Giant size: 8½ x 11 in., 192 pages + index. Manual style binding. Price postpaid, or available at your jobber, only..... **$2**

Models Made by:

R.C.A., Zenith, Philco, Sears, Fada, Emerson, Belmont, Detrola Radio, Majestic, United Motors, G.E., Westinghouse, Arvin, Stewart-Warner, Admiral, Delco, Stromberg-Carlson, Western Auto, Wards, Sparton, Motorola, Gamble, Crosley, and many others.



New 1948 T-V Manual

New, giant volume of television factory data covers every popular make. Gives description of circuits, pages of test patterns, response curves, alignment facts, oscilloscope waveforms, voltage charts, service hints, many diagrams in the form of double-spread blueprints, test points, everything to bring you up to date and make you expert in T-V repairs. Large size: 8½x11", manual style binding, flexible covers, price only **$3**

1947 F.M. and T-V Manual

Manual of instructions for trouble-shooting, repairing, and alignment of all popular 1947 F.M. and Television sets. Covers every popular make; includes F.M. tuners, AM-FM combinations, and all types of T-V receivers. This is the material you need to adjust and fix any modern F.M. and T-V set. Data on 192 large pages, 8½x11". Sturdy, manual style binding. Your price, only..... **$2**

Supreme Publications

SOLD AT ALL LEADING RADIO JOBBERS

FIND ALL RADIO FAULTS IN HALF-TIME

1947 1946 1942 1941 1940 1939 1926-38

MOST-OFTEN-NEEDED RADIO DIAGRAMS
Each manual has between 192 and 208 pages of diagrams and service hints; large size, 8½x11". Price each **$2**

DIAGRAMS
240 Pages
Price $2.50

You can speed-up and simplify radio repairs with **Supreme Publications** manuals. Service all radios faster, better, easier, save time and money, use these **most-often-needed** diagram manuals to get ahead, earn more per hour. For the remarkable bargain price (only $2 for most volumes) you are assured of having in your shop and on the job, needed diagrams and other essential repair data on 4 out of 5 sets you will ever service. Every popular radio of all makes, from old-timers to new 1948 sets, including F.M. and Television, is covered. Clearly printed circuits, parts lists, alignment data, and helpful service hints are the facts you need to be an expert in radio servicing. Save hours each day, every day, begin to earn more by making repairs in minutes instead of hours. Let these manuals give you diagrams for 80% of all sets. There is no need to spend large sums for bulky, space-wasting manuals of other publishers, or to buy additional drawings every few weeks; be wise, use **SUPREME Manuals** to get the most in diagrams and service data for the smallest cost. Select manuals wanted and rush "no-risk" coupon.

NO-RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 3727 W. 13th St., Chicago 23, Ill.

Ship the following manuals: (Satisfaction guaranteed or money back)

☐ 1948
☐ 1947
☐ 1946
☐ 1942
☐ 1941
☐ 1940
☐ 1939
☐ 1926-1938 @ $2.50

PRICED AT ONLY **$2** EACH

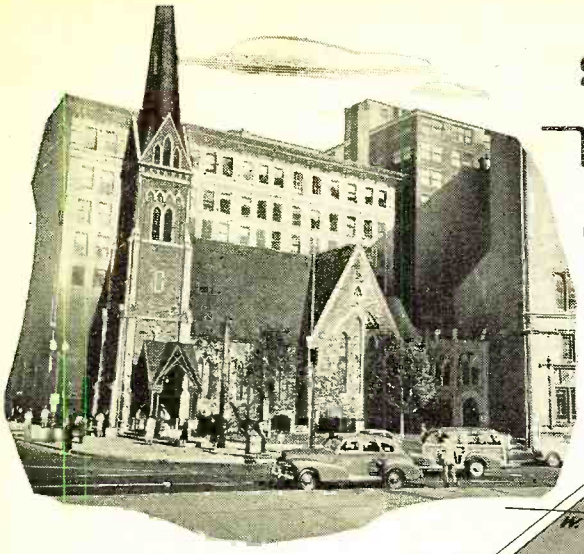
☐ New 1948 Television Manual.....$3.00
☐ 1947 F.M. and Television..... 2.00

☐ I am enclosing $....., send postpaid.
☐ Send C.O.D. I am enclosing $..... deposit.

Name: .....

Address: .....

SYLVANIA RADIO TUBES IN Motorola RADIOS SPEED THE CAB-DIRECTING MESSAGES!

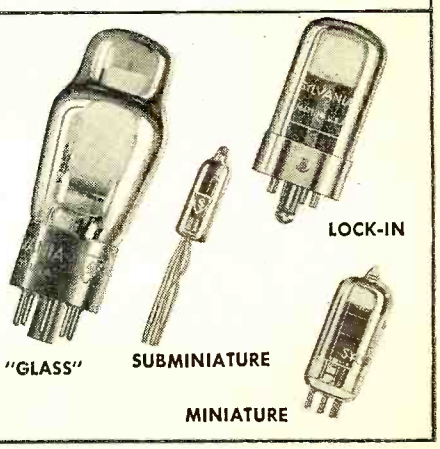


Red Cab of Indianapolis conducts 5 times more business with "Satellite" 2-way FM system!

THIS advanced system of taxicab dispatching used by Red Cab, Inc., of Indianapolis, Indiana, was especially developed by Red Cab, Inc., with the assistance and technical advice of Motorola Radio Engineers to answer the problem of congestion of the single radio frequency allowed to taxicab operators. Replacing the single central station and its single dispatcher with five independent stations, the system makes it possible for a large cab company to conduct many more times the business and radio dispatching without jamming the air. The five stations are controlled by a set of toggle switches under the various dispatchers' fingertips so that any number of dispatchers from one to five may be used and so that each dispatcher may select one station at a time or any combination.

And in every set in the 111 radio-equipped cabs, Sylvania's rugged Lock-In Tubes are firmly seated in their sockets, performing admirably day in and day out, under all kinds of jarring road conditions! For information on Sylvania Tubes see Sylvania Distributors, or write Radio Division, Emporium, Pennsylvania.

Red Cab driver receiving radioed instructions for picking up a fare in his district, in city of Indianapolis.



SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; PHOTOLAMPS

Newark Scoop! SENSATIONAL REDUCTIONS! HALLICRAFTERS RECEIVERS and TRANSMITTER

FAMOUS HALLICRAFTERS HT-17 TRANSMITTER

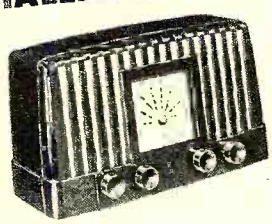
Regular $71.50 Value!

REDUCED TO $39.50

WITH ALL COILS

The HT-17 alone was always a grand buy at $49.50. Now Newark brings you the whole works — Complete Transmitter PLUS a Full Set of Coils for 10, 15, 20, 40 and 80 meters. . . . All for the Amazing Low Price of $39.50. Save $32.00! The HT-17 is a high quality transmitter or exciter for high power final amplifier. CW operation, with provision for external modulator. Full 10 watts output. 6V6GT crystal oscillator drives 807 final. 5U4G rectifier. This rig is ideal for any beginner . . . a perfect gift! Satin black cabinet 12 7/8 x 7 3/8 x 8 5/8". For 105/125 volts 50/60 cycles AC. Complete with tubes and full set of coils. Less crystal and meter. **No. A2056**, Shpg. Wgt. 25 lbs. **While they last $39.50**

HALLICRAFTERS ECHOPHONE 3-Band AC-DC RECEIVER



Regularly $39.50

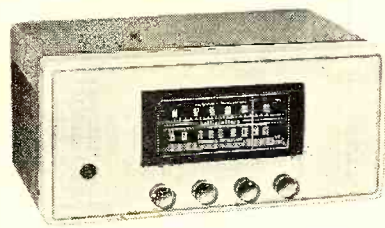
REDUCED TO $24.95

An ideal set for the SW listener . . . at a rock-bottom price! Covers all foreign broadcasts, local and DX domestic ham bands (2200-7100 Kc and 6900-22,000 Kc) PLUS fine broadcast reception (535-1625 Kc). Has electrical bandspread tuning, airplane type dial, sensitive and highly selective superhet circuit, Alnico V PM dynamic speaker, built-in loop. Excellent performance and tone quality. 8 1/2 x 14 x 6 1/2". For 105/125 volts AC or DC. Shpg. Wgt. 15 lbs.

No. S-967, in walnut plastic cabinet, **Now $24.95**

No. S-968, in ivory plastic cabinet, **Now $26.45**

NEW HALLICRAFTERS Model S-55 High Fidelity AM-FM RECEIVER



Regular Price ~~$129.50~~

REDUCED TO $49.50

Complete with Tubes

A Terrific Newark Scoop! You may never again see such amazing value! Save $80.00 on this deluxe, high fidelity AM-FM Broadcast Receiver — made and advertised to sell for $129.50 They're all brand new . . . superbly engineered for wonderful performance on both AM and FM. Has 10 tubes, plus rectifier, Automatic Frequency Control locks FM signals — eliminates drift, edge-lighted full-view dial, phono switch and jack, tone control, push-pull pentode output, built-in power supply. Speaker output is 500 ohms. Streamlined grey metal cabinet 18 1/2 x 8 7/8 x 12"D. For 105/125 volts, 50/60 cycles AC. Complete with tubes, less speaker.

No. A2073, Shpg. Wgt. 25 lbs. ***While they Last*** **$49.50**

NEW HALLICRAFTERS Model S-58 AM-FM AC-DC RECEIVER

Regular Price ~~$59.50~~

REDUCED TO $34.95

Save $24.55! We're giving you the benefit of our exceptional buy! Imagine, only $34.95 for a genuine, brand new, high fidelity AM-FM, AC-DC Hallicrafters broadcast receiver that tunes the full AM and FM bands with a frequency response of 60 to 14,000 cps, ± 3 db. They'll be scooped up fast at this bargain price! Has continuously variable tone control, 6 tubes plus rectifier, built-in power supply and superb construction. Extremely sensitive on AM and FM. Audio output is 4 watts. Loop antenna and phono connection. For 105/125 volts AC or DC. 13 1/4 x 6 x 5 1/2" H. Complete with tubes and speaker in streamlined metal cabinet. **No. A2065**, Shpg. Wgt. 20 lbs. **Limited Quantity at $34.95**

NEWARK RADIO & TELEVISION

3 GREAT STORES! Uptown: **115 West 45th Street** Downtown at **212 Fulton Street** in **NEW YORK** **323 West Madison Street** in heart of **CHICAGO**

MAIL ORDER DIVISIONS: 242 W. 55th St., N.Y. 19 and 323 West Madison Street, Chicago 6, Illinois

FREE **Send for 1949 Catalog New . . . Just off the Press!**

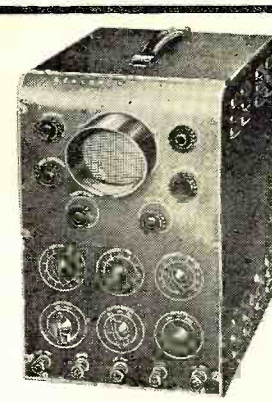
General Electric CRO-3A 3" OSCILLOSCOPE

Regularly $98.50

REDUCED TO $59.50

Save $39.00 on this brand new GE Scope! The CRO-3A was designed to fit into every progressive serviceman's workroom. Its high deflection sensitivity and stability make this scope ideal for visual alignment work with a suitable signal generator. Sweep rate is 20 to 30,000 cps, with vernier control. Uses 3AP1 Cathode Ray, 884 Sweep Osc., 6AC7 Vert. Amp., 6AC7 Horiz. Amp., and 2-5Y3GT Rectifiers. Welded steel grey wrinkle case. Size: 8" x 12 1/2" x 13". Shpg. Wgt. 30 lbs.

No. S-965 . . . . . **Special $59.50**



QUANTITIES LIMITED ON ALL ABOVE ITEMS! F.O.B. NEW YORK OR CHICAGO

You receive all parts, including tubes, for building this fine, modern Superheterodyne Receiver. This and other valuable standard equipment becomes your property.

Learn RADIO TELEVISION, ELECTRONICS by SHOP METHOD HOME TRAINING

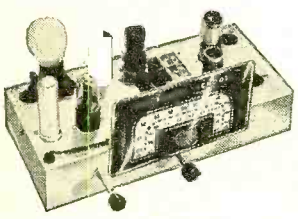
Let NATIONAL SCHOOLS, of Los Angeles, a practical Technical Resident Trade School for almost 50 years, train you for today's unlimited opportunities in Radio

these two **FREE** *books will tell you how*

Good Jobs Await the Trained Radio Technician

You are needed in the great, modern Radio, Television and Electronics industry! Trained Radio technicians are in constant and growing demand at excellent pay—in Broadcasting, Communications, Television, Radar, Research Laboratories, Home Radio Service, etc. National Schools Master Shop Method Home Study Course, with newly added lessons and equipment, can train you in your spare time, right in your own home, for these exciting opportunities. Our method has been proved by the remarkable success of National Schools-trained men all over the world.

You Learn by Building Equipment with Standard Radio Parts We Send You



Your National Schools Course includes not only basic theory, but practical training as well—you learn by doing. We send you complete standard equipment of professional quality for building various experimental and test units. You advance step by step until you are able to build the modern superheterodyne receiver shown above, which is yours to keep and enjoy. You perform more than 100 experiments—build many types of circuits, signal generator, low power radio transmitter, audio oscillator, and other units. The Free Books shown above tell you more about it—send for them today!

NOW! New Professional Multitester Included!

This versatile testing instrument is portable and complete with test leads and batteries. Simple to operate, accurate and dependable. You will be able to quickly locate trouble and adjust the most delicate circuits. You can use the Multitester at home or on service calls. It is designed to measure AC and DC volts, current, resistance and decibels. You will be proud to own and use this valuable professional instrument.

GET THE DETAILS—SEND THE COUPON →

Lessons and Instruction Material Are Up-to-date, Practical, Interesting.

National Schools Master Shop Method Home Training gives you basic and advanced instruction in all phases of Radio, Television and Electronics. Each lesson is made easy to understand by numerous illustrations and diagrams. All instruction material has been developed and tested in our own shops and laboratories, under the supervision of our own engineers and instructors. A free sample lesson is yours upon request—use the coupon below.

You Get This and Other Valuable Information in the Free Sample Lesson:

1. Basic Receiver Circuits and How They Are Used.
2. Construction of the Antenna Circuit.
3. How Energy Is Picked Up by the Aerial.
4. How Signal Currents Are Converted into Sound.
5. How the Tuning Condenser Operates.
6. How the R-F Transformer Handles the Signal and other data, with diagrams and illustrations.

Both Home Study and Resident Training Offered

APPROVED FOR VETERANS

Check Coupon Below

NATIONAL SCHOOLS
LOS ANGELES 37, CALIFORNIA EST. 1905

MAIL OPPORTUNITY COUPON FOR QUICK ACTION

National Schools, Dept. RN-1
4000 S. Figueroa, Los Angeles 37, Calif.

Mail me FREE the book "Your Future in Radio" including a sample lesson of your course. I understand no salesman will call on me.

NAME.....AGE.....

ADDRESS.....

CITY.....ZONE.....STATE.....

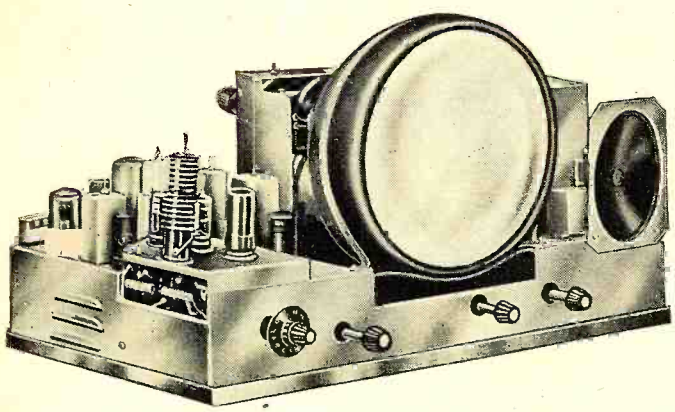
☐ Check here if Veteran of World War II

TRANSVISION

New TV KITS and CABINETS

STANDARD and CUSTOM-TYPE MODELS at LOW COST

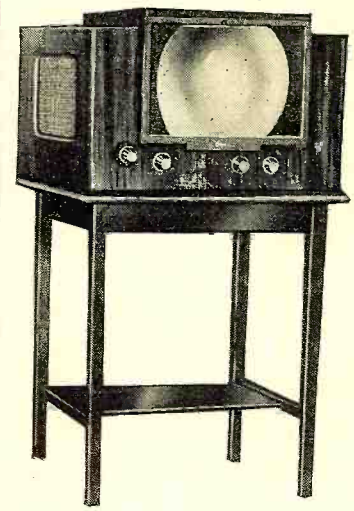
NEWEST in TELEVISION DESIGN • BIGGEST IN VALUE



Model 10A TV Kit

Featuring

- **PICTURES UP TO 150 SQ. INCHES**
- **CONTINUOUS TUNING ON ALL 12 CHANNELS**
- **LONG-RANGE RECEPTION**



▲ New 10" TV KIT

at amazingly low price!

The new **Transvision Model 10A** electromagnetic TV Kit gives a bright, stable 52 sq. in. picture. Has 10" picture tube, and **CONTINUOUS TUNING UNIT** (shown on the right hand page) **on all 12 channels.** Its high sensitivity makes for improved long-distance reception; especially good on high channels. Complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.

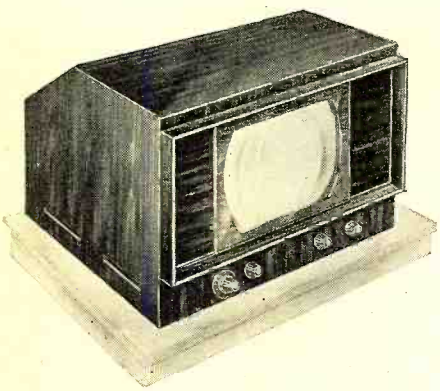
MODEL 10A TV KIT, less cabinet.....**Net $199.00**

MODEL 12A TV KIT, same as above, but has a 12" picture tube.....**Net 263.00**

◀ **NEW STREAMLINED CABINETS** for Transvision **Model 10A or 12A TV Kit.** Made of select grain walnut with beautiful rubbed finish. Fully drilled, ready for installation of assembled receiver.

Walnut Cabinet for 10A or 12A (Specify).....**Net $44.95**

Mahogany and Blonde slightly higher.



New streamlined cabinets for Models 10A or 12A TV Kits, designed by Hal Bergstrom.

New 150 Sq. In. TV Kit

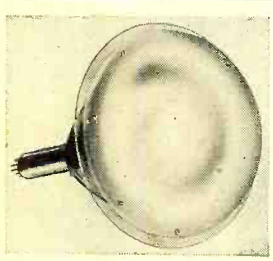
Model 10CL, with Roto-Table

This new **Model 10CL** is a 10" electromagnetic TV Kit, equipped with an **all-angle lens** (with color kit) giving a picture of **150 sq. in.** The image is clearly **visible from a very wide angle of vision, because of this specially designed lens.** Also has the new **CONTINUOUS TUNING UNIT** shown on the right. This kit comes COMPLETE with CABINET, LENS, and ROTO-TABLE; also double-folded dipole antenna (all channel) and 60 ft. of lead-in wire.

MODEL 10CL TV Kit.....**Net $299.00**

EASY TO ASSEMBLE . . . NO TECHNICAL KNOWLEDGE REQUIRED

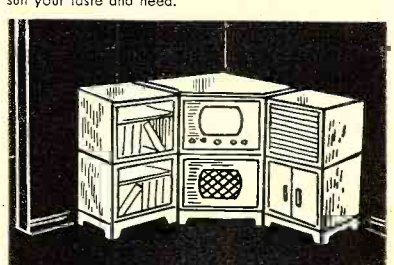
Transvision's simple step-by-step Instruction Sheet makes assembling a TV Kit a pleasure. Each kit comes **complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.** ***Nothing else to buy!***



TRANSVISION ALL-ANGLE LENSES for ALL TV SETS. Give picture sizes up to 150 sq. in. **Exclusive patented feature makes image visible from wide angle.** Lenses come with adapter for installation on ANY 7" or 10" picture tube, and with color kits. **All-Angle Lens** for 7" tubes (gives 75 sq. in. picture), **Net $21.95. All-Angle Lens** for 10" tubes (gives 150 sq. in. picture), **Net $32.50.**

ASSEMBLE Your Own CABINETS

Transvision's "MODULAR" Cabinets come in knock-down, unpainted units, offering an unlimited range of combinations, including even a bar. Finish them off to suit your taste and need.

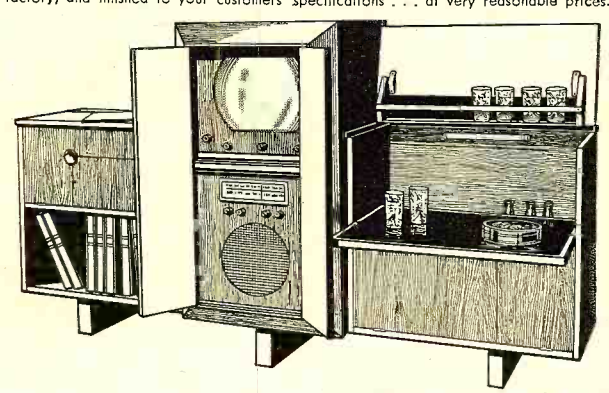


Corner piece, shown above, has room for **TV, Phono, Record Storage,** and open **Book Case.**

COMPLETE.....**Net $84.00**

For other units and prices, write for "Modular" Catalog.

"CUSTOM-ART" CABINETS Made to Order. Radiomen, Dealers—Here is a beautiful line of exclusive, **custom-built cabinets,** designed and completely built in our factory, and finished to your customers' specifications . . . at very reasonable prices.



Shown above is Transvision's "Modern Comprehensive" which has provision for TV/FM/AM, Record Changer, Album Shelf, Bar, and Concealed Wine Cellar. For further details on the complete line, **write for FOLDER No. D-1.**

GET into the TELEVISION BUSINESS in a BIG WAY

Radiomen, Servicemen, Dealers . . . Transvision offers you, through your jobber, a 3-point **Dealer Plan** for making big money in television: (1) Sell **TV sets constructed by you from Transvision Kits.** (2) Sell exclusive **Custom-Built Jobs** with beautiful "Custom-Art" Cabinets. (3) Sell **"packaged" Transvision TV Products,** including Kits, Components, and Accessories. For FULL DETAILS about this amazing plan, **WRITE FOR FOLDER No. D-1,** or ask your jobber.

FREE 162 p. TELEVISION COURSE with purchase of any Transvision TV Kit . . . You don't need this course to assemble a Transvision Kit, because the job is easy enough and our instruction sheet is simple and clear. BUT, if you want a **good introduction to television fundamentals** as a basis for further study, the **Transvision Television Home-Study Course** is ideal. Remember, you pay nothing extra for this course. Ask your jobber.

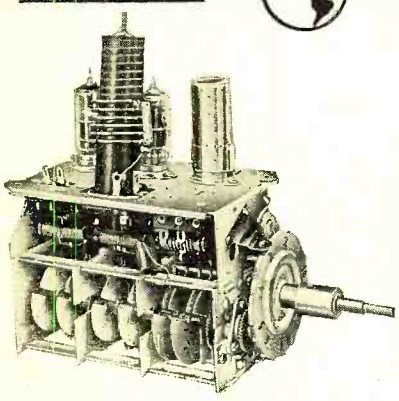
For FREE 20 p. TV BOOKLET and 8 p. CATALOG, SEE YOUR TRANSVISION JOBBER.....

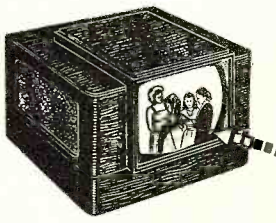
TRANSVISION

New TV INSTRUMENTS

TUNERS, BOOSTER, and ACCESSORIES

For Every Television Installation Requirement





TRANSVISION'S NEW REMOTE CONTROL UNIT KIT—for use with ANY TELEVISION SET

OPERATES *ANY* TELEVISION SET from a DISTANCE up to 50 feet.

Now you can sit back in your easy chair, a comfortable distance away, and operate your TV set. This new **Transvision REMOTE CONTROL UNIT** turns **ANY SET on, tunes in stations, controls contrast** and **brightness, turns set off.** Especially ideal for commercial installations where the TV set is inaccessible.
TUNER UNIT is a high gain, all-channel, **CONTINUOUS TUNING UNIT** (about 50 microvolt sensitivity). **Supplied in KIT form** . . . easy to assemble in about an hour.
Model TRCU Remote Control Unit Kit with 25-ft. cable . . . . . **Net $69.00**
Also available without cabinet . . . . . **Net 65.00**

NEW 12-Channel TV Tuner

CONTINUOUS TUNING

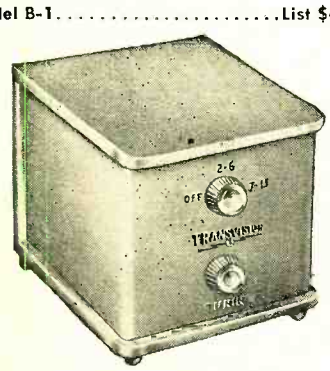
Model CT-1 (part #653), for TV channels 2 to 13, is notable for its high gain, sensitivity, excellent image rejection ratio, and **CONTINUOUS TUNING** feature. May be used with any 7", 10", 12" or 15" kit.
Model CT-1 TV Tuner . . . . . **Net $32.50**

Model TT-2 (part #301-1 or #301-2) covers **all TV channels, also FM band** (88-108 mc.). Available for 7", 10", 12", or 15" kits. Specify tube size.
Model TT-2 TV/FM Tuner . . . . . **Net $44.95**

TRANSVISION ALL-CHANNEL TELEVISION BOOSTER

CONTINUOUS TUNING

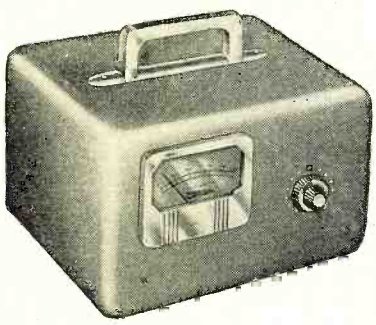
To **assure television reception in weak signal areas,** or areas which are out of range of certain broadcasting stations, Transvision engineers have designed this new booster. It **increases signal strength on all television channels.** Tunes all television channels **continuously.** Can be used with any type of television receiver. Unusually high gain in upper television channels.
Model B-1 . . . . . **List $44.95**



TRANSVISION FIELD STRENGTH METER

Saves ½ the cost of TV installations

Improves Installations! Saves ½ the Work! Has numerous features and advantages, including —(1) Measures actual picture signal strength . . . (2) Permits actual picture signal measurements without the use of a complete television set . . . (3) Antenna orientation can be done exactly . . . (4) Measures losses or gain of various antenna and lead-in combinations . . . (5) Useful for checking receiver re-radiation (local oscillator) . . . (6) **12 CHANNEL SELECTOR.** . . (7) Amplitudes of interfering signals can be checked . . . (8) Weighs only 5 lbs. . . . (9) **Individually calibrated** . . (10) Housed in attractive metal

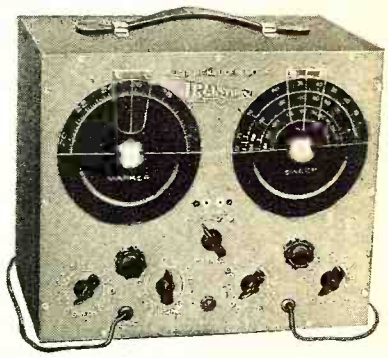


carrying case . . . (11) Initial cost of this unit is covered after only 3 or 4 installations . . . (12) Operates on 110V, 60 Cycles, AC.

Model FSM-1, complete with tubes . . **Net $99.50**

TRANSVISION TELEVISION and FM SWEEP SIGNAL GENERATOR

Complete frequency coverage from 0-227 MC with no band switching. . . . Sweep width from 0-12 MC completely variable. . . . Accurately calibrated built-in marker generator.



OUTSTANDING FEATURES: (1) Frequency range from: 0-227 MC . . . (2) Dial calibrated in frequency . . . (3) Sweep width from 0-12 MC completely variable . . . (4) Self-contained markers readable directly on the dial to .5% or better. (No external generator required to provide the marker signals) . . . (5) Crystal controlled output makes possible any crystal controlled frequency from 5-230 MC . . . (6) Plenty of voltage output—permits stage-by-stage alignment . . . (7) Output impedance 5-125 ohms . . . (8) Directly calibrated markers, 20-30 MC for trap, sound and video IF alignment . . . (9) RF for alignment of traps for IF channels when a DC voltmeter is used as the indicating medium . . . (10) Unmodulated RF signal to provide marker pips simultaneously with the main variable oscillator . . . (11) Markers can be controlled as to output strength in the pip oscillator . . . (12) Power supply completely shielded and filtered to prevent leakage . . . (13) All active tubes are the new modern miniature type . . . (14) Phasing control incorporated in the generator . . . (15) Operates on 110V, 60 Cycles, AC.
Model SG . . . . . **Net $99.50**

All Transvision Prices are fair traded; subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. RN, **NEW ROCHELLE, N. Y.**

For FREE 20-page TV BOOKLET and 8-page CATALOG, SEE YOUR TRANSVISION JOBBER!

NEW YORK, N. Y.
FEDERATED PURCHASER, INC.
80 Park Place
PALLADIUM TELEVISION, INC.
785 Third Ave.

BRONX, N. Y.
NATIONAL RADIO DIST.
899 Southern Blvd.

BROOKLYN, N. Y.
BENRAY DISTRIBUTING CO.
506 Coney Island Ave.

STATEN ISLAND, N. Y.
B. & D. DISTRIBUTING CO.
Staten Island 5

LONG ISLAND, N. Y.
ELECTRONIC SUPPLY CO.
40-14 Greenpoint Ave.
Long Island City, N. Y.
ISLAND RADIO DIST. CO.
412 Fulton Ave.
Hempstead, L. I., N. Y.

WESTCHESTER, N. Y.
RADIOMART
149 Riverdale Ave.
Yonkers, N. Y.

NEW JERSEY
NIDISCO JERSEY CITY, INC.
713 Newark Ave.
Jersey City, N. J.; also:—
Cliffside, Passaic, Trenton
VARIETY ELECTRIC CO.
601 Broad St.
Newark, N. J.

BOSTON, MASS.
BEACON TELEVISION, INC.
1306 Boylston St.

PHILADELPHIA, PA.
TRANSVISION OF PHILA.
235 N. Broad St.

WASHINGTON, D. C.
STAR RADIO
409 11th St., N.W.

CHICAGO, ILL.
TRANSVISION OF CHICAGO
1002 S. Michigan Ave.

HOLLYWOOD, CALIF.
TRANSVISION OF CALIF.
8572 Santa Monica Blvd.

Within the INDUSTRY

ERWIN A. LARSON is the new distributor sales representative for the Metropolitan New York district for the renewal tube department, Radio Tube Division, of *Sylvania Electric Products, Inc.*

After graduation from Duke University in 1942 Mr. Larson saw active service in the Navy in New Guinea, Philippine, Okinawa, and Japanese campaigns. He was formerly associated with the *Shaffer Leather Company* of Akron, Ohio.

* * *

HENRY YATES SATTERLEE has been appointed to the *Cannon Electric Development Company* factory sales engineering staff with headquarters in Los Angeles.

Mr. Satterlee who recently joined *Cannon Electric* assumes his position with a wide experience in engineering, aviation, and in sales promotion. After attending M.I.T., he was employed by *J. P. Morgan & Co.,* and later headed *Giro Associates,* of New York.

He has also been associated with *Curtiss Wright Flying Service, Fairchild Engine Co.,* and with *Pacific Engineering Co.* of Los Angeles.

* * *

L. S. RACINE, sales manager of *Chicago Transformer Division, Essex Wire Corporation,* was recently appointed chairman of the Transformer Section of the Parts Division of Radio Manufacturers Association for the year 1948-49.

Mr. Racine has been associated with the electronics industry since 1929 and was appointed production manager of *Chicago Transformer* in 1931. He has served in the post of sales manager since 1945.

His appointment as chairman of this important RMA committee brings to the post a man well-known in the industry as well as a person thoroughly familiar with the transformer manufacturing field.

* * *

MOTOROLA, INC., through its president Paul V. Galvin, has announced the purchase of the inventory and certain assets of the Car Radio Division of the *International Detrola Corporation* of Detroit.

International Detrola produces car radios for automobile manufacturers. The amount of the purchase was not disclosed. *Motorola* will continue to make these car radios at its recently enlarged plant at 4545 W. Augusta Boulevard in Chicago.

As a result of this purchase, *Motorola* for the first time will supply auto radios directly to the automobile manufacturers. The company, now in its twentieth year of manufacturing auto radios, will continue to produce car radios under the *Motorola* brand name.

* * *

ROBERT FINLAY, wartime procurement engineering counsel for the *Hallicrafters Company* in Washington, has announced the opening of his own offices at 104 Brookside Avenue, Ridgewood, New Jersey.

Mr. Finlay will serve as liaison consultant between electronics manufacturers and government agencies. He will represent a select list of companies before government purchasing and procurement agencies.

He recently marked a quarter of a century in the electronics field since leaving the military academy at West Point. Mr. Finlay spent the war years in Washington where he was instrumental in processing millions of dollars worth of electronic equipment orders for the Armed Forces and lend-lease products.

* * *

CORADIO, INC. of New York City has announced that it has received an exclusive contract for the installation of the company's radios in the entire national hotel chain operated by the Milner Hotels, Inc.

The contract, secured through *Coradio's* franchised distributor *Wittick Sales Co.* of Detroit, covers 170 hotels containing 17,617 rooms, located in 38 states. Installation has already begun and units are now operating in 14 of the hotels of the chain.

This is believed to be the largest installation of coin radios under any one contract. It is expected that approximately 10,000 units will eventually be installed. The company is using its ordinary marketing channels to complete the installation in all of the 170 hotels.

* * *

ROCKE, INC. of 13 East 40th Street, New York has been appointed industrial and manufacturing sales representative for *American Television & Radio Co. (ATR)* of St. Paul, Minnesota.

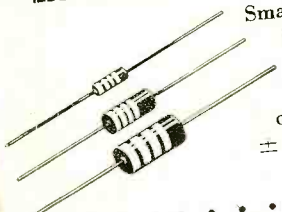
The firm will represent the company in the metropolitan New York and the New Jersey areas. *Rocke, Inc.* is the

"I like the DEPENDABILITY of OHMITE Products"

AMONG radio servicemen, amateurs, and industrial users everywhere—there's a definite preference for Ohmite resistance products. These men know—from experience—that Ohmite resistors and potentiometers provide long, trouble-free service.

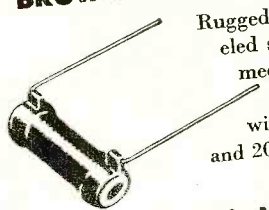
Here's the reason why you get extra performance. Every Ohmite product is designed and constructed to stand up under severe operating conditions. Every unit is built to withstand the effects of shock, vibration, temperature extremes, altitude, and humidity. Make sure you get the benefit of this unfailing dependability. Ask for Ohmite products by name.

LITTLE DEVIL COMPOSITION RESISTORS



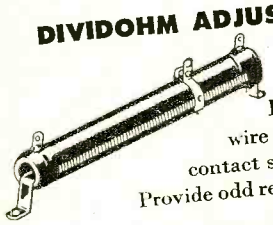
Small and sturdy, these units come in ½, 1, and 2-watt sizes. 10 ohms to 22 megohms. Tol. ± 10% and ± 5%. Values to 2.7 ohms available in 1-watt size, ± 10% tolerance.

BROWN DEVIL WIRE-WOUND RESISTORS



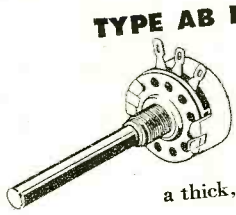
Rugged, dependable, vitreous-enameled surface protects winding from mechanical damage. BrownDevils are easily mounted by tinned-wire leads. Tol. ± 10%. In 5, 10, and 20-watt sizes.

DIVIDOHM ADJUSTABLE RESISTORS

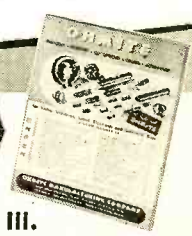


Used as multi-tap resistors or voltage dividers. Have a narrow strip of exposed wire along one side to provide a contact surface for the adjustable lugs. Provide odd resistance values quickly.

TYPE AB POTENTIOMETER



A 2-watt molded composition unit with good margin of safety. It is unaffected by heat, cold, moisture, or length of service. Resistance element is a thick, solid-molded ring.



Write for Catalog 19

OHMITE MANUFACTURING COMPANY • 4883 Flournoy St., Chicago 44, Ill.

Be Right with OHMITE

RHEOSTATS • RESISTORS • TAP SWITCHES • CHOKES • ATTENUATORS

domestic division of *Rocke International Corporation* which has been associated with the radio parts industry for 25 years.

Lewis & Sachs Company of New York will continue to handle all *ATR* distributor sales in the same territory.

* * *

WILLIAM P. LEAR has been named to the newly-created post of chairman of the board of *Lear, Incorporated.* He will also serve as director of research and development for the company.

At the same meeting of the board of directors Richard M. Mock was named president of the corporation, succeeding Mr. Lear to the post. Mr. Mock who has been executive vice-president since June 1947, has been carrying the duties of president for some time to allow Mr. Lear to devote his time and energies to technical development of aircraft radio, automatic flight control, and wire recorder products.

Mr. Lear served the company as its president since the inception of the organization almost twenty years ago. Mr. Mock has been with the company since 1940 and has held the position of application engineer, chief engineer, sales manager, and manager of the Electro Mechanical Division before becoming executive vice-president.

* * *

REFCO CORP. has been recently formed in New York City to do contract and subcontract work for the radio, electrical, and electronics trade.

The company is set up to produce cable harnesses, resistor board assemblies, switch cables, assembling, wiring, testing of units, and subassemblies of specialized radio equipment, power supplies, radar, television, industrial and medical electronics items.

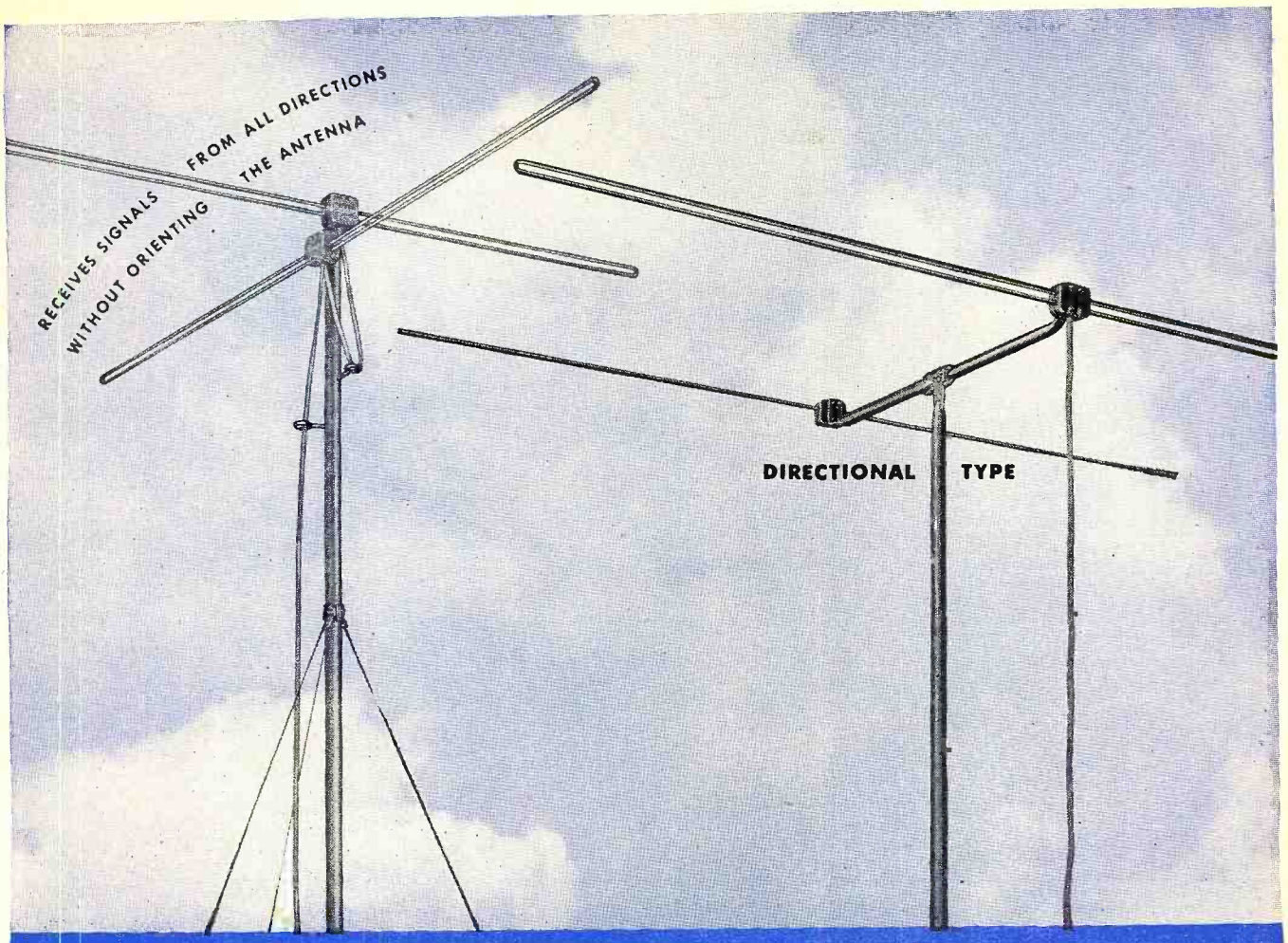
The new firm is headed by M. J. Simons who is serving as president and general manager; Elias A. Smyrnakis, vice-president and production supervisor; and Richard L. Crandall, secretary and treasurer.

The company maintains headquarters at 4509 White Plains Road, New York 66, New York.

ROBERT E. BURROWS, well-known radio executive, has been appointed sales and advertising manager of the *Meissner Division* of *Maguire Industries, Inc.* of Mt. Carmel, Illinois.

Mr. Burrows joins *Meissner* from *Westinghouse Electric International Company* of New York where he was manager of the Home Radio Department, handling the export activities of that department. Prior to joining *Westinghouse,* he was advertising and

(*Continued on page* 164)



Insure FM Performance with a GOOD FM ANTENNA

The Belden Poly-Point 8322

- Belden FM Antennas are engineered for finest FM reception.
- Use Belden 8322 Poly-Point Antenna to receive signals from all directions without turning!
- Use Belden 8320 Dipole Antenna for installations requiring directional characteristics.
- Sturdy aluminum construction withstands severe ice loading and high wind.
- COMMON-SENSE PRICES.

ASK your Belden Jobber

The Belden Dipole 8320

Belden *Radio* WIRE

Here's How CREI Home Study Training Prepares You NOW For a BETTER Job and a Secure Future in Radio-Electronics and Television

CREI Courses for Every Radioman Keep You Ahead of Competition—Earn You More! Never before have so many men like you had the opportunity to step ahead into better-paying jobs and enjoy lasting success. Men with up-to-date technical training are needed in every branch of radio-electronics. That's because radio's *manpower* has not kept pace with radio's *technical* developments.

What are you doing to meet this need for highly trained, expert technicians and engineers? You must improve your technical knowledge not only to qualify for the better job you want, but to *hold* the job you now occupy. CREI offers you a proved program of technical self improvement that you can study in your spare time, at home. The same type of practical, down-to-earth training for which thousands have enrolled since 1927.

Remember, too, there's a CREI course for *you*. No matter what your radio experience—CREI offers complete training in radio-electronics for *any* man who wants to improve his ability and his chances for advancement. You can *"go all the way* with CREI" from introductory basic principles to advanced training and on to specialized engineering subjects.

Read our new 32-page booklet . . . then judge for yourself. There is no obligation. You are already started in this field. Find out how you can rapidly prepare to advance beyond your present level. Send the coupon NOW!

VETERANS! CREI TRAINING AVAILABLE UNDER G. I. BILL

If you have had professional or amateur radio experience and want to make more money, let us prove to you we have the training you need to qualify for a better radio job. To help us answer intelligently your inquiry—*please state briefly your background of experience, education and present position.*

Capitol Radio Engineering Institute

An Accredited Technical Institute

FOUNDED IN 1927

Dept. 111A, 16th and Park Road, N. W., Washington 10, D. C.

Branch Offices: New York (7) 170 Broadway • San Francisco (2) 760 Market St.

MAIL COUPON FOR FREE BOOKLET

CAPITOL RADIO ENGINEERING INSTITUTE
16th & Park Road, N. W., Dept. 111-A, Washington 10, D. C.

Gentlemen: Please send your free booklet, "Your Future in the New World of Electronics," together with full details of your home-study training. I am attaching a brief resume of my experience, education and present position.

Check field of greatest interest:

☐ PRACTICAL RADIO-ELECTRONICS ☐ PRACTICAL TELEVISION
☐ BROADCASTING ☐ AERONAUTICAL RADIO ENGINEERING
☐ RECEIVER SERVICING

NAME.....

STREET.....

CITY.....ZONE.....STATE.....

☐ I AM ENTITLED TO TRAINING UNDER G. I. BILL.

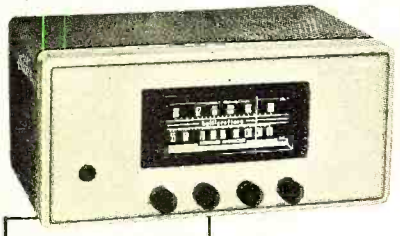
NOW Big Price Reductions at ALLIED—on Famous Hallicrafters models

SAVE 40% to 60%

Outstanding Quality Hallicrafters Models at Less Than Factory Cost

Brand New—Limited Quantity

A great ALLIED purchase now makes it possible for you to own a quality Hallicrafters radio receiver or transmitter—*at a fraction of the original price!* Each of these models is *brand new*—backed by Hallicrafters' reputation for superb engineering—guaranteed by ALLIED, world's largest and most dependable radio supply source. Quantities are limited—so send your order now to take advantage of these once-in-a-lifetime values.



Originally $129.50
ALLIED'S PRICE $49.50

Famous Hallicrafters S-55 DeLuxe FM-AM Receiver

Save over half on this great model! Features: Two bands—540-1700 kc for AM; 88-108 mc for FM; push-pull audio (7½ watts); automatic frequency control; four-position tone control; phono player input; giant slide-rule dial; separate antenna inputs for AM and FM. Can be used with any speaker of 500 ohms input. In attractive satin-gray metal cabinet, 18½ x 8½ x 13". Complete with 10 tubes plus rect. (less speaker). For 115 v., 60 cy. A.C. Ideal for custom installations. Shpg. wt., 25 lbs.

97-543. S-55 Receiver, f.o.b. Chicago, ONLY . . . **$49.50**

Originally $71.50
ALLIED'S PRICE $39.50

The HT-17 Transmitter . . . Amateurs' Favorite

Ideal CW rig for beginners. Has 10 watts output on 80, 40, 20, 10 meters. Matching network for any antenna or for driving high-power amplifier. Uses 6V6GT crystal oscillator driving an 807 final. Controls: Plate Tuning, Antenna Loading, Standby, Meter Switch, Power on-off. Rear terminals for antenna, ground, key, external modulator. Satin-black metal cabinet, 12⅞ x 6⅞ x 7⅞". For 105-125 v., 50-60 c. AC. Complete with tubes and all coils. Less crystal. Shpg. wt., 25 lbs.

97-580. HT-17 Transmitter, f.o.b. Chicago, ONLY **$39.50**

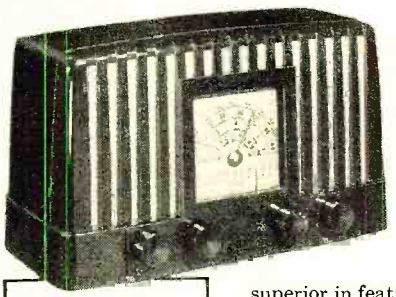
Originally $59.50
ALLIED'S PRICE $34.95

Hallicrafters S-58 FM-AM Receiver

A Terrific Buy!

At less than the cost of an ordinary AM table model, enjoy both AM and FM reception in a compact AC-DC type receiver. Tunes 540-1600 kc for AM, 88-108 mc for FM. Calibrated dual scale slide-rule dial; only band-in-use scale is illuminated. Built-in PM speaker. Has phono input and continuously variable tone control. Highly efficient circuit uses 6 tubes plus rectifier. Sensitivity: AM, 50 microvolts; FM, 100 microvolts. Audio response ± 3 db, 1000 to 10,000 cps. In satin-black metal cabinet, with contrasting speaker grille; 13¼" x 6" x 5½" Operates from 110 v., AC or DC. Shpg. wt., 25 lbs.

97-517. S-58 Receiver, f.o.b. Chicago, ONLY **$34.95**



Was $39.95
ALLIED'S PRICE $24.95

Famous Echophone Three-Band Receiver

What a buy! A good-looking universal AC-DC receiver packed with exceptional features: Covers three full bands—535-1625 kc; 2200-7100 kc; 6900-22,000 kc; has electrical bandspread tuning, handsome airplane type duplex dial, highly selective and sensitive superhet circuit. With Alnico PM dynamic speaker, built-in loop antenna. A wonderful performer, superior in features, power and tone quality to ordinary table models. For 50-60 cycle AC or DC on either 105-125 or 210-250 volts. Beautiful plastic cabinet in choice of ivory or walnut, 8½ x 14 x 6½". Shpg. wt., 15 lbs.

97-518. Walnut, Echophone EX-102 3-Band Receiver, f.o.b. Chicago, ONLY **$24.95**

97-519. Ivory, f.o.b. Chicago, ONLY **$26.45**

QUANTITIES LIMITED—ORDER TODAY!

You Save at ALLIED RADIO

ALLIED RADIO CORP., Dept. 1-AA-9
833 W. Jackson Blvd., Chicago 7, Ill.

Please ship me the following:

- ☐ Hallicrafters Model S-55 Receiver
- ☐ Hallicrafters Model HT-17 Transmitter
- ☐ Hallicrafters Model S-58 Receiver
- ☐ Echophone EX-102 Three-Band Receiver

$. . . . . Enclosed. ☐ Ship C.O.D.

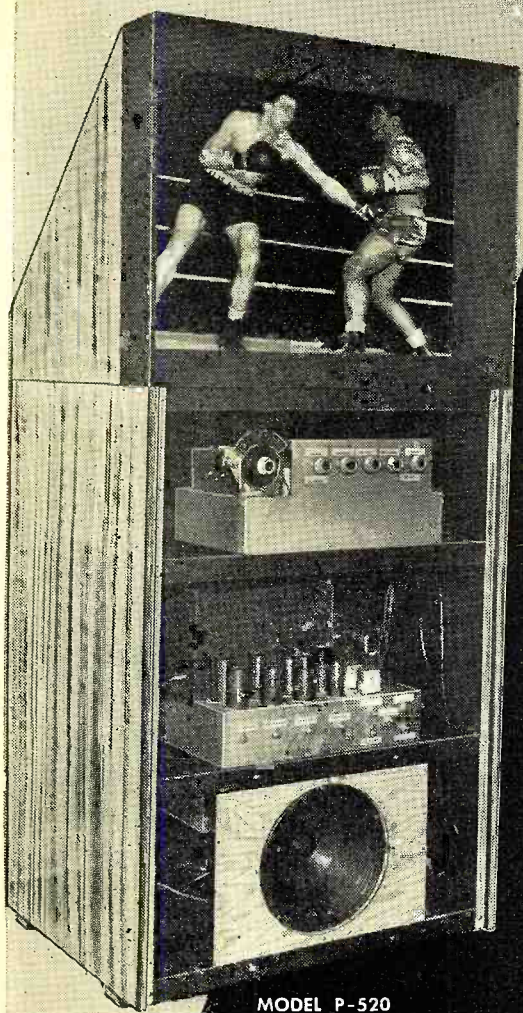
Name . . . . . .

Address . . . . . .

City . . . . . *State* . . . . . .

TELEVISION ASSEMBLY CO.

for the best in TELEVISION for CUSTOM-BUILT installations



MODEL P-520

520 SQUARE INCH PICTURE 20 INCHES BY 26 INCHES

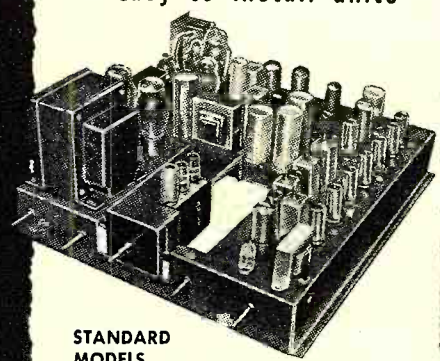
PROJECTION TELEVISION

Bausch & Lomb Optical Electronic System provides a contrasty sparkling picture projected onto the Eastman Kodak Glass Projection Screen, completely glare-proof. Every part of the entire set is designed, engineered and manufactured for the express purpose of bringing you the finest in television . . . ready for CUSTOM-BUILT installations in homes, schools, lodges, clubs, hospitals, taverns and other public places.

- **BAUSCH & LOMB** F/1.9 PROJECTION LENS
- **RCA** 5TP4 PROJECTION C. R. TUBE
- PRE-WIRED 27-30 KV TRIPLER FLYBACK POWER SUPPLY
- ALUMINUM COATED TOP PROJECTION MIRROR
- **EASTMAN KODAK** GLASS PROJECTION SCREEN
- PRE-WIRED, PRE-TUNED I. F. PICTURE & SOUND STRIP (PAT. PEND.)
- **DUMONT** INPUTUNER all channels — All FM Radio
- **RCA** 12" HIGH FIDELITY PM SPEAKER
- MANUAL OF INSTRUCTIONS & SCHEMATIC DATA prepared & edited by renowned JOHN F. RIDER PUBLISHER, INC.
- COMPLETE WITH RACK, HOOD & PICTURE FRAME

10" 12" or 15" TUBE TELEVISION

in easy to install units



STANDARD MODELS

30-tubes, including the C.R. Tube. Supplied with 13-tube I.F. Picture and Sound Strip (Pat. Pend.) completely wired, tubed, tested and aligned. Has standard tuner pre-wired to handle 13 channels, ready to use with above unit.

Here's why Television Experts praise T.A.C. Television

Our products contain every new development, every new creation of television research. Our efforts are bent towards quality and this is particularly evident in the performance of our Assemblies. That's why men who know television are telling others about T.A.C. supremacy.

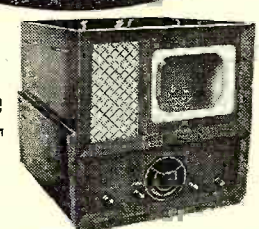
TELEVISION ASSEMBLY COMPANY GUARANTEE

All components are of the finest quality and are fully guaranteed under the Standard RMA Guarantee. All TAC Assemblies are guaranteed to operate when assembled according to directions.

T. A. C. CHAMPION MODELS WITH DUMONT INPUTUNER

Gives continuous tuning for all 13 channels plus all FM Radio. Available for all tube sizes.

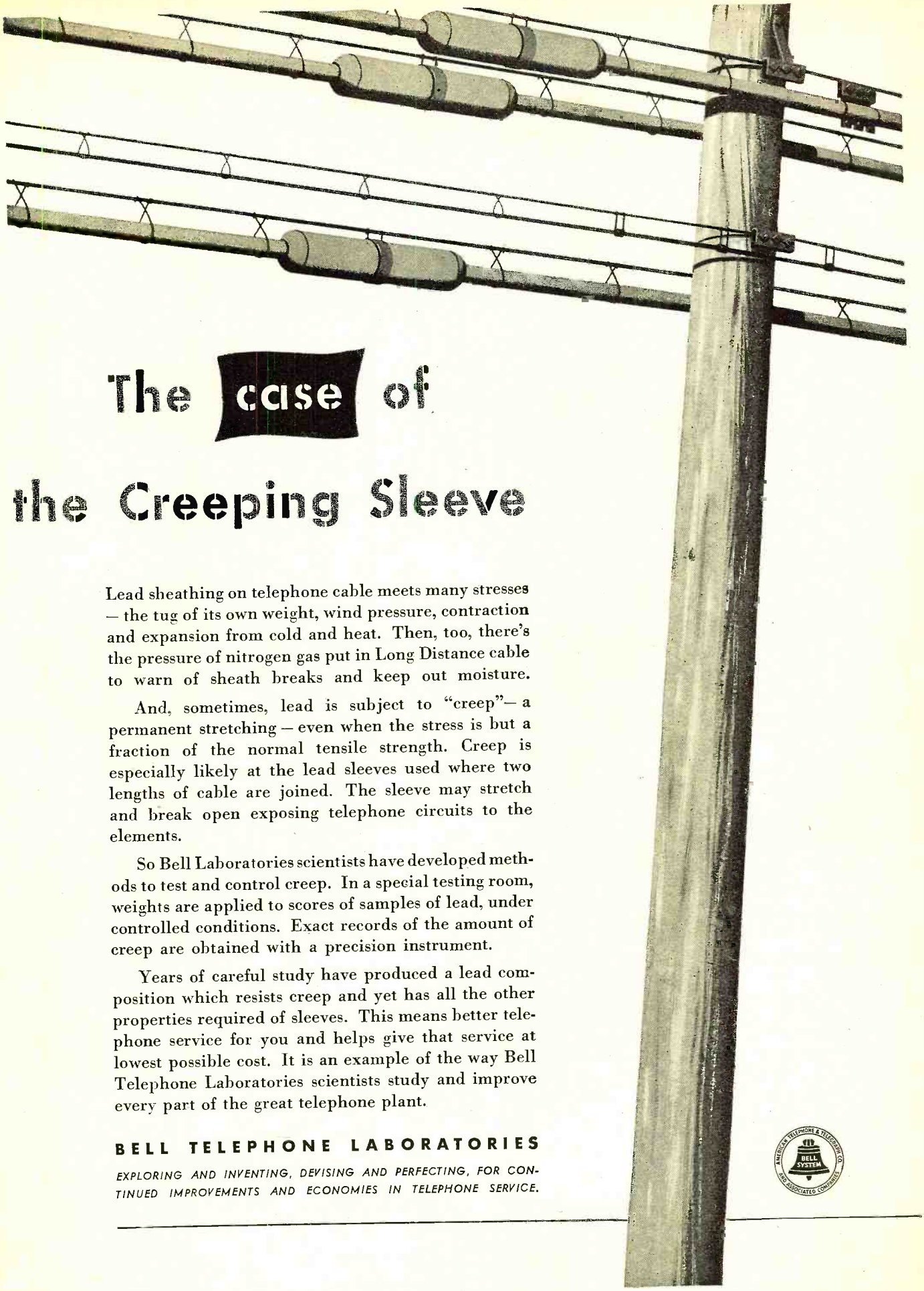
Smart, Modern Hand-Rubbed Walnut & Blonde Cabinets for 10" 12" or 15" tube chassis



Our own exclusive designs, available for all T.A.C. models. Details on request.

TELEVISION ASSEMBLY CO. 540 Bushwick Ave., B'klyn 6, N. Y.

Available only through National Parts Distributors
Write us for list
Write for literature



The case of the Creeping Sleeve

Lead sheathing on telephone cable meets many stresses — the tug of its own weight, wind pressure, contraction and expansion from cold and heat. Then, too, there's the pressure of nitrogen gas put in Long Distance cable to warn of sheath breaks and keep out moisture.

And, sometimes, lead is subject to "creep"— a permanent stretching — even when the stress is but a fraction of the normal tensile strength. Creep is especially likely at the lead sleeves used where two lengths of cable are joined. The sleeve may stretch and break open exposing telephone circuits to the elements.

So Bell Laboratories scientists have developed methods to test and control creep. In a special testing room, weights are applied to scores of samples of lead, under controlled conditions. Exact records of the amount of creep are obtained with a precision instrument.

Years of careful study have produced a lead composition which resists creep and yet has all the other properties required of sleeves. This means better telephone service for you and helps give that service at lowest possible cost. It is an example of the way Bell Telephone Laboratories scientists study and improve every part of the great telephone plant.

BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.

Which Do You Want?

Better Pay

A Nice Home

A New Car

Greater Security

Happy Vacations and Travel

Get Your FCC Ticket Jobs worth $3,000 to $7,500 are opening up right now for FCC Licensed Radiomen.

Add Technical Training to Your Practical Experience and

Get Your FCC COMMERCIAL RADIO OPERATOR LICENSE in a Few Short Weeks

It's EASY if you use CIRE Simplified Training and Coaching AT HOME in SPARE TIME

Get your license easily and quickly and be ready for the $3000 to $7500 jobs that are open to ticket holders. CIRE training is the only planned course of coaching and training that leads directly to an FCC license.

YOUR FCC TICKET IS RECOGNIZED IN ALL RADIO FIELDS AS PROOF OF YOUR TECHNICAL ABILITY

CIRE Graduates Find FCC License Pays Off

"Transmitter engineering is great, especially in the job I am on. Thanks again for all you have done, and you can take the credit for the fact that my 'ticket' is now posted on the wall of a 1000 watt broadcast station."
Student No. 3678N12

"I now hold ticket P-10-3787, and holding the license has helped me to obtain the type of job I've always dreamed of having. Yes, thanks to CIRE, I am now working for CAA as Radio Maintenance Technician, at a far better salary than I've ever had before. I am deeply grateful." *Student No. 3319N12*

"I was issued license P-2-11188 on November 4. The next day I was signed on board a tanker as Radio Operator-Purser. Besides radio operating, I handle the payrolls, etc., which is all over-time and brings my monthly pay up to between $500 and $650." *Student No. 2355N2*

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk RN-1 4900 Euclid Bldg. Cleveland 3, Ohio
Approved for Training under "G.I. Bill of Rights"

GET THIS AMAZING NEW BOOKLET

1. TELLS OF THOUSANDS OF BRAND-NEW, BETTER-PAYING RADIO JOBS NOW OPEN TO FCC LICENSE HOLDERS.
2. TELLS HOW YOU WILL BENEFIT BY HOLDING AN FCC COMMERCIAL LICENSE.
3. TELLS HOW YOU CAN GET YOUR FCC COMMERCIAL RADIO OPERATOR LICENSE IN A FEW SHORT WEEKS—EASILY AND QUICKLY, BY USING CIRE SIMPLIFIED TRAINING AND COACHING AT HOME IN YOUR SPARE TIME.
4. TELLS OF HUNDREDS OF OUR SUCCESSFUL STUDENTS WHO NOW HAVE LICENSES AND NEW, BETTER-PAYING JOBS.
5. TELLS HOW WE PREPARE YOU TO PASS THE NEW FCC COMMERCIAL LICENSE EXAMINATIONS, WHICH NOW INCLUDE FM AND TELEVISION.
6. TELLS HOW WE GUARANTEE TO TRAIN AND COACH YOU UNTIL YOU GET YOUR LICENSE.
7. TELLS HOW WE HELP YOU TO GET A BETTER-PAYING, LICENSED JOB, WITH OUR FREE AND EXCLUSIVE SERVICE, WHICH PREPARES AND MAILS YOUR EMPLOYMENT APPLICATION TO HUNDREDS OF EMPLOYERS, INCLUDING FM, AM AND TELEVISION BROADCAST STATIONS, RADIO MANUFACTURERS, POLICE RADIO STATIONS, AND RADIO-EQUIPPED TAXI, BUS AND PUBLIC UTILITY COMPANIES.

Get All 3 FREE Send Coupon Now!

CLEVELAND INSTITUTE OF RADIO ELECTRONICS
Desk RN-1, 4900 Euclid Building, Cleveland 3, Ohio
(Address to Desk No. to avoid delay.)

I want to know how I can get my FCC ticket in a few short weeks by training at home in spare time. Send me your FREE booklet "Money Making FCC License Information," as well as a sample FCC-type exam and free booklet, "How to Pass FCC License Examinations," (does not cover exams for Amateur License).

Name .....

Address .....

City ..... Zone ..... State .....

☐ Veterans check for enrollment information under G. I. Bill.
NO OBLIGATION—NO SALESMEN.

There's Money In CUSTOM INSTALLATIONS

A group of Jensen "Customode" units assembled in one of the several ways in which these cabinets can be used.

By
JOHN D. GOODELL
The Minnesota Electronics Corporation

Part 1. There is plenty of custom work to be done in every community but you'll have to go after it.

FEW people expect to purchase a good piano for much less than a thousand dollars. A fine violin may be worth many times that price. The total value of the instruments used by a dance band might approximate five thousand dollars, and fifty thousand would not be an unreasonable estimate for a symphony orchestra.

The music reproducing system of a home radio-phonograph is expected to produce a close reproduction of the performance of any or all of these instruments combined. It is remarkable that the critical listener may obtain such equipment for less than the price of a good piano alone. It is unfortunate that many people make the mistake of comparing the output of a music reproducing system with live music but fail to compare the cost with the original instruments. Perhaps the most unfair concepts about cost involve the loudspeaker. The loudspeaker is expected actually to vibrate mechanically so as to duplicate the complex resultant pattern of a hundred instruments playing simultaneously. Yet, if the loudspeaker is as expensive as a medium-sized accordion or a good guitar, it is often considered outrageously high priced.

The loudspeaker and its enclosure are expected to reproduce the lowest notes of a pipe organ, a piano, a bass viol or a tuba, yet very few people will expect it to occupy as much room as the smallest of these instruments.

Part of these general misconceptions originate from the fact that even a low-priced table model is capable of producing a great deal of pleasant music. As a matter of fact, it is educational and worthwhile to listen to a good acoustic phonograph. The frequency response is limited, indeed, but the range that is reproduced is often startlingly "clean." The customer to whom music is important is not satisfied with merely "pleasant" music. He is seeking an auditory experience as close to the original performance as possible. Some people may quarrel with this statement and perhaps it should be qualified to include, "together with facilities for modifying the original in accordance with personal preference." These comparisons are important and may be of great aid in discussing the selection of equipment with a prospective customer.

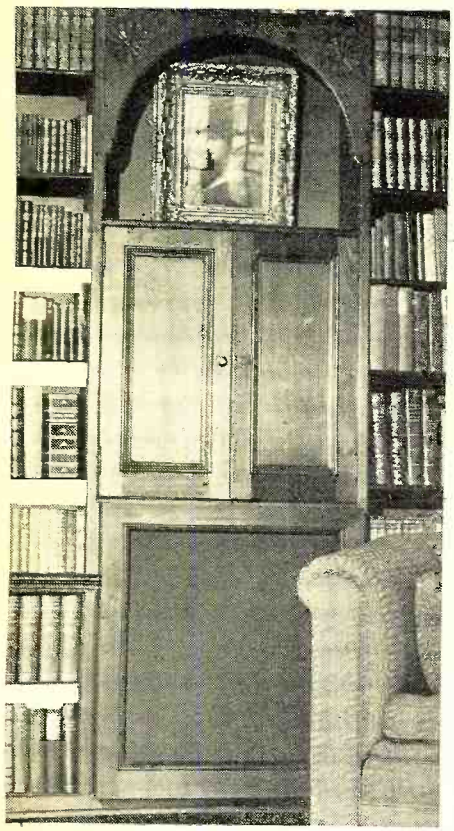
A great portion of any selling problem is solved when customer confidence has been developed. A large percentage of customers for high quality home-music systems are remarkably well informed and often have considerably more listening experience than the average engineer. It is important that the engineer, technician, or salesman be competent to answer the majority of their questions in reasonably non-technical terms and to have the good judgment to say, "I don't know, but I'll try to find out for you," when this is the indicated reply.

Everyone active in the audio industry is asked by friends and customers to advise them which loudspeaker, amplifier, tuner, pickup? What kind of cabinet—bass reflex, corner cabinet, etc.? Unfortunately, stock standard answers are not possible. Assuming that the individual who is asked for these answers has first-hand knowledge of all or most of the units available on the market, the minimum information required for complete answers will include replies to the following counter-questions:

1. Will you use the equipment enough for direct listening to warrant a sub-

Another possible combination of Jensen "Customode" units. These cabinets can be arranged in various ways to meet different decorating and space requirements.

Custom installation taking advantage of an existing alcove in a built-in bookcase. Rear of speaker enclosure opens into basement and mounting board is rigidly coupled to floor. In addition to providing architectural unity, custom installations require the use of the finest radio and acoustic equipment.



stantial investment, or do you simply want to obtain pleasant background music for other activities?

2. How large is the room in which the equipment will be installed? Is it heavily carpeted and draped so that sound is quickly absorbed, or can you observe a distinct reverberant liveness when you clap your hands sharply?

3. Do you listen principally to symphony, piano, string quartette, or dance music, or to a wide variety of music?

4. Do you prefer listening to low or medium loudness levels, or do you turn up the volume to approximate the effective loudness of the original music?

Most prospective customers have equipment of some kind. Fifteen minutes of discussion and listening with them in their homes to their existing equipment will usually produce a great deal more accurate information than can be obtained in several hours of discussion elsewhere. The language of sound is sadly lacking in accurate, well-defined adjectives. A volume level considered moderate by one observer may be intolerably loud for another. The ideal location, built-in possibilities, or cabinet dimensions and styles are best determined by actual observation of the room.

It is not too difficult to bracket prices for any customer. The minimum cost for phonograph equipment only to be used in an average living room to produce good reproduction of recorded music will approximate $250 to $300. The maximum cost for radio and phonograph facilities of the highest quality to be used in a relatively large room with ample reserve power will approximate $1000. These estimates are very rough and are not intended to include cabinets or installation costs which will vary a great deal and should be separately computed. However, the response to such a broad indication of prices will rapidly lead to a discussion of requirements that may be readily tied down to a close bracket. In some instances, depending upon the policies and methods of operation of an organization or individual custom builder, it may be wise to include a reasonable installation estimate in the initial approximate figures. Others may prefer to specify this separately.

When it is possible to have facilities for demonstration sufficiently elaborate to permit switching various speakers, amplifiers, and pickups into the system, the customer may make his own selection on the basis of listening tests. This is a desirable arrangement although there are a number of problems involved. Unless the switching facilities are carefully designed, the characteristics of the various units may be seriously affected. For example, it may appear desirable to operate all the speakers from 500-ohm lines in order to simplify impedance matching. This involves a 500-ohm line-to-voice coil transformer at each speaker, or a single 500-ohm line to multiple voice coil matching transformer with a suitable selector switch. In any event, a transformer that will probably not be used in the final installation is introduced, and for valid demonstration, it must be a very high quality unit. If voice coil impedances are run directly from the various amplifiers to selected speakers, the switching network may become quite complicated. Switching facilities for pickups are still more likely to seriously affect the results obtained. Nearly all technicians realize that pickups of different operating principles (crystals, magnetics, etc.) require different equalizing networks. Many are not fully aware of the importance of proper impedance loading of cartridges of varying design but using the same basic principles. The capacity of the cable used to connect the pickup to the amplifier input is often neglected. Six feet of average shielded cable may introduce sufficient capacity to resonate the coil of a magnetic pickup well within the audio range. A peak in the response curve around eight to ten kilocycles produced in this manner results in extremely objectionable increased noise and distortion.

Few demonstration sound rooms, even in the stores of large distributors, have really satisfactory and flexible facilities of this kind, and the problem is considerably more complicated than cursory consideration indicates.

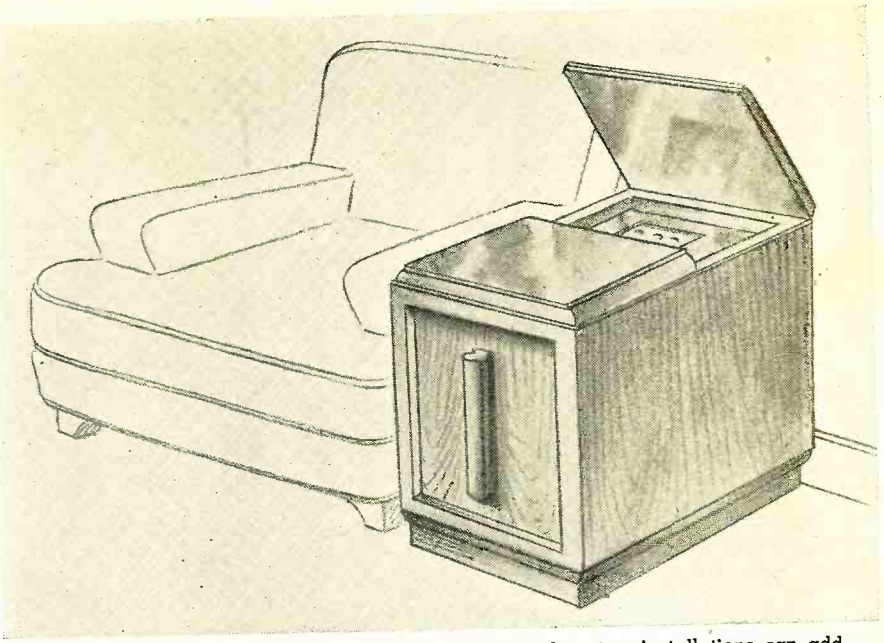
Where comparison tests are being made for any reason, it is extremely important that the source material be standardized. It is not difficult for an experienced listener to differentiate

rapidly between a very poor system and a very good one. It is impossible for even the most competent and well-trained observer to make sure judgments of relative quality in good systems without direct comparison, or at least a set of recordings with which he is thoroughly familiar. Even then, if he is a reallly competent listener, he will be slow to reach positive conclusions.

In calling on customers in their homes to listen to their existing equipment, it is extremely valuable to have available several records with which you may judge for yourself the characteristics of their systems. These should be records with a wide variety of music, and you should have listened to them for sufficient time on top-flight equipment and poor reproducers to know what they sound like under all conditions. In general, they should include:

(1) A piano record, preferably recorded at high level but without distortion in the record (not easy to find, but perhaps at least a section of the record may be found that is entirely clean). Such a record will provide a rapid guide to the dynamic range of the machine. If the system does not have adequate reserve power, the initial transients of the piano tone will drive it into flat-top distortion and the tone quality will go to pieces when the loudness level is brought up to anything approaching the loudness of a real piano in the room. Surprisingly few phonographs are capable of reproducing piano music at normal loudness levels without distortion. Many times the records are wrongly blamed for distortion that originates in the amplifier.

(2) A symphonic record with wide dynamic range, a few crescendo passages with cymbal crashes and kettle drums. If the frequency response is limited, the cymbals will lack crispness and "shimmer." Triangles are often used as a criterion, but it is not always easy to judge their relative loudness.



Submitting professional looking sketches of projected custom installations can add to your prestige, help the customer visualize the work, and provide a sales stimulus.

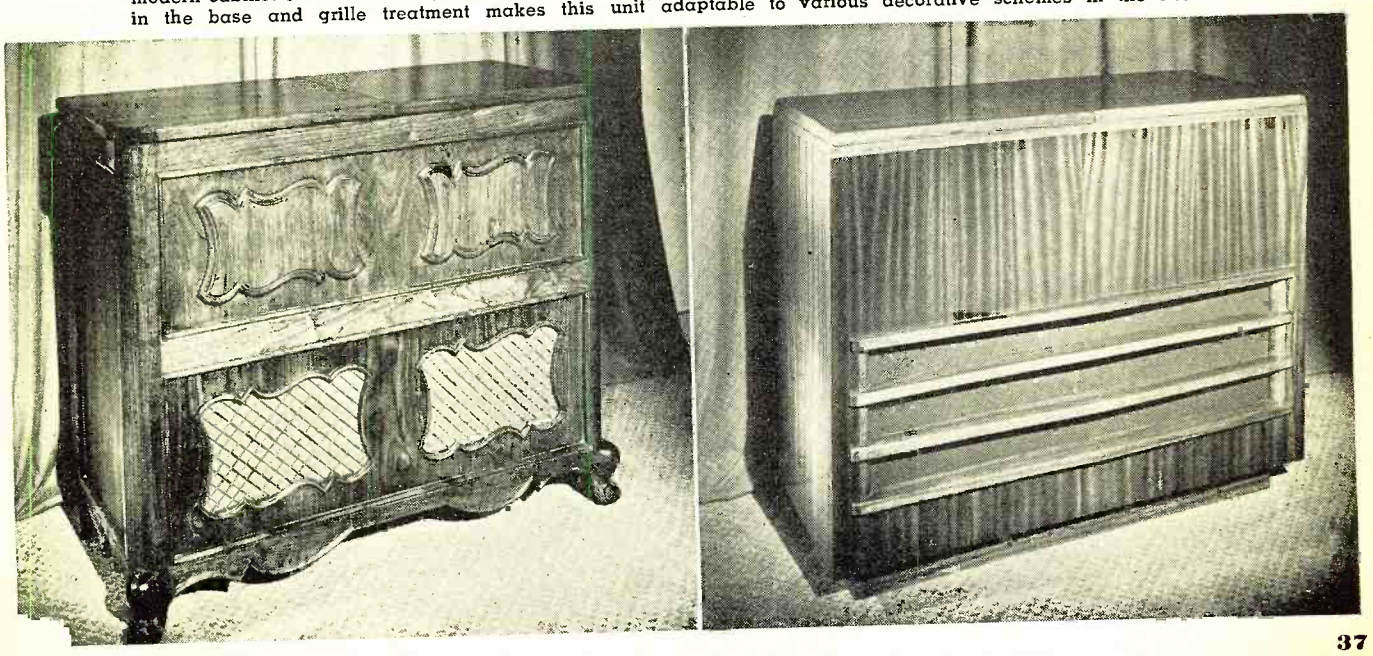
(3) A string quartette. This is an excellent type of recording with which to judge the ability of the reproducer to "separate" instruments. String tones are also a good indication of frequency response, and on a system with poor treble response will sound thin, flute-like in the upper register, and lacking in brilliance.

(4) A popular music record with snare drum and cymbals and a vocal chorus.

(5) A frequency record covering the range from 50 to 10,000 c. p. s. A special frequency record of this kind is available with several interesting test tones on the reverse side. This includes a sine wave at 1000 cycles that starts clean and is gradually driven into severe distortion. Aside from using it to demonstrate just what distortion sounds like to the customer (the question is not uncommon), it is very valuable in making rapid observation of frequency response. On very wide range equipment, the distortion will be extremely objectionable. On limited range equipment the high frequency components of distortion will not be evident, and on very narrow range equipment, the distortion may not be evident in any serious form at all. Another cut on this record demonstrates harmonic and intermodulation distortion combined with two frequencies. Lastly, there are two sets of grooves with no signal except the

(*Continued on page* 140)

(Left) A massive walnut cabinet that was designed for full power output from two coaxial speakers. (Right) A modern cabinet of ribbon mahogany housing four loudspeakers which lend spatial perspective. A slight change in the base and grille treatment makes this unit adaptable to various decorative schemes in the home.



The Television TEST PATTERN

By
M. S. KAY

EVERY television station, prior to its actual broadcasting period, transmits a test pattern for the purpose of permitting set owners to adjust their receiver controls for optimum reception. In addition, many stations set aside 3 to 4 hours during the day—generally the morning and afternoon—during which they transmit nothing but a test pattern accompanied either by a 400 cycle audio note or music. The purpose of this transmission is to enable television servicemen to install and/or repair television receivers. Without such aid, television work would be confined only to those relatively few evening hours when the stations are on the air. While equipment is becoming available now which will permit adequate television service work without the need of a transmitter on the air, no such simple solution is in sight for television receiver installations. Only a signal received from a station, as normally transmitted under actual operating conditions, can be of any assistance in properly orienting the television antenna.

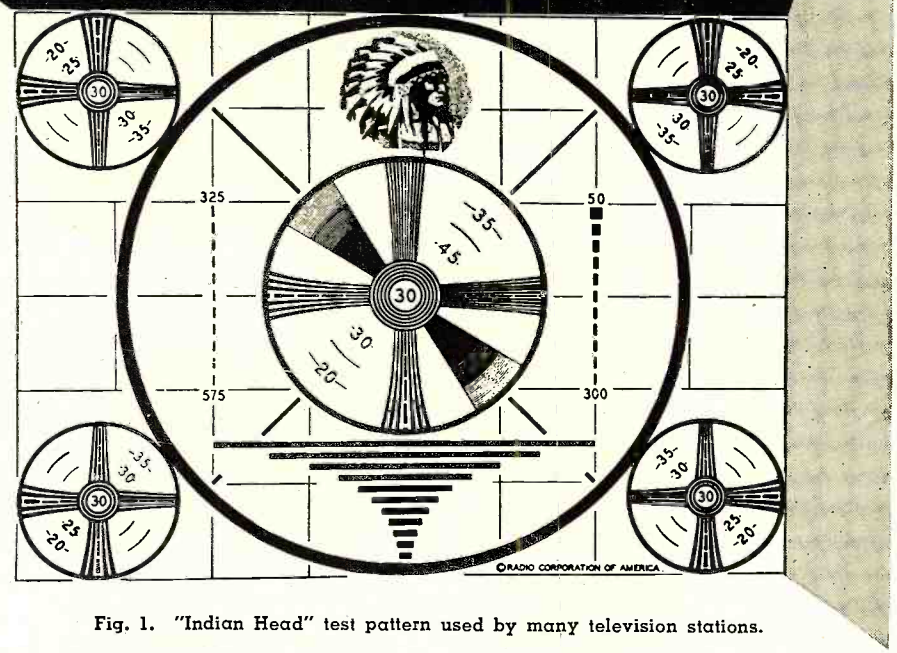


Fig. 1. "Indian Head" test pattern used by many television stations.

The test pattern has been designed to convey important performance data. Study it carefully.

Television test patterns assume many forms, but the one in most common use today is that shown in Fig. 1. This pattern is produced by the *RCA* "Monoscope" tube, 2F21, from a plate built into the tube. When the station is transmitting this test pattern, the "Monoscope" supplies the complete signal in place of the television camera tube.

With the aid of these test patterns, the television serviceman can check the adjustment of the following items concerning a television receiver: 1. Focus Setting; 2. Aspect Ratio; 3. Linearity Adjustment; 4. Frequency Response; 5. Shading and Contrast; 6. Interlacing.

1. *Focus:* Focusing of the image is probably the simplest operation of all. It consists merely in rotating the focus potentiometer until the various sections of the test pattern stand out sharp and clear. On either side of the correct focus control setting, the image will become blurred and fuzzy. Some receivers achieve focusing control by permitting adjustments to be made on the physical positioning of the focus coil along the neck of the cathode-ray tube. These adjustments are generally screwdriver adjustments and must be made from the back of the receiver. When one man is working alone on a set, the only way that he can see what is appearing on the screen is through the use of a mirror, placed facing the screen and tilted slightly upward.

2. *Aspect Ratio:* The aspect ratio is the ratio of the image width to the image height and in modern television has been standardized at 4 to 3. This means that the width is one and one-third times greater than the height. On the test pattern, Fig. 1, the large circle has a diameter which represents the three in the aspect ratio. In other words, it is three-fourths of the image width. The picture appearing on the television receiver screen should be adjusted until the upper and lower portions of the large circle are touching the top and bottom edges, respectively, of the screen mask. The width of the image is then increased until the four smaller circles are each in one corner of the screen. Note that the background of squares in the image also indicates the aspect ratio. There are eight horizontal squares across the image to six vertical squares. 8 divided by 6 equals 4 over 3.

3. *Linearity:* To check the proper setting of the vertical and horizontal linearity controls, examine the central circles in the image. If they are egg-shaped, the beam is not traveling at a uniform speed over the screen. Vertical non-linearity is indicated by the circle being "egg-shaped" in the vertical direction. See Fig. 2. By the same token, horizontal non-linearity is indicated by having the circle "egg-shaped" in the horizontal direction (Fig. 3). Whichever control is affected should be adjusted until the circles become circular again. (Note: It frequently happens that after this adjustment has been satisfactorily made for one station, that the same test pattern for one or more of the other local stations will be slightly egg-shaped. This is due to non-linearity in the scanning equipment at the broadcast station. The only thing the serviceman can do is to set the receiver linearity controls to some compromise position. Fortunately, with transmitted programs, slight non-linearity is seldom noticeable.)

4. *Frequency Response:* The frequency response of a television receiver is one of its most critical features and determines how well an image will be resolved. Of particular importance is the extent of the low and high ends of this response and a careful check of the test pattern will indicate whether the system is fully compensated at each of these ends.

High-Frequency Response. High-frequency response of the receiver can be judged by examination of the four

wedges at the center of the test pattern. The numbers close to the wedges (i.e., 20, 30, 35, and 45) stand, respectively, for 200, 300, 350, and 450 line resolution. Between each of these numbers is a line which stands for the middle value. Thus, the line between 20 and 30 stands for 25, and the line between 35 and 45 is for 40. At the center, the number 30 means 300 lines. The word "line" refers to the number of lines that could be accommodated within the vertical *height* of the pattern. The frequency at which the system cuts off is indicated in the wedges at the point where the lines blend together and are no longer visible separately and distinctly. Thus, in most receivers, the lines run together between 30 and 40. In a poorly designed set, the lines may blend at 25. The circles in each corner also contain wedges with numerical line markings. However, the resolution of these circles is made less than the resolution of the center circles because the beam is not capable of being as sharply focused at the sides of the screen as it is in the center.

The wedges are formed with the black and white lines having the same width if measured along a line normal to the wedge centerline at that point. It will be noted that the two horizontal wedges are identical to the two vertical wedges. This permits us to check both the horizontal and vertical resolutions of the system. The horizontal wedges are used to determine vertical resolution and the vertical wedges are used to determine horizontal resolution. That this should be so is evident from the following reasoning. Vertical resolution, for example, is dependent upon the closeness with which lines can be placed above each other. In the horizontal wedges, the lines are placed one above the other, with the spacing between them varying at various points along the horizontal wedges. When the lines are no longer distinguishable from each other, we have reached the limit of the vertical resolution. By the same token, the vertical wedges indicate how closely lines or details can be placed next to each other horizontally. When the system is no longer able to resolve these pinpoint white and black lines, they become indistinguishable and the limiting resolution has been reached.

In a television receiver, the vertical resolution is almost entirely a function of the number of lines used, in this case, 525. Normally, the performance of the receiver has little effect upon this vertical resolution unless the interlacing is poor in which case other indications on the test pattern reveal this. (To be explained in detail later.) The horizontal resolution, on the other hand, is dependent upon the response and performance of the receiver r.f., i.f. and video-frequency stages and this is important to the serviceman. Hence, the vertical wedges are examined to determine where the lines blend and the reading at this point is recorded as so many lines, say 300. This means that up to the number 30 in the test pattern the lines are separate and distinct but beyond this they run together. Through experience, most servicemen know that a resolution of 300 lines is close to a 4.0 mc. bandpass in the receiver, but they possess no accurate method of determining the system response for other values of line resolution. With the following formula, the conversion from the number of lines to frequency response can be readily achieved.

$$Freq.\ (\text{cycles}) = 12{,}500 \times N$$

Where: N = number of lines as read from the test pattern. For example, if the lines merge at 300 lines, the receiver response is: $Freq. = 12{,}500 \times 300 = 3{,}750{,}000$ cycles $= 3.75$ mc.

When the receiver system is over-compensated at the high frequencies, so that a definite peak results, then a process known as "ringing" will take place. We check for "ringing" with the two columns of single rectangular areas located on either side of the inner circle. The numbers (50, 300, 325, and 575) indicate the width of the nearest rectangle, the width being given as the number of lines which could be accommodated vertically in the image. If over-compensation or "ringing" is present, the rectangles will be followed on the screen by multiple rectangles somewhat similar to ghost images, but evenly spaced from each other. This can be explained as follows.

When a signal containing high-frequency components is applied to this system, the effect, if sudden enough, will produce a series of high-frequency oscillations. These oscillations generally die out rapidly, but before they do, they place several small lines on the screen, each evenly spaced from the original sharp line (or rectangle) that produced them. The lines are produced by the negative peaks of each oscillatory cycle. Not all the oscillations produce visible marks on the screen. Generally only the first two or three are able to do this, depending on the extent of the over-compensation.

When only slight over-peaking is present, it can be detected by examining the black horizontal bars at the bottom of the image. At the left-hand edge of these bars, the margin will be excessively black whereas at the right-hand edge, there will be a short excessively white margin following these

(*Continued on page* 135)

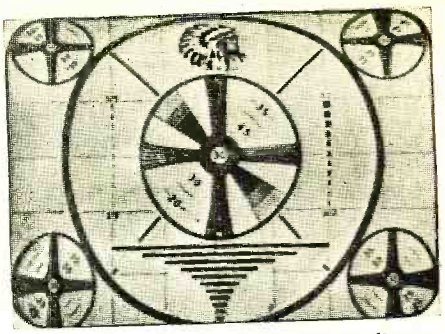


Fig. 2. An example of vertical non-linearity in a test pattern. Note how compressed the Indian Head is whereas the bottom third of the pattern image is "stretched out."

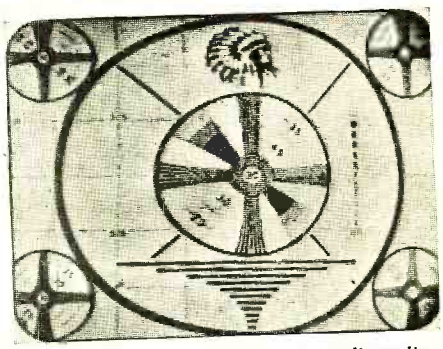
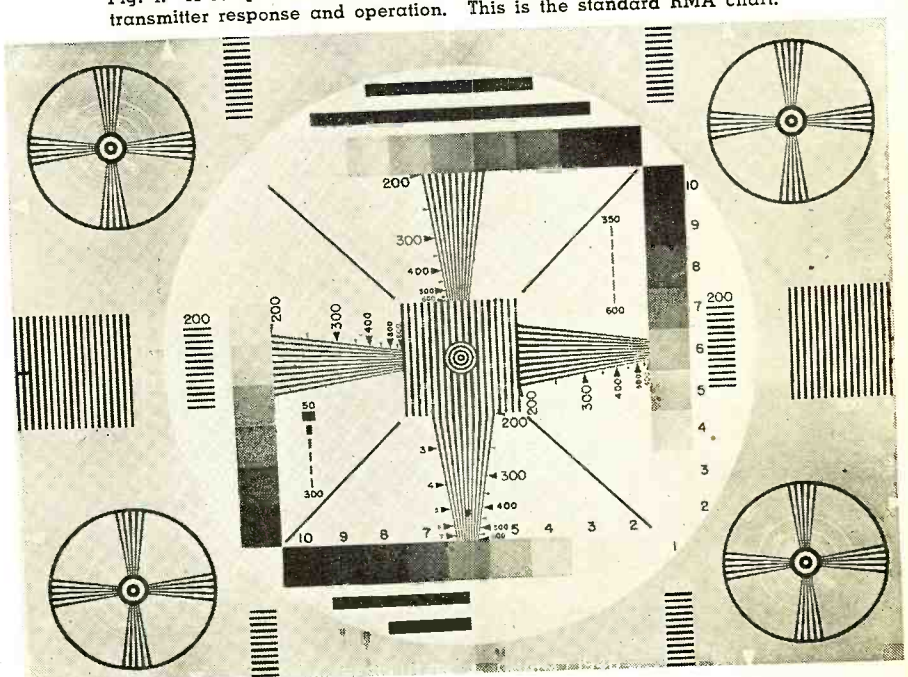


Fig. 3. Example of horizontal non-linearity.

Fig. 4. A comprehensive test pattern designed for checking television transmitter response and operation. This is the standard RMA chart.



HOW TO VALUE YOUR BUSINESS

By FRED MERISH

Do you know what your business is worth? If not, here is the way to figure it out.

DURING the past year, we have been asked many times by radio and television dealers, "What's my business worth?" This indicates that there is considerable interest in the subject. Maybe the dealers wanted to know just as a matter of curiosity, maybe they wanted the information handy just in case some one came around with an offer. At any rate, we do know that more than the usual number of businesses are changing hands these days. Sellers apparently figure that if they sell now they will get top prices because the price level is high. If the reader is trying to buy an established business, if he wants to sell one or wishes to appraise the value of his business for one reason or another, the counsel given in this article should be helpful.

More than one dealer has confided that he tried to place a value on his business by mulling through his books, but he couldn't arrive at anything realistic. This is not surprising because the answer isn't there. Although the book figures are the base from which to work, and they must be accurate, the value of a business is arrived at by a special formula. The assets must be divided into tangible and intangible holdings, book values and market values.

First, list the tangible or physical assets and check the book values to see that the proper adjustments have been made in accordance with good accounting practice. Fixed assets should be properly depreciated. Take the inventory of radios, television sets, sound equipment, record changers, repair parts, etc., at cost or market, whichever is lower. Bad accounts should be written off. Goodwill should be listed at $1.

However, book values, even if accurately recorded, may not represent actual value because market value may be more or less than book value. Just as it is poor accounting practice to enter intangibles at more than a nominal sum, it is usually poor practice to appreciate assets if market value is more than the recorded cost on the books, but the big increase in property values and construction cost has appreciated many business properties, and so, this increase must be considered when putting a current value on a business. Furniture, fixtures, business property, trucks, and servicing equipment should be listed at market values. If market value is lower than recorded value, make an adjustment downward. It is wise to call in competent appraisers to fix the market value of business properties.

Liabilities are definite figures. Businessmen may carry inflated values on assets but never knowingly on liabilities.

So, based upon the book figures and the adjustment for market value, the owner can prepare a "Value of Business" balance sheet, the difference between the assets and the liabilities being the current value of the tangible net worth. A purchaser is not likely to give more than the tangibles are worth because he has yardsticks to measure their value. The intangible value of a business, however, is not arrived at by cost or market calculation based upon book figures and it offers the big problem. These suggestions will help in this calculation.

Goodwill and earning power are the sources of intangible value. Goodwill is begotten of business reputation and managerial "know-how." Often it is worth more than the physical properties. All that one would need to start a good mail-order business would be the right to the name, *Sears, Roebuck.* Years ago, a part-owner of a large concern with $2 million in stock offered his partner the stock and building in trade for the company's name, nothing else. The offer was refused.

Goodwill is the sum a purchaser is willing to pay for the privilege of conducting an established business, the sum which it is necessary to add to the

(*Continued on page* 160)

General layout of a profit and loss statement, showing the income from sales, the outgo for overhead expense, and the cost of goods or services sold.

Profit and Loss Statement

Sales	$50,000
Cost of goods or repair service sold	29,000
Margin earned on sales	$21,000

Overhead Expense

Depreciation	$
Interest paid	
Property taxes	
Other taxes (except income tax)	
Repairs and maintenance	
Insurance	
Advertising	
Office expense	
Payroll expense	
Owner's salary	
Truck expense	
Heat, light, power and water	
Legal and accounting	
Miscellaneous expense	
Total overhead expense (Deduct from margin on sales)	$16,000
Net profit on sales	$ 5,000—(A)

Balance Sheet or Financial Statement

Assets (B)		Liabilities and Net Worth	
Cash	$ 2,500	Accounts payable	$ 3,000
Accounts receivable	1,500	Loans payable	4,000
Inventory	10,000	Mortgage payable	15,000
Business building	21,000		
Servicing equipment	2,000	Total liabilities	$22,000
Furniture and fixtures	4,000	Net worth or capital investment	21,500—(C)
Truck	1,500		
Other assets	1,000		$43,500
	$43,500		

NOTES:

To arrive at the value of goodwill, average the net profit (A) for prior years, deduct interest on average capital investment (C) for the same period, then multiply by the "number of years' purchase."

Total the net profit (A) for a number of prior years, multiply by 10 and deduct the assets (B).

The capital investment is the difference between the assets and the liabilities for an individual operating a business, the capital stock plus the surplus for a corporation.

*Do not forget to include a salary for your services under overhead expense.

WHY MUST WE HAVE BAD AUDIO?

By LLEWELLYN BATES KEIM

A few simple and inexpensive changes and the addition of a new loudspeaker of outstanding performance will lift a poor receiver into the high-fidelity bracket.

Fig. 1. Three views of the Western Electric Model 755-A high fidelity speaker used in the conversions discussed. Power rating is 8 watts and frequency response is from 70 to 13,000 cycles. Angle of coverage is 70 degrees and impedance 4 ohms. The unit should be housed in a 2 cu. ft. baffle totally enclosed except for 7" baffle hole. Inside dimensions of baffle should be 19" wide, 22" high, 8⅞" top depth, and 11 13/16" bottom depth. Lining should be 1" sound absorbing glass wool.

A STUDY is currently being made by the author on present-day radios and radio-phonograph combinations with a view to preparing a market analysis of just what the public is being offered for its radio dollar. As a result of this work, the following study is offered as being of interest not only to the consumer, the radio retailer, and the serviceman, but to the design engineer. This article will point out where most manufacturers have strayed from good engineering practices and how this has affected consumer acceptance of high-fidelity reproduction. It tells a story that is sad in its implications but one that is not hard to correct. Proper buying resistance on the part of the public can force this needed designing revolution in less than one season if the radio set manufacturers would display a willingness to offer top quality merchandise for the price.

It is a sad commentary that either through a lack of "know-how" or through willful neglect the audio system built into almost every radio receiver on the market today fails to live up to high fidelity standards. Not one of the many sets tested thus far by the author has incorporated an audio channel that was capable of reproducing FM program material adequately. Yet, in all cases, the advertising material covering the receivers stressed the advantages of "FM reception."

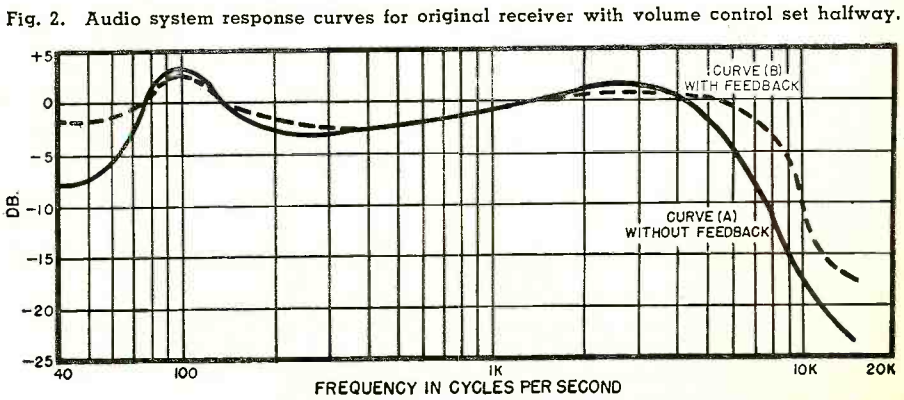
This article, however, will be a specific case study of changes made in three standard sets which will, perforce, remain nameless. The article will deal with typical examples of how a competent serviceman, dealer organization, or even the manufacturer can better the product before it is offered to the customer.

No one will doubt, if he is being honest with himself, that the prime requisite of a good audio system is a good loudspeaker. Fortunately there are many excellent loudspeakers on the market today.

Unfortunately, feminine aesthetes usually prevent the use of large, theater-type dual systems. The need for a separate and large baffling enclosure often rules out the truly desirable audio installation, but in some cases where the family is desirous of securing the ultimate in sound reproduction such installations can be made.

Within the past few months the introduction of small, highly efficient,

Fig. 2. Audio system response curves for original receiver with volume control set halfway.



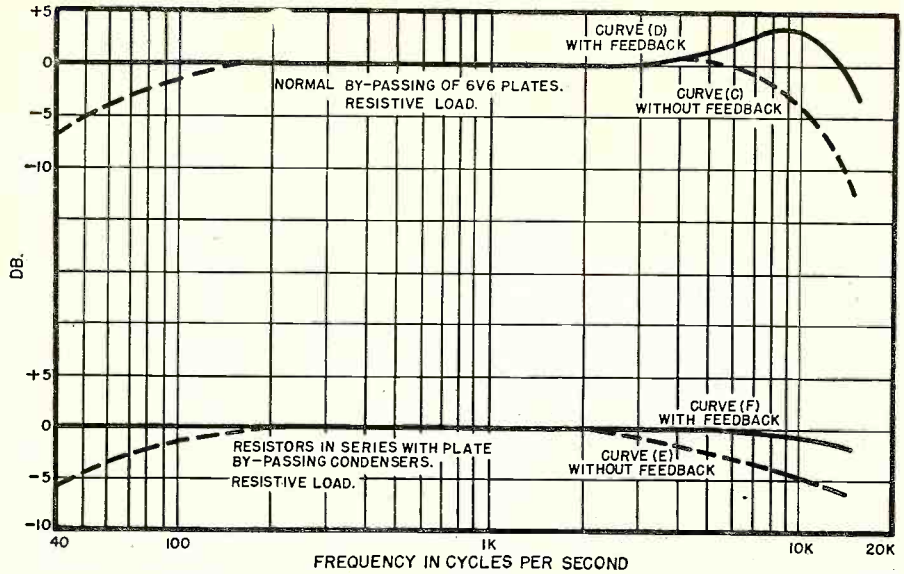


Fig. 3. Curve shows improvement in the set's response after circuit alterations were made. Curves were taken with the volume control full-on.

single-unit transducers, which lend themselves to inclusion within the confines of the set's cabinet, have been introduced.

One such speaker is the new *Western Electric* Model 755-A which has a response extending from 70 to 13,000 cycles and performs through this range with a small, completely enclosed baffling structure which does not require any venting port. This new unit is illustrated in Fig. 1. The added first-cost of equipping a receiver with an improved audio system can be fully justified in terms of improved performance. The dealer who is alert to such possibilities could so equip a set and have it on display on his sales floor, perhaps next to the same model receiver as it arrives from the manufacturer. This is one way to speed up the turnover of stock and at the same time render a valuable service to your customers.

Let us point out at the inception of this detailed description of the changes made on these sets that the same improvement can be made in almost any set without too much difficulty or highly specialized training. A sound background of audio frequency fundamentals and the ability to interpret a schematic diagram are the only special requirements. What has been done in the way of improvement on the three sets used as examples can be done on any receiver providing it has the space to mount a new loudspeaker, and the necessary power output to drive that speaker. The receiver should have a reasonably husky output transformer in order that the transfer of ten watts of audio power may be accomplished properly and not through a bell-ringing coil, or similar unit of inadequate power handling capacity. This is one of the all-too-prevalent faults which may be found in the current market offerings.

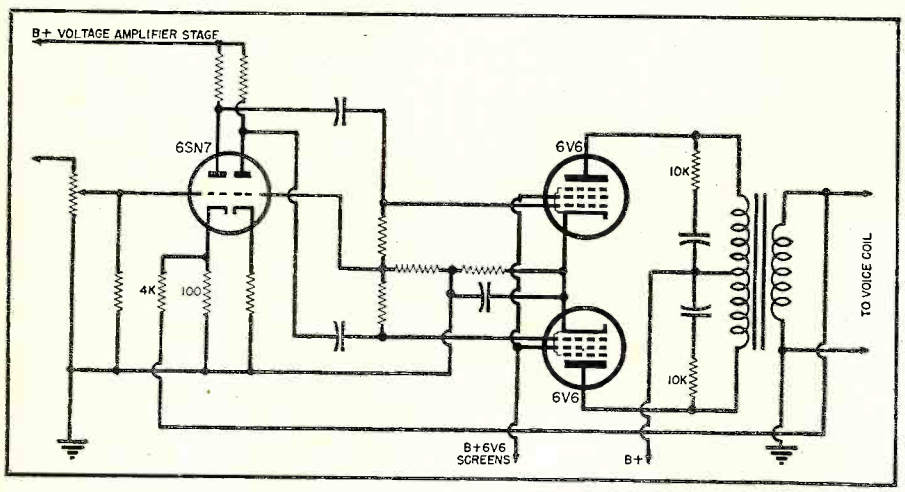
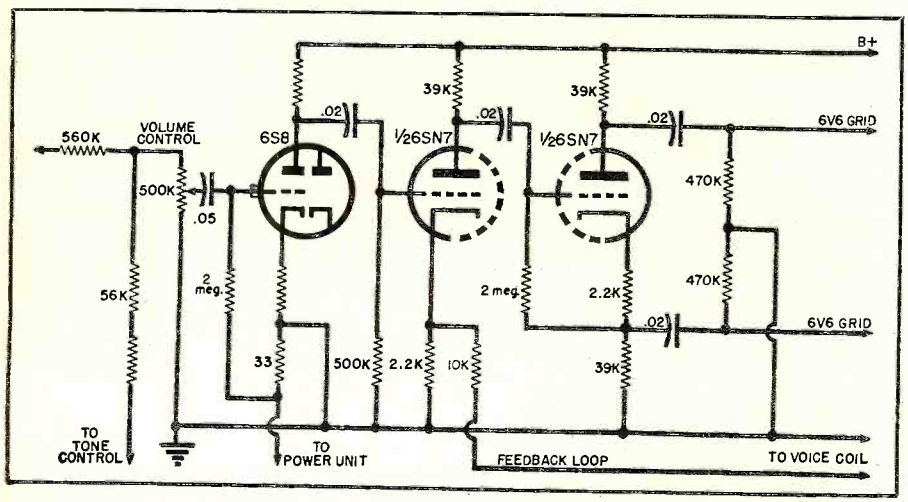


Fig. 4. Audio system of first set showing the four added resistors which were inserted in the circuit to improve the response and performance.

Fig. 5. Schematic diagram of modified audio system of the second receiver tested. All changes indicated on the diagram are explained in the text.



The first study concerned a combination AM-FM tuner which incorporated 10 tubes and a 12 inch loudspeaker. A frequency run of the audio amplifier was made with the gain control advanced about halfway. The ouput voltmeter shunted the voice coil of the speaker. Curve *A* in Fig. 2 indicates the results obtained. The set showed a peak at 100 cycles and very poor high frequency response. Some thought was given to the problem of improving the results obtainable from the receiver. 7 db. of inverse feedback, measured at 1 kc., was introduced around the entire audio system, from the voice coil winding to the cathode of the input stage. Curve *B* of Fig. 2 shows the improvement which was obtained. While the response was considerably improved the set still failed to meet "high fidelity" standards.

The use of pentodes in the output stage of the receiver meant that some form of plate bypassing was necessary in order to stabilize tube performance, prevent "singing," and eliminate supersonic oscillation. As constructed, the condensers in this set are quite large, and although they could not be eliminated entirely, some modification of values was tried. A set of curves was run, using a resistor as a load instead of the loudspeaker voice coil, in order to standardize the measuring technique. Curves *C* and *D* of Fig. 3 show the amplifier performance with the resistive load, with and without the feedback loop connected. The peak occurring at about 9 kc. is due, in part, to these bypassing condensers. A 10,-

000 ohm carbon resistor was inserted in series with each of the bypass condensers and the frequency response measurements were repeated. Curve *E* of Fig. 3 shows the results introduced without the feedback loop in operation and Curve *F* shows the improved circuit with the use of feedback. Now the amplifier is performing within limits of ± 2 db. from 40 to 15,000 cycles although all that has been done to the set is add a feedback connection and four carbon resistors. See Fig. 4. Listening tests were then made with the original loudspeaker and with the 755-A. A rapid transfer switch was used so that the two units could be interchanged. The improvement was so remarkable that the performance of the receiver was unrecognizable from its previous state. The conversion was simple and required but little time and effort, excluding the time spent in making response curves, but it did change the set from a mediocre one to a creditable performer worthy of the name under which it was being marketed.

So gratifying was this experiment that a larger console radio-phonograph unit became the next subject for study. The measured results were highly disappointing in the data revealed. This set was an 11 tube receiver, incorporating an unconventional tone control system. Because it was hoped that the receiver might be made to perform more satisfactorily, a new loudspeaker was installed first, together with the proper amount of baffling. However, listening tests showed that there was no combination of settings of the tone controls that would produce anything but a "boomy" response. Even listening to an FM station transmitting live material failed to show any high frequency transmission of the audio system, nor was it possible to operate the set at medium to high volume levels without distortion. Analysis of the published schematic revealed insufficient bias on the first audio stage so that an input signal of any appreciable level caused serious distortion. Tests with an audio oscillator, after installation of a suitable cathode biasing resistor, showed that it was virtually impossible to develop more than four watts of power, a very low figure considering the tube manufacturer's rating on 6V6's. Examination of the output transformer seemed to indicate that this was the offending component as the core was too small for a unit called upon to handle any appreciable audio power. The next step was to substitute a more adequate output unit. This transformer was mounted externally to the chassis but the move was well justified. The first runs, using the oscillator as a signal source, are not plotted as the results were poor. Further study of the schematic showed a rather heavy use of bypassing condensers throughout the receiver's audio channel, thus precluding anything like a flat audio response. Removing the 500 $\mu\mu$fd. condenser from the plate

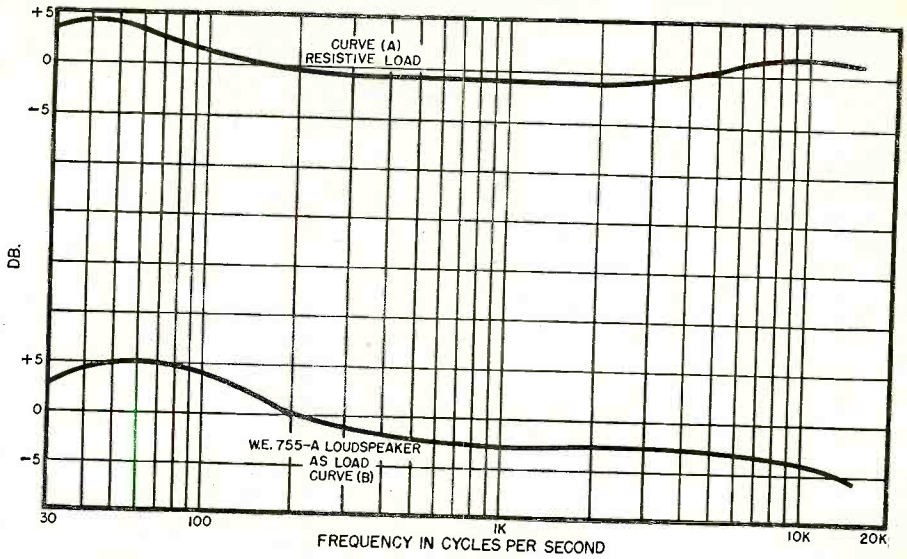


Fig. 6. Performance curves of the amplifier shown in Fig. 5. These curves were made with volume control in mid-position and optimum tone control settings.

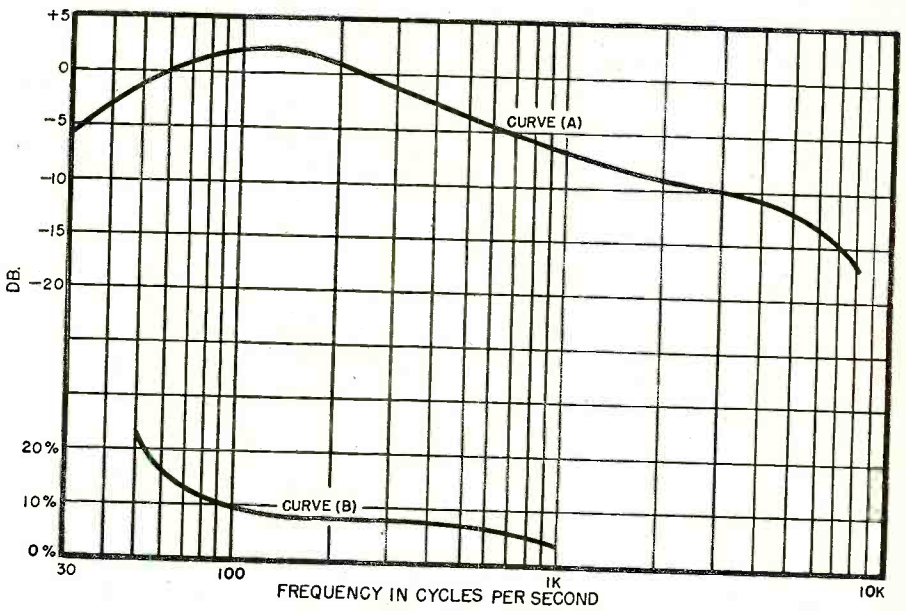
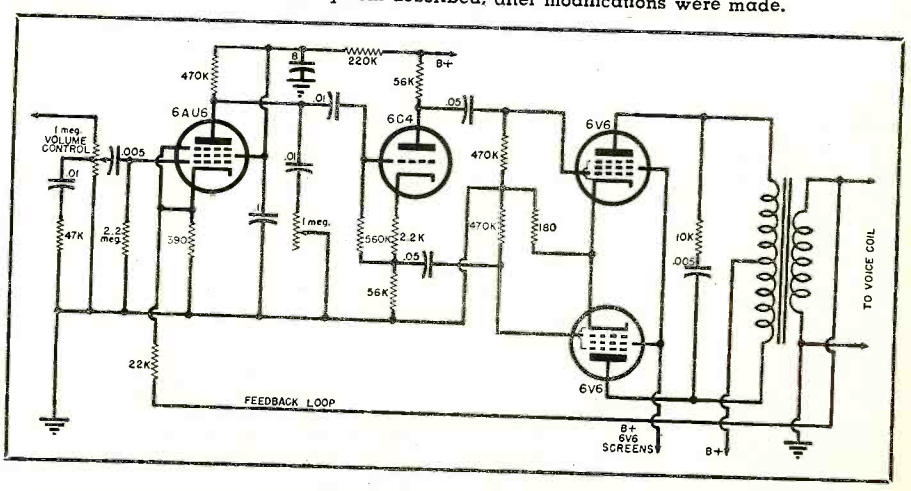


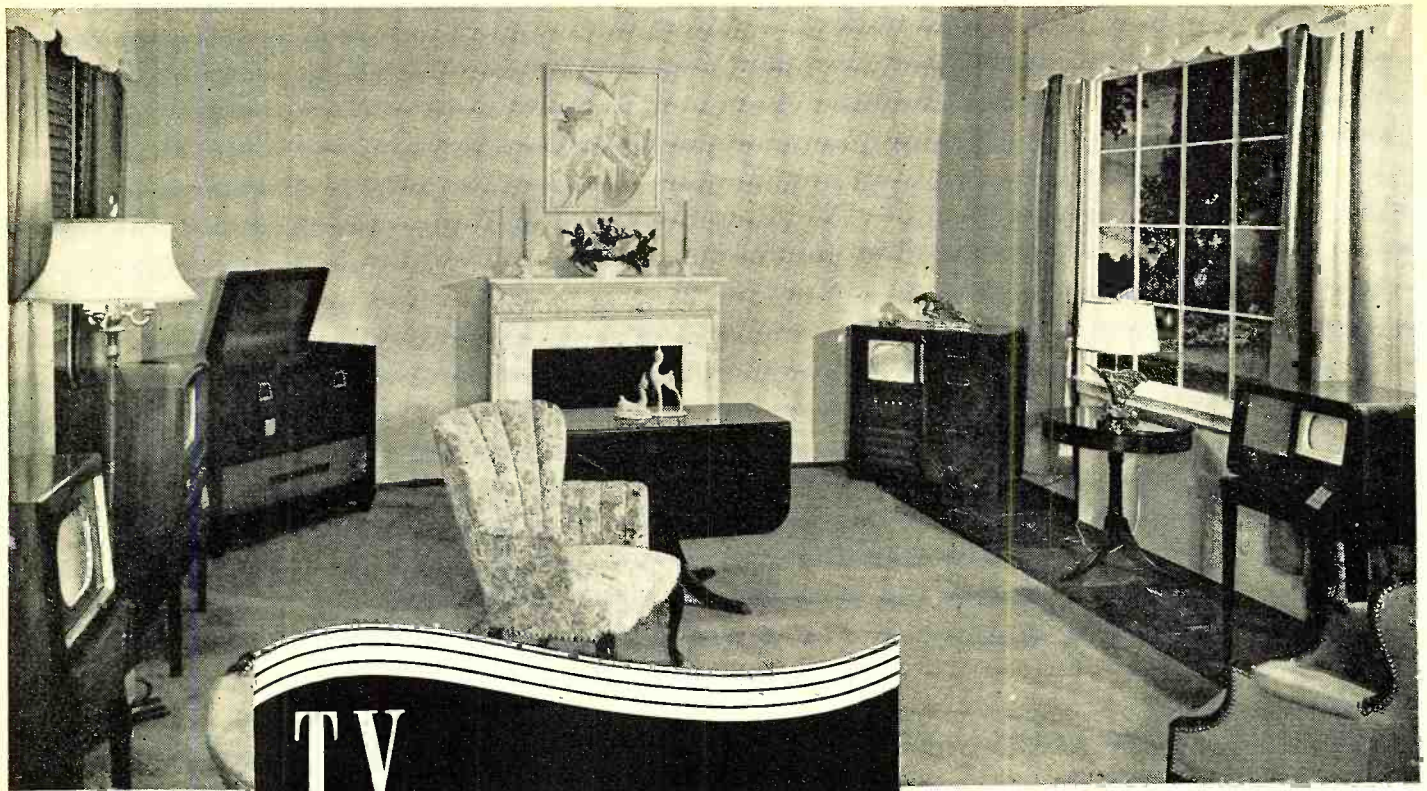
Fig. 7. Response of audio system shown in Fig. 8 before modifications.

of the first audio tube, and the .005 μfd. unit shunting the output transformer primary improved matters to some extent but was not the final solution to the problem. The tapped control used in the volume adjustment was changed from a high resistance

(*Continued on page* 122)

Fig. 8. Third audio system described, after modifications were made.





TV PROMOTION

The "living room" atmosphere achieved by Philco Corporation in this display proves to be a powerful sales stimulus. A special backdrop simulates a garden scene.

By
HERBERT S. LAUFMAN and MILT HOPWOOD
Hopwood, Laufman, Fomund & Cross

Getting on the television bandwagon now will give you a money-making business in the years to come.

SO THERE'S a new television station in your town—or there will be soon! And you're to be charged with the responsibility of selling a fine line of television sets in addition to being expected to install, service, and repair the sets to the complete satisfaction of your customers.

This is a big problem, but not unusual. Since the war more and more dealers have been meeting the challenge of television—and making money.

With the establishment of a TV station in your vicinity certain problems will arise unlike any which have occurred since radio was first introduced. Basically the problems boil down to this: *The public must be sold on TV as practical, entertaining, and necessary before sets can be sold.*

Only when this is accomplished will your television business assume money-making proportions. As with any other commodity, the desire must be created before a purchase will be made. This is best accomplished by a concerted sales promotion campaign. It must be handled cooperatively by the manufacturers and distributors of all television lines and by the stations. Until the public is completely "sold" on television, it is up to all interested parties to cooperate in selling video to the public.

Top-notch entertainment and public service features will make television a necessary and practical adjunct to daily living. It is up to the dealers, station owners, manufacturers, and distributors to recognize this responsibility and underwrite cooperatively costs of television programs until sets begin to move and thus create a more profitable market for the advertiser. Once sets are in homes and public places where they can be seen set sales will gather momentum and continue to multiply. Other advertisers will then underwrite the still high production costs.

A well-rounded sales promotion program should include, in addition to television itself; radio, newspapers, direct mail, posters and billboards, public demonstrations, and "trial installations."

Sales resistance to television assumes diverse forms. According to a recent survey, reasons for not buying TV sets were found to be (in order of prevalence):

1. Too expensive
2. Sets not perfected
3. Programs not interesting or poorly done
4. Sets will become obsolete
5. Landlord won't allow antenna installation
6. A.c. service not available.

In each of these instances it has been found that the lack of complete and correct information has led the customer to draw these conclusions. When the facts were accurately presented to the customer, in almost every case, resistance was eliminated.

Here, then, is the list of objections with the answers you can use to combat such objections.

1. *Too expensive*—This argument can be overcome by pointing out that there are many sets now on the market which retail for less than $200.00.

2. *Sets not perfected*—Untrue. The picture received on the screen of a *properly installed* television receiver is clear enough for complete satisfaction. Most improvements, in the near future, will be made in transmitting equipment and will be reflected in current receivers.

3. *Programs not interesting or poorly done*—Professional baseball, foot-

ball, boxing, etc. are televised as they happen and provide "in person" coverage. Production techniques are much more polished than, say, even a year ago.

4. *Sets will become obsolete*—According to the most reliable industry estimates, color television is at least five years away. Black and white channel allocations are now relatively stable and persons hesitating to purchase a set because of possible obsolescence should hesitate no longer.

5. *Landlord won't allow antenna installation*—While many landlords will not permit each owner-tenant to erect a separate antenna some may be talked into permitting a multi-set antenna system to be installed. Indoor antennas can be used in some instances depending on the location of the customer's residence.

6. *A.c. service not available*—Inverters are available to convert d.c. to a.c. and permit the operation of standard television receivers.

Newspaper Promotion

Newspapers play a natural part in television promotion. Many TV stations are owned and operated by newspapers. Whether the newspaper is financially interested in television or not they usually devote a special section to television at the time new stations go on the air. Space in this section is sold to dealers, distributors, and manufacturers and affords a concentrated kick-off of particularly high reader interest. Arrangements can usually be made with the distributor or manufacturer to help pay for space in this section. Cooperative advertising contracts vary but usually the manufacturer or distributor will pay half the line costs of the ads.

Trial Installation

Television must be seen to be sold!

Television sets in public places such as hotels, bars and grills, office building lobbies, department stores, and theaters afford the general public the opportunity for seeing television in operation. Here the desire to buy is created.

Special arrangements should be made with such establishments to put TV in on a trial basis. The management of public places generally cooperates because television programs draw crowds and increase customer traffic. This is particularly true of bars and grills. In New York, Chicago, and several other television cities this market has been saturated first and has done more to stimulate set sales than any other single factor. By emphasizing installation in these places, the advantage of a vast number of viewers per set helps present a large audience for advertisers despite limited set sales.

There are few products which cannot find a market in the bar and grill trade. Most nationally advertised products such as cigarettes, automobiles, beverages, TV receivers, watches, razors, cosmetics, etc. find here the same prospects as they reach through their magazine, newspaper, or radio coverage.

As the sale of television sets to homes increases the number of viewers in public places tends to decline. The home market has become the measuring stick for a profitable TV market from the sponsor's point of view.

Before great sums of money are invested in television, advertisers must be assured of a home market. Despite the large audience available in public places, it must be realized that attention is greater and interest higher in the home where the evening is usually set aside for television entertainment and the disturbing overtones of conversation, cash registers, and clinking glasses are absent.

Trial installation is one of the most potent selling techniques yet devised. Once a set is installed in the home, nine-tenths of the selling is done. In the home where the family can see it, admire it as a piece of furniture, compare it with existing room appointments, there is a much less formidable selling job to be done. An offer to place a set in the home at no cost is a lure that customers find hard to resist.

The Kiddies

Youngsters constitute one of the most enthusiastic segments of the television audience and can be instrumental in directing an enormous amount of business in your direction.

Almost every TV city has its "kiddie shows." They range from the lovable puppets "Kukla and Ollie," a dragon and little boy, appearing on WBKB, Chicago; and NBC's "Howdie Doodie," to adventure serials, animated cartoons, western movies, and typical "uncle" shows where the funnies are

(*Continued on page* 119)

SETS IN OPERATION AS OF NOV. 1ST		TV CONSTRUCTION PERMITS	
New York-New Jersey	320,000	Albuquerque, N.M.	New Orleans, La.
Philadelphia	77,500	Ames, Ia.	Oklahoma City, Okla.
Chicago	41,650	Binghamton, N.Y.	Omaha, Neb.
Los Angeles-Hollywood	38,200	Birmingham, Ala.	Peoria, Ill.
Boston	30,400	Bloomington, Ind.	Phoenix, Ariz.
Baltimore	26,000	Charlotte, N.C.	Pittsburgh, Pa.
Washington	24,050	Columbus, Ohio	Portland, Ore.
Detroit	20,500	Davenport, Ia.	Providence, R.I.
Cleveland-Akron	16,572	Dayton, Ohio	Riverside, Cal.
St. Louis	13,000	Erie, Pa.	Rock Island, Ill.
Schenectady-Troy	10,600	Grand Rapids, Mich.	Rochester, N.Y.
Bridgeport-New Haven	9,800	Greensboro, N.C.	Rome, N.Y.
Milwaukee	9,300	Indianapolis, Ind.	St. Petersburg, Fla.
Cincinnati	8,000	Jacksonville, Fla.	San Diego, Cal.
St. Paul-Minneapolis	7,500	Johnstown, Pa.	San Francisco, Cal.
Buffalo	6,300	Kalamazoo, Mich.	Seattle, Wash.
Toledo	4,100	Kansas City, Mo.	Stockton, Cal.
Richmond	4,000	Lansing, Mich.	Syracuse, N. Y.
Atlanta	3,800	Lancaster, Pa.	Tulsa, Okla.
Dallas-Ft. Worth	3,350	Louisville, Ky.	Utica, N.Y.
Memphis	1,500	Miami, Fla.	Waltham, Mass.
Salt Lake City	750	Nashville, Tenn.	Wilmington, Del.

Notes: At this writing 46 stations are in operation in 25 cities.

Over 300 requests for construction permits covering television stations are now on file with the FCC.

It is expected that more than 850,000 television sets will be installed by the end of 1948. More than 440,000 TV sets were produced during the first eight months of this year, more than all the sets produced in 1947 and part of 1946.

In October of 1948 more than 104,700 sets were produced.

Here is your television market. Facts and figures on stations and set distribution.

Although space is at a premium, Hudson-Ross of Chicago recognizes the importance of providing suitable "settings" for their line of telesets. In separate viewing booths, the prospective customer is cut off from outside distractions in the store.

A 220 mc. Converter from the Surplus R-1/ARR-1

By
LEROY W. MAY, JR., W5AJG

With minor alterations, the ARR-1 becomes a high gain converter with two stages of r.f. amplification.

External view of the ARR-1. The dial is actually calibrated by inserting the number 2 before each of the dial markings. Thus, 38 becomes 238, the frequency to which the unit is tuned. Since the photo was taken the amateur assignment has been lowered to 220-225 mc. instead of 235-240 mc. A simple alteration of the tuning coils effects this lowering of frequency.

ASSUMING you have enjoyed some success on the 144 mc. band and operation therein has now become "normal" instead of *"snafu,"* as it was when the can-opener was first applied to the now famous SCR-522, perhaps you have raised your sights to our next higher authorized amateur band, the 220-225 mc. strip, sometimes known as the 1¼ meter band.

In the past, and even up to the present as far as commercial equipment is concerned, units covering this frequency are still rather expensive and scarce. However with the television activity extending upwards to the edge of our 220 mc. band, such equipment may become a reality. It is doubtful, very doubtful though, that such apparatus will sell for anything under the one-hundred dollar level.

Until such a time then, a break is in store for these good hams interested in high quality equipment for the 220 mc. band, in the form of airborne surplus units. With such apparatus as this available and at such moderate cost (four to ten dollars at the present market), it is doubtful if one could construct a decent superregenerative rushbox receiver at anywhere near the same price. As it stands when completed the R-1/ARR-1 will be essentially a two-stage r.f. acorn-tube superhet converter, employing a total of four tubes.

To be described is a piece of airborne (Navy) gear called a Model ZB-2 aircraft radio. The receiver portion is probably better known to those who had dealings with it as the R-1/ARR-1. Needless to say, it is a natural for the v.h.f. ham and is one of the most beautifully built pieces of surplus imaginable—with its acorn tubes and ganged, slug-type of tuning mechanism.

As for size—it will, of course, be excellent for mobile use as it was originally an airborne type and is built to withstand severe jolts. The R-1/ARR-1 measures 3½" wide by 3" high and 10" deep, and is constructed of aluminum throughout.

Inspection of Figs. 3 and 4 before and after conversion will show the unit's construction, and it is a safe bet that somewhere along the line, a v.h.f. amateur had something to do with the design, as it is entirely straightforward and logical in layout, which is somewhat more than we can say of some surplus gear released since the war.

The wartime role played by the ARR-1 was considered secret, of course, and even today it is not too well understood or appreciated. In an effort to provide secret communication or intelligence for "homing" purposes, it was found that by taking a fairly low radio frequency, say around 700 kc., and modulating it by voice, tone, or pulse, or perhaps other methods and then using this 700 kc. modulated carrier to modulate one somewhere between 234 and 258 mc., it could not be detected by standard enemy v.h.f. receivers. That is, the 200 mc. or so carrier could be tuned in, but for all practical purposes it would appear to be unmodulated. The ARR-1 unit which was used to receive the signals however, consists of three 954 tubes in a cascade r.f. stage and one 954 as a low frequency detector. It was here in this last stage that the low frequency 700 kc. component was separated from the 200-mc. carrier. It was then passed on to the regular low frequency receiver and detected in the usual fashion. In actual practice, both the r.f. carrier and the modulation carrier could be changed daily, the former from 234 to 258 mc. and the latter from 200 to 1500 kc.

Since the design of the ARR-1 is straightforward, it is quite easily modified to resemble a bonafide converter. The last 954 stage, which is originally a broad-band "detector," is rebuilt into a regular acorn tube mixer stage. The output frequency is changed from the original 700 or so kc. to one of 30 mc. The third r.f. stage is also rearranged and changed into a 955 acorn tube oscillator to inject into the mixer stage.

Naturally, any other frequency besides 30 mc. may be chosen for the i.f. frequency from the converter. Our selection of this frequency is intentional inasmuch as our station equipment readily tunes to 30 mc. and since we intend to experiment with the 30 mc. radar preamp strips now on the surplus market. It is believed that the converter coupled to one of these strips

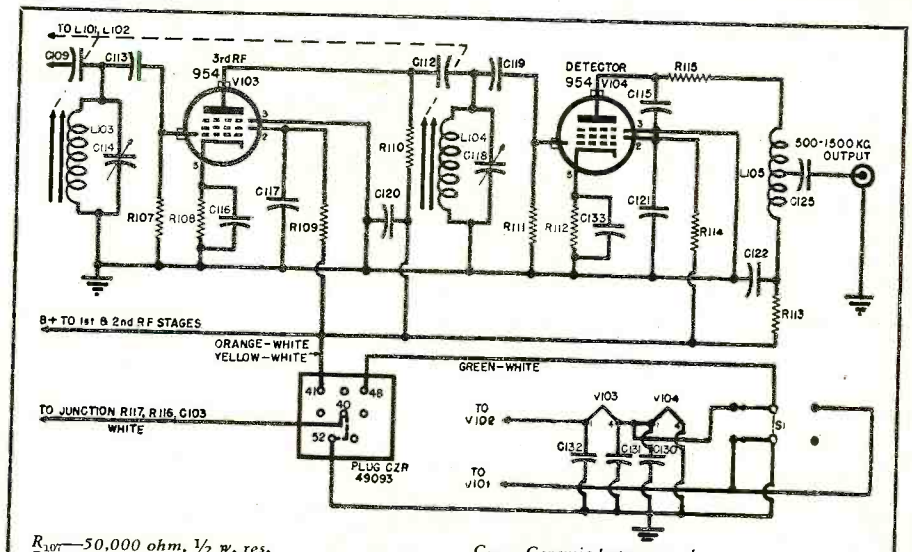
with the bandwidth narrowed down somewhat would make an excellent complete receiver for the 220 mc. band, at the same time not tying up any of the regular station equipment.

The Original Circuit

Wiring schematics of the ARR-1 do not seem to be readily available for some reason and this has caused many fellows to hesitate to buy these units. While no schematic was available for our particular unit, we did take the time and trouble to trace through the original circuit. Fig. 1 shows the circuit of our model. It is probably representative of all the ARR-1 units. The function of the several sockets that appear at the rear of the ARR-1 is not known. They appear to be cross connections of the main power supply, probably to furnish voltages for other units. At any rate they are not an integral part of the wiring and hence are not shown in Fig. 1.

The 954 acorn type, r.f. pentode input stage is a conventional r.f. amplifier with a tuned grid circuit. The antenna and grid connection for the 954 is tapped down on the grid coil. The next two stages, also consisting of 954 acorns, are capacity-coupled and provide three ganged r.f. stages covering 234 to 258 mc. As the tuning dial is rotated, polyiron slugs move in and out of the field of all the tuned circuits. This is a beautiful, simple, and effective trick for tuning and makes a surprisingly smooth and easily handled converter. Since our amateur band is now 220-225 mc. it becomes only necessary to squeeze the tuning coils slightly to alter the frequency range. More on this later.

The fourth, and last, 954 acorn stage is the broad-band detector, the output of which is fed into a coax type connector. As is almost every piece of Army or Navy equipment, each and every component is stencilled with a number. This makes identification particularly easy and this notation is used in Fig. 1.



R_{107}—50,000 ohm, ½ w. res.
R_{108}—1000 ohm, ½ w. res.
R_{109}, R_{114}—200,000 ohm, ½ w. res.
R_{110}, R_{113}—30,000 ohm, ½ w. res.
R_{111}—20,000 ohm, ½ w. res.
R_{112}—10 ohm, ½ w. res.
R_{115}—50 ohm, ½ w. res.
C_{109}, C_{112}, C_{113}, C_{119}—Ceramic coupling cond.
C_{114}, C_{118}—Tank tuning cond.
C_{115}—Ceramic bypass cond.
C_{116}, C_{117}, C_{120}, C_{121}, C_{130}, C_{131}, C_{132}, C_{133}—30 μμfd. midget tub. cond.
C_{122}—.006 μfd. mica cond.
C_{125}—.0006 μfd. mica cond.
L_{103}, L_{104}—Tank inductors. 2 t. #16 wire air-wound to ⅜" dia. Spaced dia. of wire
L_{105}—Det. output coil
V_{103}, V_{104}—954 acorn tube

Fig. 1. Original diagram and parts list for the last 2 stages of the surplus ARR-1 unit.

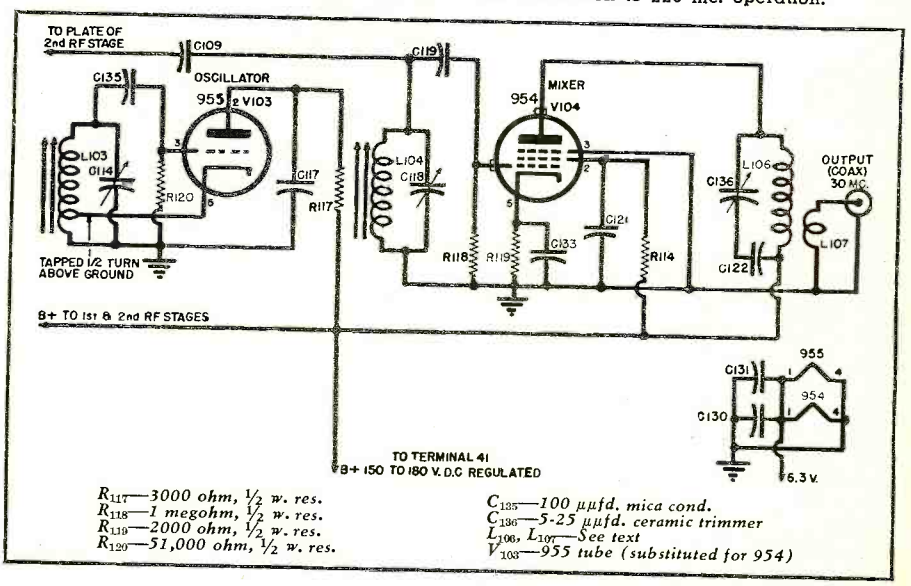
The Modification

The first step in the modification is to rewire the filament circuit. It will be found that originally the heaters could operate on either a 12.6 volt series-parallel arrangement or a 25 volt series circuit by throwing the d.p.d.t. toggle switch on the underside of the unit. Rewiring is a very simple operation. Merely put the filament voltage selector switch on the 12.6 volt position and unsolder the black and white tracer heater wire on tube V_{103} (should be the heater lead where C_{132} is located). Then ground the socket pin where the heater wire was just removed. This same procedure is then followed on V_{102}. In this case, change the heater lead from the pin where C_{128} is attached to the pin where C_{129} is soldered. Then ground the C_{128} side of the heater circuit. Condensers C_{128} and C_{132} may be removed if desired. The heaters will now operate on 6.3 volts a.c. Actually it is not necessary to go to this trouble as the filaments may be operated directly from a 12.6 volt transformer without any modifications whatsoever. Two very light duty 6.3 volt windings may be tied in series to accomplish the same end. The current drain is quite small. Most experimenters by now have used this trick on various pieces of surplus gear they have converted. Also, it goes without saying, a transformer delivering 24 or 25 volts a.c. will do the job. Just throw the switch to the 24 volt position.

The second step in the modification is to rebuild the mixer stage. To do this, remove the following components from this stage; L_{105}, C_{125}, R_{113}, R_{115}, and C_{115}. In the place of L_{105} and C_{125} substitute the circuit shown in Fig. 2. These parts have been relabeled as L_{106}, L_{107}, and C_{136}. In removing L_{105}, we stripped the wire from the form and used this form to wind L_{106} and L_{107}. To tune to about 30 mc. the coil L_{106} should consist of 14 turns of d.c.c. No. 18 wire, closewound. L_{107} is also wound on the same form and is placed as close to the cold end of L_{106} as possible. This new coil L_{107} consists of 7 turns of No. 26 d.c.c. wire closewound. The new tuning condenser C_{136} is a 25 μμfd. ceramic trimmer.

In the cathode of the last stage, remove R_{112} (10 ohms) and substitute in its place a 2000 ohm, ½ watt carbon resistor which we have relabeled R_{119} in Fig. 2. In the control grid circuit, remove the 20,000 ohm resistor (R_{111}) and substitute a 1.0 megohm resistor, (R_{118} in Fig. 2). This completes the

Fig. 2. Circuit diagram shows modification of the ARR-1 unit. The changes affect only the last two stages of the converter. Parts listed are the additional components required to complete the conversion to 220 mc. operation.



R_{117}—3000 ohm, ½ w. res.
R_{118}—1 megohm, ½ w. res.
R_{119}—2000 ohm, ½ w. res.
R_{120}—51,000 ohm, ½ w. res.
C_{135}—100 μμfd. mica cond.
C_{136}—5-25 μμfd. ceramic trimmer
L_{106}, L_{107}—See text
V_{103}—955 tube (substituted for 954)

modification of the 30 mc. mixer stage.

The third 954 r.f. amplifier stage is now rebuilt into a 955 acorn oscillator stage. First, remove R_{108} (1000 ohms) and C_{116} from the cathode pin of the 954 acorn socket (V_{103}). Once this socket pin is clear, take a piece of stiff wire a few inches long and bring it from the socket thru a hole in the partition wall and solder it to coil L_{103}. A piece of spaghetti may be used for insulation. The connection to coil L_{103} should be made about one-half turn above the ground end. The hole in the partition wall just referred to is conveniently provided by removing a shield partition screw. The photograph, Fig. 4, shows this arrangement quite clearly. After soldering the cathode lead to L_{103}, squeeze the turns of the coil together as closely as possible without having them actually touch each other. This should place the frequency of the oscillator tank about 30 mc. lower than that of the mixer grid circuit. If it does not, then wind another coil similar in shape but slightly larger in diameter to cover the necessary 30 mc. lower frequency range. In all the alterations of the coils, as well as the squeezing of same, a grid dip meter is indispensable. With it one can trim every coil to the exact frequency desired and can be certain that when the voltages are applied the set will be on frequency. Lacking the grid dip meter, it is necessary to use the older, but still workable, method of "cut and try." It will simply consume more time and patience. Final tuning and padding of the oscillator is done with C_{114}.

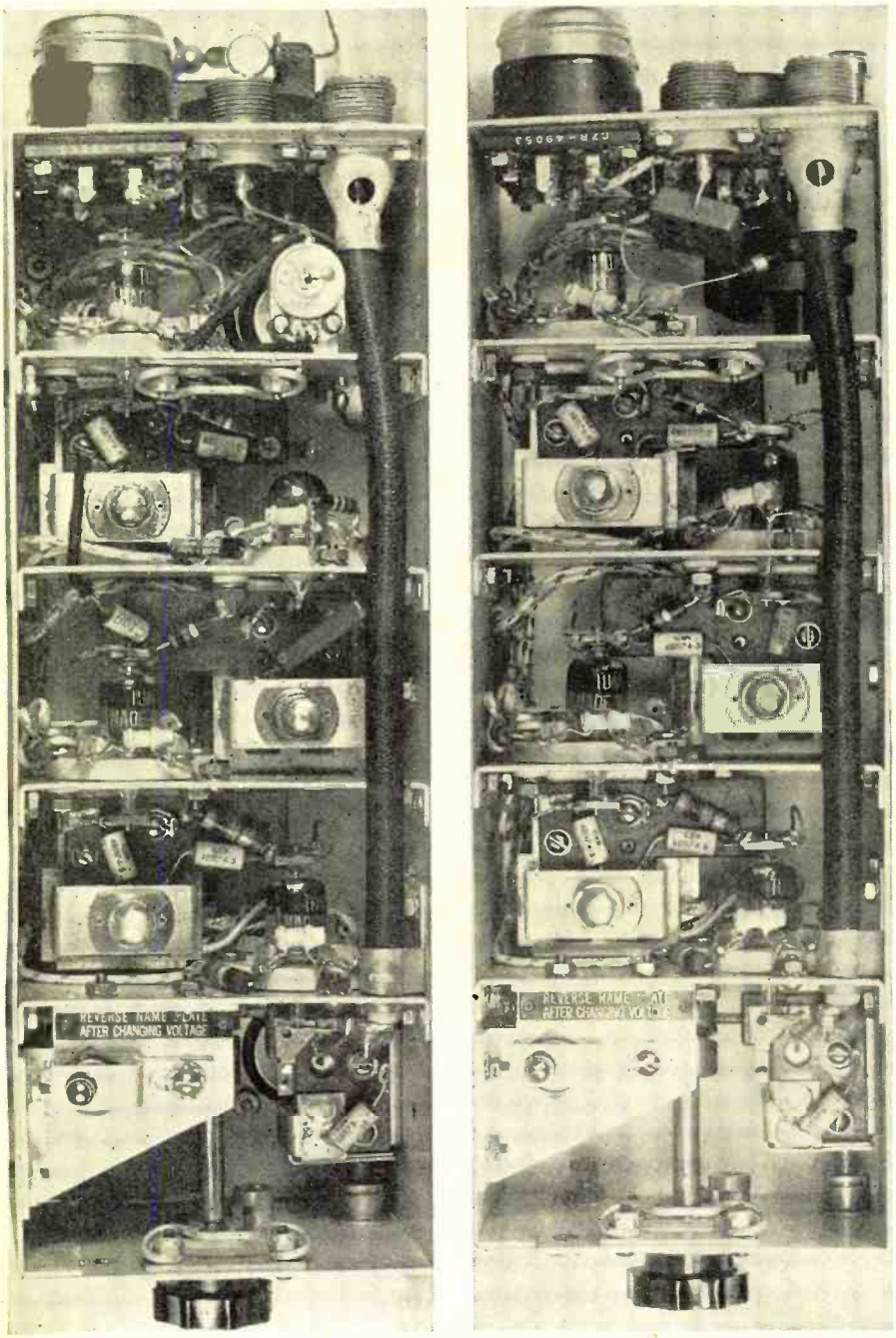
Since the oscillator plate of the new 955 acorn tube must be at r.f. ground potential, it must be bypassed properly. However, in switching tubes the screen bypass condenser C_{117} accomplishes this purpose and hence remains in the circuit. R_{109} must be removed and a 3000 ohm resistor (R_{117}) substituted. The suppressor pin of the 954 now becomes the control grid pin of the 955 acorn and so must be ungrounded. This pin then connects to the tuned circuit L_{103} and C_{114} through a new 100 $\mu\mu$fd. postage stamp size mica (C_{135}). A 51,000 ohm resistor, R_{120} is soldered between the control grid pin and ground to serve as the grid leak.

It is now necessary to reroute the output of the second r.f. stage (V_{102}) into the tuned circuit, L_{104} and C_{118}. Perhaps the easiest method of doing this is to drill a small hole in the shield partition separating the second r.f. stage from the new 955 oscillator stage. Then cut C_{109} loose at the tank circuit end, thereby removing the plate circuit of V_{102} from the oscillator LC (L_{103} and C_{114}). Solder a short length of wire on the free end of C_{109}, which has now become the interstage coupling condenser and bring it through the shield partition and tie it onto the mixer grid coil. This should be at the junction of C_{119}, C_{118} and L_{104}. This may be seen to be a better advantage in Fig. 3. The injection of the oscillator voltage at these frequencies is not a serious problem and the stray fields between the oscillator and mixer stages should serve this purpose admirably.

Components C_{112}, C_{120}, and R_{110} are not used and should be removed from the circuit. This completes the wiring changes except for shorting out resistor R_{116} in the cathode circuit of the first r.f. stage. This 100,000 ohm resistor was used to control the sensitivity of the receiver. It could be used as protection against strong signals or overloading, but probably will always be shorted out of the circuit in normal use of the receiver when in the receiving position. If desired, this feature may be continued to be used through a normally-closed relay, which would open when transmitting.

Almost any power supply will serve for this unit, although a 150 to 180 volt supply that is well regulated would naturally be preferred. The plate current drain is less than 15 ma. so it is entirely feasible to "borrow" this amount of voltage from some other existing piece of station equipment.

Fig. 3. (Left) Top view of the ARR-1 after modification. Condenser C_{109} may be seen rerouted through the partition wall between the second and third compartments from the top. In the extreme top compartment, the new 30 mc. tank is under the coaxial input cable. The 955 acorn has been substituted for the third r.f. stage as an oscillator. The filament voltage changeover switch is in the bottom compartment. (Right) Top view of the ARR-1 unit before modifications were made.



Tuning Up

The tuning up procedure is no more involved than that required in any other home constructed converter. As previously mentioned, the use of a

(*Continued on page* 111)

W3KPX High-Gain PREAMPLIFIER for 10 Meters

Rear view of the home-built, high gain preamplifier. This unit is used in conjunction with a prewar communications receiver in author's shack.

By
HARRY D. HOOTON, W3KPX

Pep up that old receiver and reduce the images with this ten meter pre-amplifier.

HOW many times have you listened on the 10-meter amateur band and decided *not* to turn on the transmitter because the band was "dead?" The author, using a prewar design communications receiver, experienced this condition entirely too often, *particularly when other local hams were working DX at that time.* Since the purchase of a new receiver was out of the question, it was decided to make an effort to improve the sensitivity of the existing receiver.

Considerable work was done on the front end of the receiver, especially the r.f. amplifier. All paper bypass condensers were either removed and mica condensers substituted in their place, or the paper condensers were shunted by appropriate mica units. This improved the sensitivity considerably on both 10 and 20 meters but the performance on 10 meters was still far from satisfactory.

At this point it was decided that an auxiliary unit—either a converter or a preamplifier—would be required in order to obtain the necessary 35 to 50 db. gain ahead of the mixer in the receiver. A minimum of operating controls was desirable so the converter seemed a logical choice and a great deal of experimental work with various types of converters, particularly those of the grounded-grid variety, was carried out. The results were disappointing to say the least. The required gain was readily obtainable but the signal-to-noise ratio was not improved; in fact, S9 signals were often barely readable in the high noise level. Furthermore, the oscillator circuit in the receiver is not well shielded, and it was found difficult to eliminate "birdies" and "unmodulated carriers," due to the oscillator harmonics, in the 10-meter band. In view of these numerous difficulties, it was decided to discontinue work on the converters and concentrate on the design of a good, high-gain, low-noise-level, preamplifier.

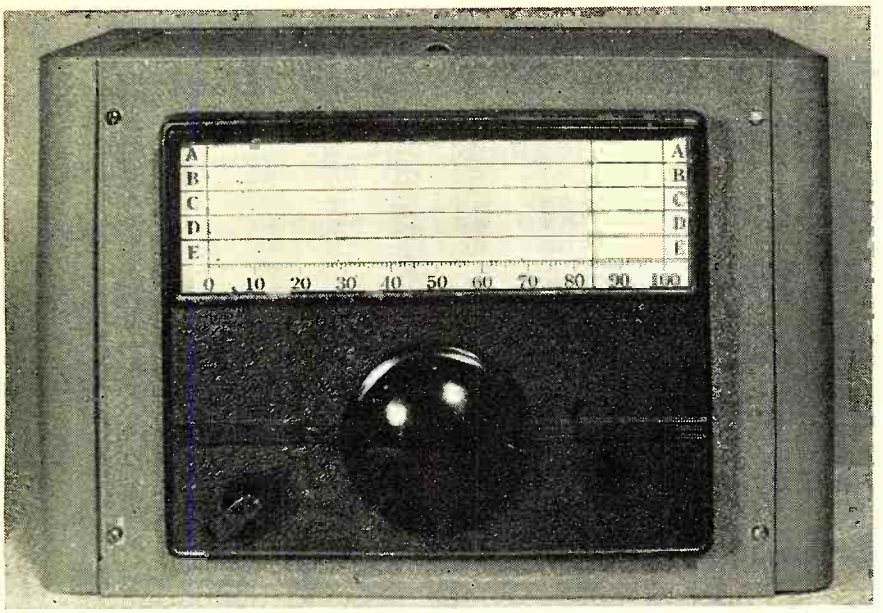
This preamplifier incorporates two 6AG5 miniature pentodes in a two-stage circuit. The use of high-"Q," iron-core, r.f. coils and plate circuit tuning in the output stage, boosts the gain and selectivity tremendously. Once the gain and selectivity were obtained, the greatest problem was to "tie down" the circuit so that these desirable features could be utilized without having the circuit "take off" into oscillation without a moment's notice. Experiments indicated that it would be necessary to completely shield the components associated with each tuned circuit and to make effective use of the bypass condensers incorporated in the circuit.

The first experimental circuit was built up on an iron chassis; this unit proved unsatisfactory and it was decided to use an aluminum chassis, with all components, except the tubes, enclosed, in order to obtain better ground connections and more complete isolation between the various parts of the circuit.

The physical layout and construction of the unit is shown in the photographs. The circuit is divided into three sections, as indicated by the dotted lines on the schematic, and all of the components indicated in a section are enclosed in one of the compartments shown in the bottom chassis photograph. The compartment near the front panel contains the components of the input circuit; the center compartment contains the components associated with the plate circuit of the 6AG5 input stage and the grid circuit of the second 6AG5; the compartment at the rear of the chassis contains the components of the 6AG5 output circuit. An aluminum plate covers the bottom of the chassis thus completing the shielding.

The two 6AG5 heaters are operated from a 6.3 volt filament transformer operating on the 110 volt a.c. line; the plate and screen voltages are taken from the receiver. The average communications receiver can handle an additional few milliamperes drain from the high voltage supply but the filament windings are usually loaded to the limit. If desired, a separate power supply, using a selenium rectifier, may be used for operation of the pre-amplifier.

The construction and wiring of the unit is very simple and should present no difficulties to any ham. However, a few precautions should be observed. The coils should be wound exactly as shown in the constructional details sketch. The grid end of L_1 and L_2 should be connected to the terminal at



Front view of preamplifier. The unit is housed in a standard cabinet.

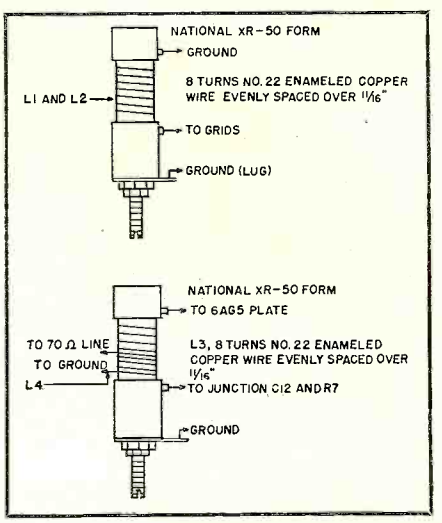
the end of the winding space nearest the core adjustment screw; the other terminal should be connected to the common ground. Since the coils are mounted under the chassis, this method of connection will reduce the distributed (grid-to-ground) capacitance and give a much higher *"Q"* tuned circuit. It also helps to prevent interstage oscillation because the "hot" ends of the coils are in line with the centers of the compartment shields thus preventing stray coupling around the edges of the plates. The large soldering lug under the mounting nut should be connected to ground; otherwise the iron slug may assume an electrical potential different from that of the coil and may cause noise or microphonism during adjustment.

All leads, particularly those of the plate and grid circuits, must be short and direct. Keep the leads from the coils to their respective tuning condensers very short and avoid making sharp turns or bends. All connections must be well-soldered with rosin-core solder and a clean, hot and well-tinned iron. The various bypass condensers are mounted directly on the terminals of the sockets and other bypassed components; the ground side of these condensers is soldered to a lug bolted to the aluminum chassis. The various ground lugs are then soldered to a common ground wire which, in turn, is connected to "B-minus." The importance of good ground connections in a high-gain amplifier of this type cannot be over-emphasized. If trouble from interstage oscillation is experienced, check the ground connections first of all.

In the author's arrangement, the length of the coaxial output cable is adjusted so that the output winding L_4, the receiver antenna coil and the cable capacitance form a resonant circuit. This provides a good impedance match between the two units and boosts the apparent gain tremendously. For the *Hallicrafters* SX-25, a 24-inch piece of RG-29-U (53 ohms) proved satisfactory. When using the preamplifier with other receivers, it may be necessary to use a different length of cable and increase or decrease the number of turns in L_4 until the maximum signal transfer is obtained.

The adjustment of the preamplifier circuits should be carried out by means of a stable, low-level local signal. A suitable signal source will be the 10-meter harmonic of a 40-meter crystal oscillator. The test signal should be of such a level as to give a maximum reading of S3 to S4 on the receiver carrier level indicator *without the preamplifier*. A higher level signal will make peaking of the tuned circuits difficult. With the signal tuned for maximum indication on the receiver, connect the preamplifier, as shown, and rotate the tuning dial for maximum S-meter indication. Even though the preamplifier circuits are not peaked, a gain of 10 to 15 db. should be obtained. Turn the preamplifier gain full-on and adjust the output coil slug for maximum S-meter indication. The adjustment of this slug will be somewhat critical. Next, adjust the second 6AG5 grid coil slug for maximum indication on the receiver. This circuit will also be slightly critical in adjustment. At this point, rock the tuning dial slightly each side of resonance and carefully readjust the output coil slug for maximum indication. Most of the over-all gain of the preamplifier circuit is built up in this stage and a careful adjustment of these two slugs may give as much as 10 db. gain over a simple peaking alignment. The antenna coil slug will be quite broad in adjustment and should peak with the slug approximately half-way inside the coil. If the antenna circuit does not peak at all, or peaks with the slug completely out of the coil, loosen the antenna coupling by reducing the capacitance of the trimmer condenser C_1. If the antenna circuit peaks very sharply or oscillates when brought to resonance, the antenna coupling should be increased. The setting of C_1 will affect both the gain and the signal-to-noise ratio and the correct position will be found by the trial and error method.

Fig. 1. Winding details for the three coils.



The bandpass of the unit (the region where signals can be received without retuning the preamplifier) is about 20 kc. each side of the resonant frequency. This is generally sufficient unless the operator listens for calls far removed from his operating frequency. This narrow bandpass is very desirable for elimination of images and other types of interference but requires the adjustment of two dials when covering the entire band. If some sacrifice in gain can be tolerated, greater bandpass may be obtained by stagger-tuning the tuned circuits in a manner similar to that of a television video i.f. amplifier. Experiments with this preamplifier show that with L_2 peaked at resonance, L_1 peaked 25 kc. *below* resonance and L_3 peaked 25 kc. *above* resonance, the receiver may be tuned over a range of approximately 150 kc. before readjustment of the preamplifier dial is necessary. The gain under these conditions will be reduced to approximately 20 to 30 db. over-all. However, when the circuits are tuned in this manner, the antenna coupling may be loosened, permitting some regeneration in the first 6AG5 circuit and thereby increasing the over-all gain. Again the setting of C_1 must be carried out by experiment.

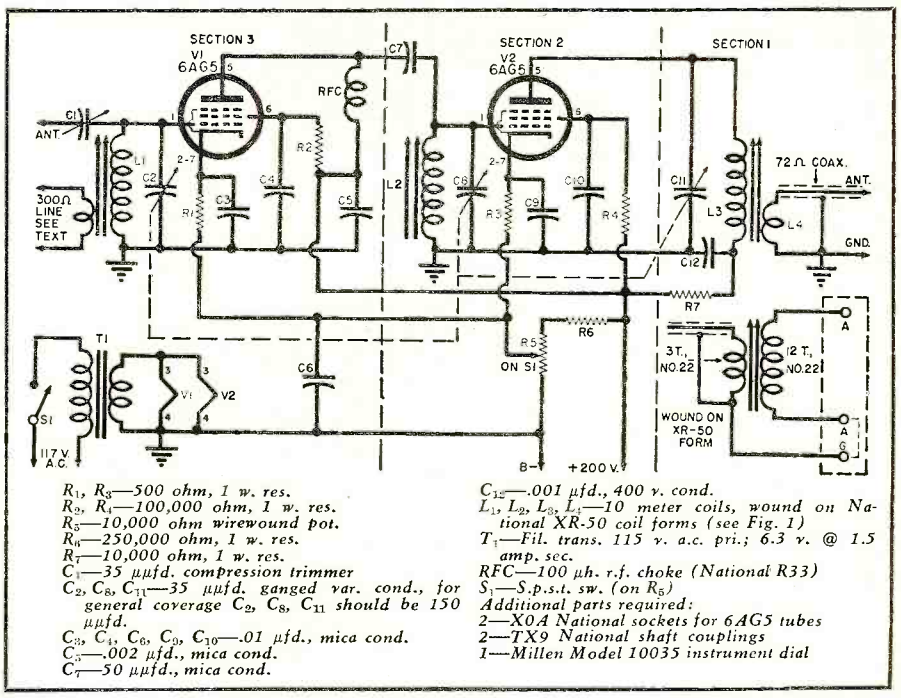
The output impedance of the preamplifier, using the coils as specified, is around 50 to 70 ohms. Tuning the coupling circuit as outlined will give a good signal transfer with either a 50 or 70-ohm coaxial line *of the proper length*. If a long coaxial line must be used, it may be necessary to use an impedance-matching transformer in order to match the low-impedance line to the receiver input. Most modern communications receivers have an input impedance of around 400 ohms and

a transformer consisting of 12 turns of No. 22 enameled wire, closewound on a *National* XR-50 coil form, as secondary, and 3 turns of No. 22 as primary, will give a good impedance match.

The primary, if the transformer is connected as shown in Fig. 2, should be wound over the "cold" end of the secondary winding. If the secondary is center-tapped and the center-tap connection is returned to ground, the primary should be wound over the center of the secondary. In the latter type of winding the ground connection, indicated by the dotted line from "A" to "G" (Fig. 2) is not used. The coaxial outer conductor must be connected to the ground terminal of the receiver in every case. The use of 300-ohm "ribbon" lines between the preamplifier and receiver is not recommended.

The preamplifier input circuit is designed for a single-wire transmission line. The author uses a relay system which connects one conductor of the transmitting antenna transmission line to the preamplifier input when the transmitter is in standby position. In case it is desired to use a separate receiving antenna, with a two-wire transmission line, the trimmer condenser C_1 should be omitted. For matching a 300-ohm "ribbon" line to the 6AG5 input an antenna coil consisting of about 6 turns of No. 22 enameled wire may be interwound with the "cold" end turns of L_1. Sufficient turns should be used to "load" the input circuit so that the best gain and signal-to-noise ratio will be obtained. In experiments with a separate receiving antenna, the author used a half-wave folded dipole and two-wire transmission line made from the 300-ohm ribbon. The results were satisfactory but the connection to the transmitting antenna proved better and more convenient.

If the preamplifier unit is carefully constructed and aligned, as described above, no trouble should be experienced. It must be remembered, however, that this is a very high-gain instrument and unless good quality components and good construction (particularly ground connections) are employed, oscillation may occur when the circuits are peaked and the gain control fully advanced. If the circuit oscillates during alignment, check the various bypass condensers for good ground connections. Make certain that the aluminum compartment shields are making good contact with the chassis. The aluminum bottom plate should be held in place by means of self-tapping screws in order to insure a good electrical contact between it and the chassis. The tube shields must be grounded to the chassis; it may be necessary to solder a short piece of flexible wire to the shield and attach it to the chassis by means of a soldering lug and self-tapping screws in order to obtain a low-impedance ground connection. Oscillation may be due to insufficient antenna coupling



R_1, R_3—500 ohm, 1 w. res.
R_2, R_4—100,000 ohm, 1 w. res.
R_5—10,000 ohm wirewound pot.
R_6—250,000 ohm, 1 w. res.
R_7—10,000 ohm, 1 w. res.
C_1—35 μμfd. compression trimmer
C_2, C_8, C_{11}—35 μμfd. ganged var. cond., for general coverage C_2, C_8, C_{11} should be 150 μμfd.
C_3, C_4, C_6, C_9, C_{10}—.01 μfd., mica cond.
C_5—.002 μfd., mica cond.
C_7—50 μμfd., mica cond.
C_{12}—.001 μfd., 400 v. cond.
L_1, L_2, L_3, L_4—10 meter coils, wound on National XR-50 coil forms (see Fig. 1)
T_1—Fil. trans. 115 v. a.c. pri.; 6.3 v. @ 1.5 amp. sec.
RFC—100 μh. r.f. choke (National R33)
S_1—S.p.s.t. sw. (on R_5)
Additional parts required:
2—X0A National sockets for 6AG5 tubes
2—TX9 National shaft couplings
1—Millen Model 10035 instrument dial

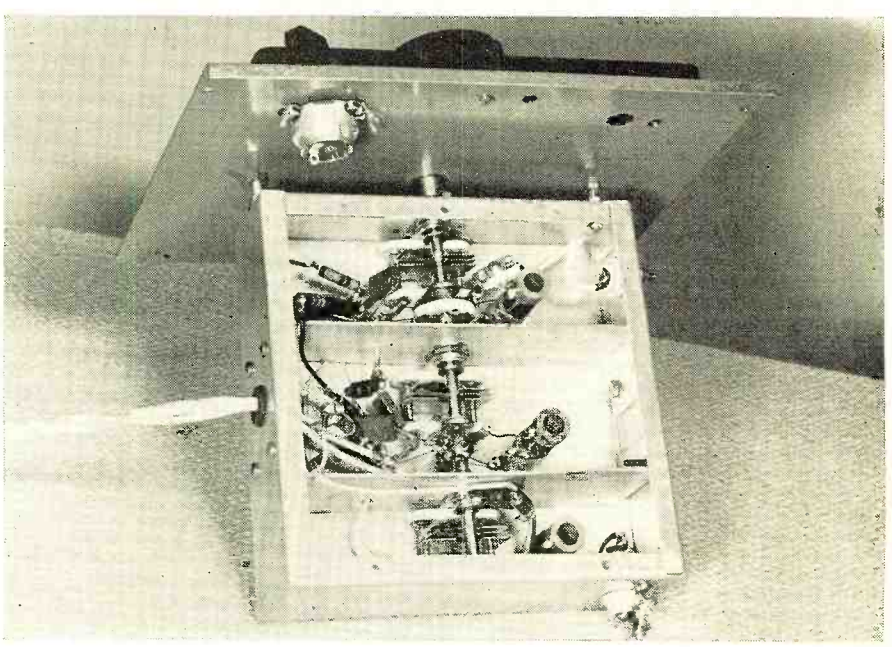
Fig. 2. Circuit diagram of the two-tube preamplifier. The circuit shown at the lower right may be used to match preamplifier to the normal 400 ohm receiver input.

since there is some regeneration in the input circuit. The trimmer C_1 should be near maximum capacitance in order to properly load the input circuit. The "B-plus" voltage should be approximately 200 volts; the circuit may oscillate if voltages higher than this value are applied to the plates and screens of the 6AG5 tubes.

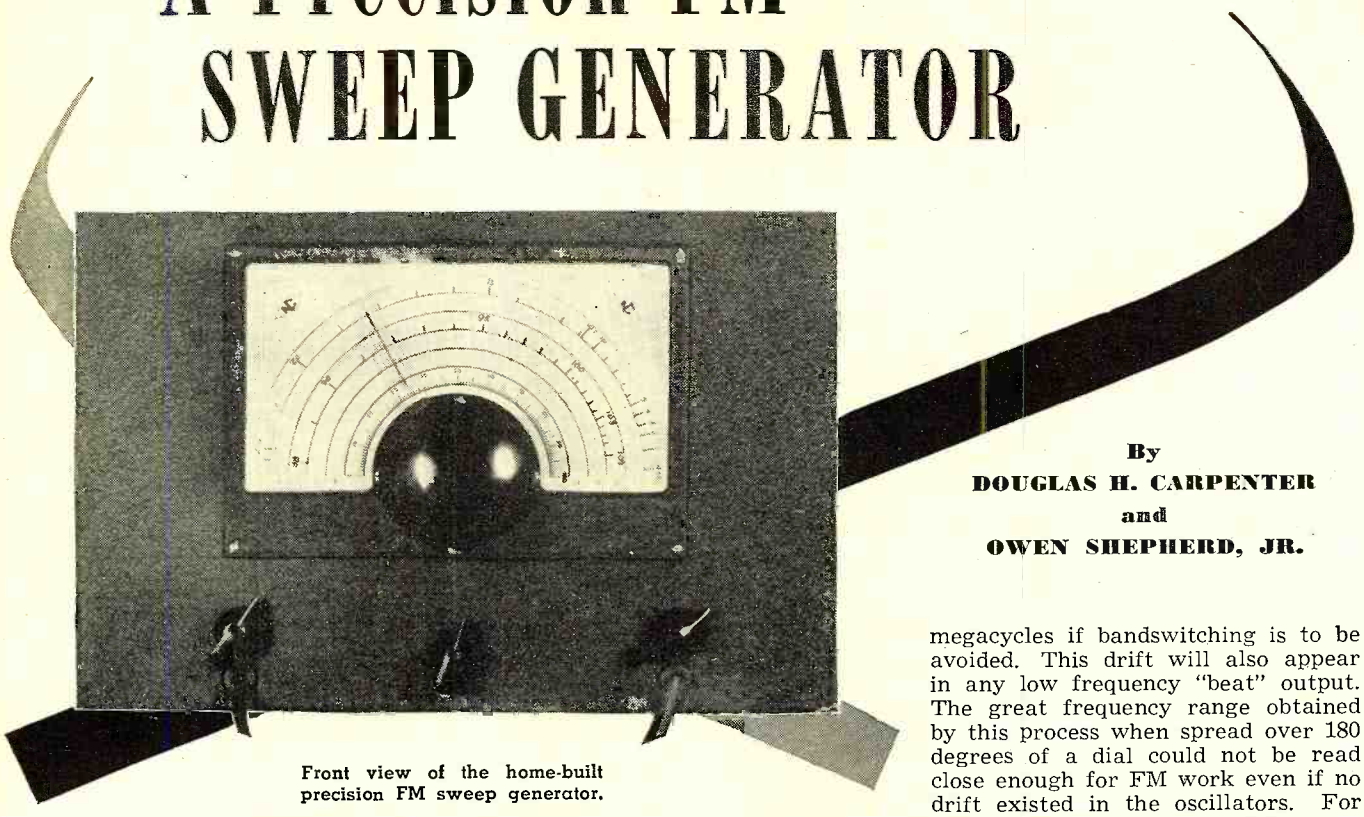
The high-gain preamplifier unit described above has been designed especially for ham purposes on the 10-meter band and therefore no provision has been made for bandswitching or plug-in type coils. Some hams or short-wave listeners may require a general coverage unit which will not only provide better receiver sensitivity on 10 meters but will "pep up" the so called "dead" range between 20 and 30 mc.

If a general coverage unit is desired, the coil data, as given in Fig. 1, will be correct. It will be necessary to add a small 20 μμfd. variable air trimmer across C_8 and another across C_{11} in order to obtain proper tracking across the entire dial scale. The 150 μμfd. condensers should have a very low minimum capacitance. The adjustment procedure will remain essentially as described above except that the 20 μμfd. trimmers should be set at about half maximum capacitance and the coil slugs adjusted so that the 10-meter band falls near the extreme high-frequency end of the tuning scale.—30—

Under chassis view of preamplifier. Chassis is a standard 7 x 7 inch aluminum unit.



A Precision FM SWEEP GENERATOR



Front view of the home-built precision FM sweep generator.

By
DOUGLAS H. CARPENTER
and
OWEN SHEPHERD, JR.

An instrument of extraordinary stability that any serviceman can build. Covers .3-23 and 87-109.7 mc.

IN REVIEWING commercial sweep equipment now available to the service industry it was found that there was no "one unit" instruments available within the average serviceman's purchasing range. By a "one unit" instrument is meant one which would completely align a FM receiver without the use of additional equipment. There are any number of excellent technical and sales appeal reasons why such a unit is not available, and it might be more accurate to say that these are correlated. A sweep generator to have wide sales appeal should cover the range of relative zero through 216 mc. It should also do a job on both FM and television receivers. There are today available instruments of this type that are excellent "sweepers," but in every case it is necessary to use a separate unmodulated generator to provide marker "pips." This is required to trace out the exact frequency and amplitude response of the pattern observed.

Although the above mentioned instruments serve a multitude of practical applications they have the singular disadvantage of requiring the separate marker generator. This of course means that a job requiring the regular test oscillator (marker generator) will have to wait while FM alignment is being done. This loses time, and in the busy service establishment this means less sets serviced. The instrument to be described is not intended to replace those mentioned, but simply serves as an auxiliary device to avoid conflicting use of present equipment. It is believed that as such it will soon repay the initial component cost, and time involved in construction. This unit may, of course, serve as the complete FM alignment tool in areas where television has not as yet become popular.

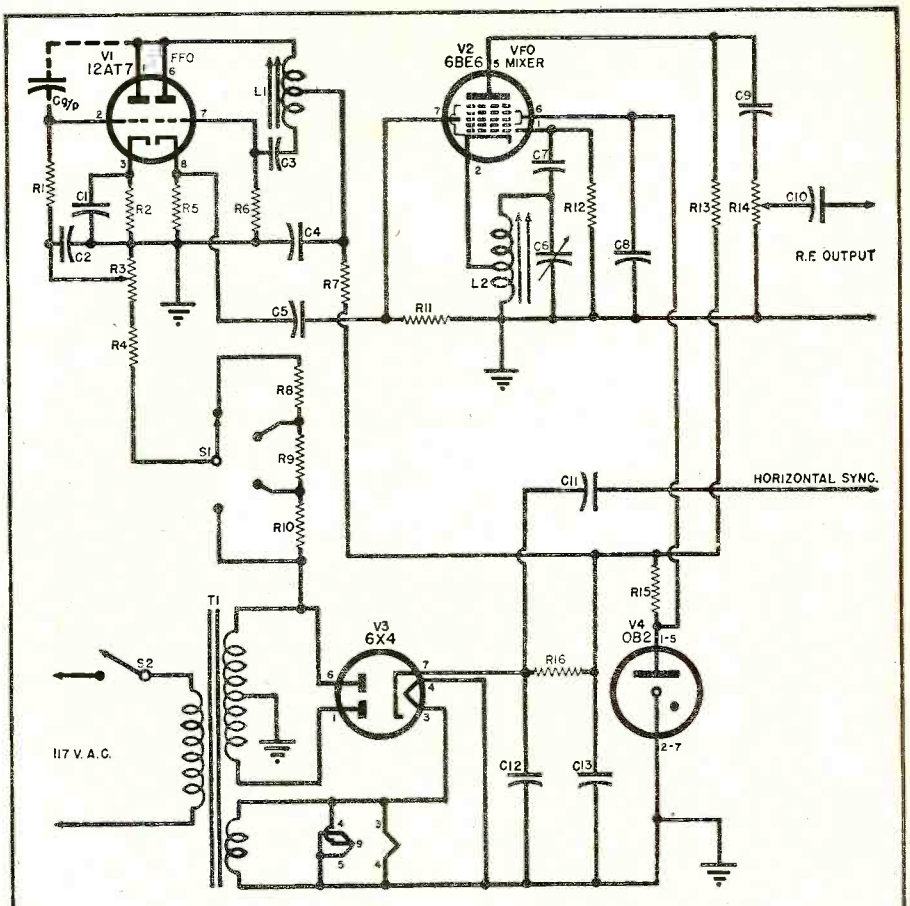
It was mentioned that available FM-TV generators required separate generators to provide frequency marker points. There are several reasons for this. The oscillator that generates the frequency swept signal is a fixed device, and to obtain enough "swing" for television alignment (some ten megacycles) necessitates operating this oscillator at a frequency in excess of 100 mc. A second variable frequency oscillator is mixed with this fixed oscillator, and the sum and difference frequencies used as final output. The fixed oscillator may have beautiful stability in terms of its fundamental, but when this drift is translated in terms of the lower beat output the error is prohibitive. The variable oscillator must also operate at a high frequency to give the frequency change required in terms of megacycles if bandswitching is to be avoided. This drift will also appear in any low frequency "beat" output. The great frequency range obtained by this process when spread over 180 degrees of a dial could not be read close enough for FM work even if no drift existed in the oscillators. For the above reasons marker signals are a must when using such instruments.

In order to circumvent the above difficulties for just the FM job required considerable scratching of our collective heads. The first apparent requirement was to lower the frequency of the fixed oscillator to the lowest point that would provide sufficient "swing" for FM application. The choice of a tube for this oscillator was also something of a problem, as low interelectrode capacitance was also to be desired both in terms of the sweep width required, and to hold the drift problem to minimum. Lady Luck was with us when we came across the 12AT7. The frequency selected for the fixed oscillator (f.f.o.) was 55 mc., and when operating at this frequency the 12AT7 exhibits practically zero change vs. time when used in the circuit indicated in the schematic (Fig. 1). Another reason for choosing 55 mc. was the fact that it was desired to run the v.f.o. (variable oscillator) on the low side of 55 mc. to improve its stability. A third reason for this choice was, of course, the frequency range required by mixing these two oscillators. The range produced is 300 kc. to 23 mc. the difference; and 87 to 109.7 mc. the sum. These frequencies are simultaneously present and no bandswitching is needed. The combination of frequencies to be described has been very carefully chosen and this should not be changed in duplicate design. A lot of very unpleasant things can happen such as two or three adjacent responses if the oscillator settings are not exactly followed.

The design of this sweep generator is by no means original, and the general circuit conformation may be found in most present day instruments. The first requirement is of course an oscillator whose frequency may be varied linearly. To obtain this a reactance modulator is employed. The reactance modulator is a tube that causes a phase change of the fixed oscillator's plate current when a modulating voltage is applied to the reactance modulator grid. In this circuit the reactance modulator is the second half of the 12AT7. The 12AT7 is a dual triode and two functions are obtained in the same envelope. The variable oscillator is the cathode-grid-screen section of a 6BE6 pentagrid converter. This oscillator is varied over the range of 32 to 54.7 mc. by the tuning condenser C_6. The screen of this oscillator is voltage regulated by the OB2, V_4, providing a constant 105 volts to the screen (actually the plate of the variable oscillator) to keep the frequency regulation of this oscillator optimum. The fixed oscillator frequency swept signal is taken off across R_5 and is applied to the signal grid of the 6BE6 through the coupling condenser C_5. The physical plate of the 6BE6 is not a part of an oscillatory circuit but simply provides a means of getting the required voltage out of the tube. The effective resistance of the plate load resistor is shunted for r.f. by the combination of C_9 and R_{14}. Even with this low value of output load the voltage developed across R_{14} at the desired frequencies is from over .5 volt to .3 volt as C_6 is tuned through its extreme limits. This provides more than enough voltage for stage-by-stage FM alignment, and the rough output control R_{14} is satisfactory for attenuation to prevent overload throughout the r.f. range. To provide the required ranges the following occurs.

The frequency modulated signal from the f.f.o. is injected at the signal grid of the 6BE6. This signal is varying around 55 mc., determined by the amount of modulating voltage applied to the reactance modulator grid. The local oscillator (v.f.o.) may be generating any frequency in the range of 32 to 54.7 mc. depending on the setting of C_6. These two frequencies are mixed due to intermodulation of the 6BE6 electron stream and the sum and difference frequencies will appear in the plate circuit. It is these frequencies in which we are interested. The difference range is of course the f.f.o. minus the v.f.o. or a continuous range of 300 kc. (55-54.7) to 23 mc. (55-32 mc.). The sum range, provided at the same time, is the addition of the respective frequencies, or 87 to 109.7 mc. This is derived by 55 + 32 and 55 + 54.7. It may be noted that when for instance an FM i.f. of 10.7 megacycles is being generated on the difference range the sum is 99.3 mc. In every instance the sum is remote from the difference and vice versa so no

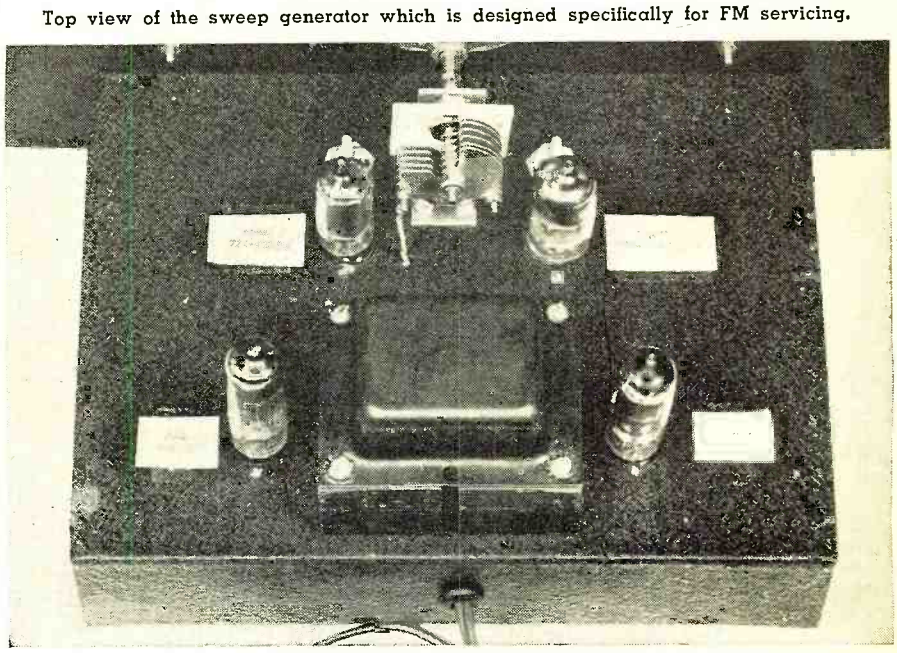
(*Continued on page* 88)



R_1—150 ohm, ½ w. res.
R_2—510 ohm, ½ w. res.
R_3—30,000 ohm pot.
R_4, R_{11}—220,000 ohm, ½ w. res.
R_5—30 ohm, ½ w. res.
R_6, R_7—5000 ohm, ½ w. res.
R_8—18 megohm, ½ w. res.
R_9—2.2 megohm, ½ w. res.
R_{10}—4.7 megohm, ½ w. res.
R_{12}—60,000 ohm, ½ w. res.
R_{13}—10,000 ohm, ½ w. res.
R_{14}—125 ohm pot.
R_{15}—30,000 ohm, ½ w. res.
R_{16}—2000 ohm, 2 w. res.
C_{gp}—Plate-to-grid capacity, 1.4 μμfd.
C_1, C_2, C_4, C_8—500 μμfd. ceramic cond.
C_3, C_5—50 μμfd. ceramic cond.
C_6—4-40 μμfd. var. cond.
C_7—100 μμfd. ceramic cond.
C_9, C_{10}, C_{11}—.02 μfd., 600 v. cond.
C_{12}, C_{13}—8/8 μfd., 450/450 v. elec. cond.
T_1—Power trans., 300-0-300 v. @ 60 ma.; 6.3 v. @ 2 amps.
S_1—S.p.4-pos. rotary ceramic sw.
S_2—S.p.s.t. sw. (on R_3)
L_1—16 t. #28 wound on ⅜" slug-tuned form. Tap at midpoint
L_2—14 t. #28 wound on ⅜" slug-tuned form. Cathode tap 4 t. from gnd. end
V_1—12AT7 tube
V_2—6BE6 tube
V_3—6X4 tube
V_4—OB2 tube

Fig. 1. Complete circuit diagram and parts list of the stable FM sweep generator.

Top view of the sweep generator which is designed specifically for FM servicing.



MICROGROOVES Mean More Money

By

JOHN B. LEDBETTER

Eng., WKRC, WCTS-FM, WKRC-TV

Fig. 1. Top view of an Admiral Microgroove record player showing the two pickup arms used.

The introduction of Microgroove recordings offers a new source of revenue for the radio serviceman.

INTRODUCTION of the new Columbia Long-Playing Microgroove records represents perhaps the greatest single step forward in the history of phonograph records. At least, it is the most notable contribution toward high fidelity in home-type record-playing systems since the development of Vinylite.

Microgroove records have the following advantages over standard 33⅓ r.p.m. records: (1) longer playing time, (2) high-fidelity frequency response, (3) improved dynamic range, (4) extremely light needle pressure, (5) practically no needle scratch, background noise, or turntable rumble, (6) longer record life.

Using the Microgroove system, up to 50 minutes may be recorded on a 12-inch 33⅓ r.p.m. disc, as compared to 8 or 9 minutes on a standard 33⅓ r.p.m. and 4 to 5 minutes on a standard 78 r.p.m. disc. This is accomplished by recording at 224 to 300 lines-per-inch instead of the conventional 90 to 112.

A comparison between the groove widths of a Microgroove record and a standard 33⅓ are shown in Fig. 2. It will be noted that groove widths of the new records are about one-third those of the standard type. This necessitates the use of a very light-pressure playback head and a much smaller needle tip radius than usual. More care must also be exercised in handling and changing records in order to prevent damage to the delicate grooves.

To more fully understand the advantages of Microgroove records, it might be well to discuss some of the shortcomings which limit high-fidelity recording at 33⅓ r.p.m. The first and most important limitation arises from the very nature of lateral-disc recording—the inherent inability to obtain a flat frequency response over the entire recorded portion. This is because the velocity of the recording stylus decreases as it moves toward the center of the disc. As this velocity decreases, insufficient space is provided in the groove to permit satisfactory cutting of the higher frequencies, especially those of very short duration. As a result, these higher frequencies are either lost entirely or attenuated to a serious degree as the recording diameter is decreased. This effect can be seen in Fig. 2C. Letting A, B, C, and D represent the same frequency at different recording diameters, note the increased distortion when the stylus compresses each audio cycle into a smaller segment with each successive revolution. This condition, often referred to as pinch effect or translation loss, necessitates the placing of a practical limit on the minimum cutting diameter, and the use of an equalizer to restore in part the loss of high-frequency response at the inner diameters. (This is done by gradually pre-emphasizing the higher frequencies as the stylus moves inward. For inside-out recording, of course, the process is reversed). In practice, the minimum recording diameter is about 8 inches at 33⅓ r.p.m. and 5¾ inches at 78 r.p.m.

High-fidelity response in Microgroove records is attained through the use of two important recording factors. Fidelity in recording depends mainly on; minimum recording diameter, record speed, ratio of modulated to unmodulated grooves, and stylus tip radius. Ordinarily, high-frequency response is reduced at 33⅓ and proportionately increased at 78 r.p.m. The range of high frequencies, on the other hand, can be increased by equipping the stylus with a smaller stylus tip. In Microgroove records, slow speed and the increase in cutting lines-per-inch result in much longer playing time, while the accompanying loss in high-frequencies is more than compensated by employing a special pickup having a .001-inch stylus tip radius and a pressure of .20 ounce. (Compare this with the .003-inch stylus radius and 1.0-ounce pressure of standard pickup heads). The smaller tip radius, in fact, allows such high-frequency compensation that frequency response and lack of distortion at the inner diameter (5¾ inches) of Microgroove records is still much better than that of a standard 33⅓ disc at its *8-inch* diameter.

In recording Microgroove records, the NAB curve is closely followed, ex-

cept that emphasis is added for frequencies below 100 cycles. This allows a reduction in turntable rumble and background noise. Greater dynamic range is made possible by recording on Vinylite discs. The extremely low noise level of this material, aided by the light pickup head pressure, results in a virtually noiseless record groove. Because of this absence of noise, it is possible to record all low and high passages without increasing or compressing the volume. This makes for almost unbelievable naturalness in record reproduction.

Opportunities for the Serviceman

Long-playing records have opened up an entirely new field, and the aggressive serviceman will find the number of applications and opportunities unlimited. Here are a few which immediately suggest themselves: (1) sales and service of new Microgroove changers and record players, (2) adaptation of standard players, (3) wiring phonograph connections into straight receivers, (4) replacement of the regular audio system and speaker with high-fidelity units, and (5) custom building of amplifiers and speaker systems to meet individual tastes. Many servicemen have already made a habit (and a profitable one at that) of carrying a portable long-playing phono unit along on all service calls. Advantages of the new system are explained to the customer and he is invited to try it himself. Inevitably, such a demonstration results in the sale of a new changer or player, or the revamping of the customer's old player.

Microgroove Adaptation of Old-Model Record Players

For adaptation of standard record players, all that is necessary is the replacement of the 78-r.p.m. motor with a dual-speed turntable motor, and the pickup and arm with one of the new Microgroove units. Any 33⅓ r.p.m. motor will be satisfactory; some of the most popular units now available are the *Alliance* Model MP DO 600; *General Industries* Models DR and DM and their Green Flyer model; and the *Garrard* Model 201-V. The *Garrard* is a high-quality precision unit in the higher-price range; the others list below $30.00. Single-speed 33⅓ r.p.m. motors also are available for ordinary record players in which operation at 78 r.p.m. is not desired. A few of these models are the *General Industries* LX-3, CX-3 and RM4-3; and the *Alliance* MPO 625.

Several good Microgroove pickups are available. These include the *Shure* Model 900MG pickup and cartridge, and the *Astatic* Model FL-33. The latter employs the LP-33 plug-in cartridge for Microgroove operation. This cartridge is instantly interchangeable with the LP-78 cartridge when standard phonograph records are to be played.

In adapting standard record *changers,* it is not advisable to replace the regular pickup arm with a Microgroove interchangeable unit. In the first place, the changing cycle is too slow and the dropping force too heavy and abrupt. Better results will be obtained by installing the Microgroove pickup on the record changer chassis (see Fig. 3). In installing the new arm, be sure its position will allow the correct swing across the disc radius. This may be compared with the swing of the record changer pickup.

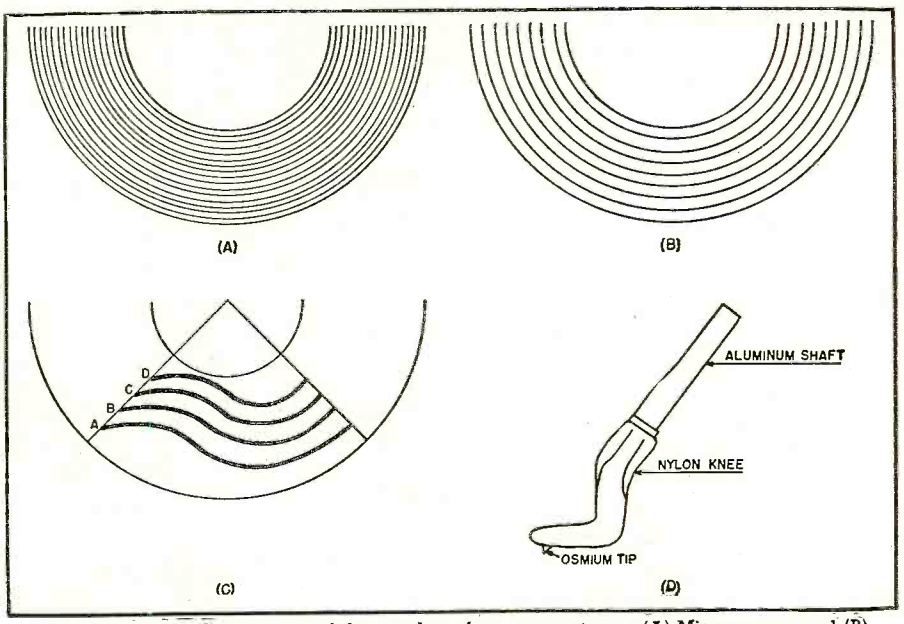
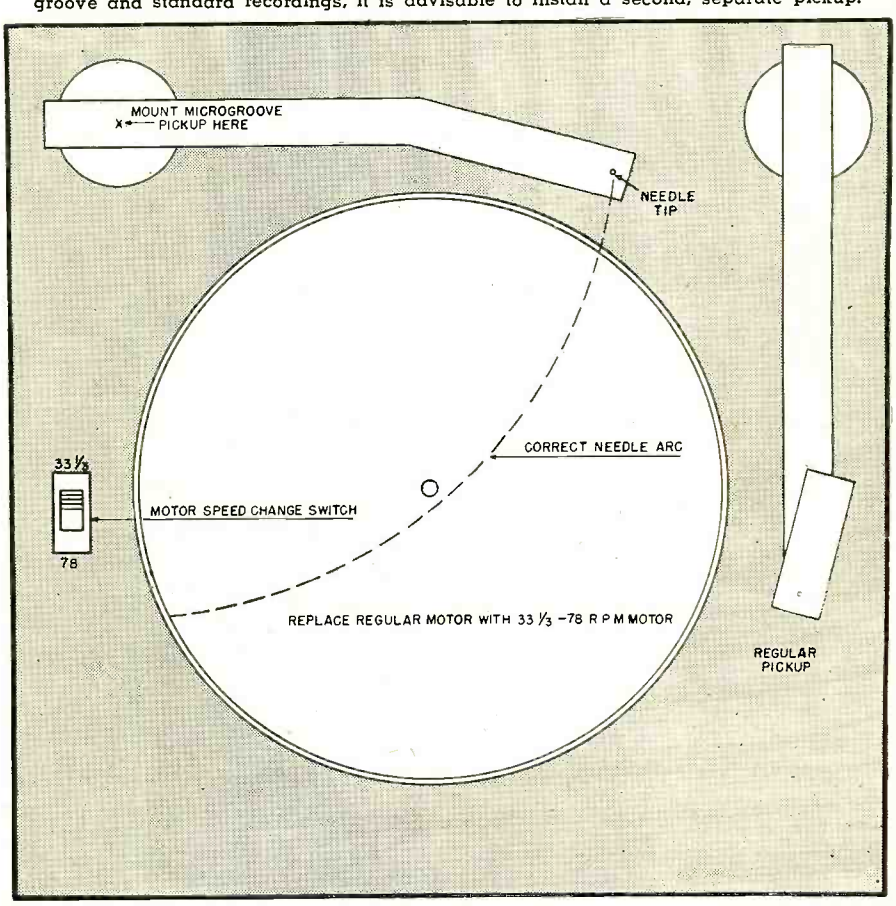


Fig. 2. (A and B) Comparison of the number of grooves cut on a (A) Microgroove and (B) standard recording. (C) An exaggerated example of the "pinch effect." (D) The Webster-Chicago nylon "knee-action" needle designed to be used with Microgroove records.

A d.p.d.t. switch will be required for cutting in the proper pickup and starting the proper motor. This switch may be installed in place of the original on-off switch or, if the latter is specially designed or a part of the reject-select mechanism, it may be left intact and an extra Microgroove-operation switch installed.

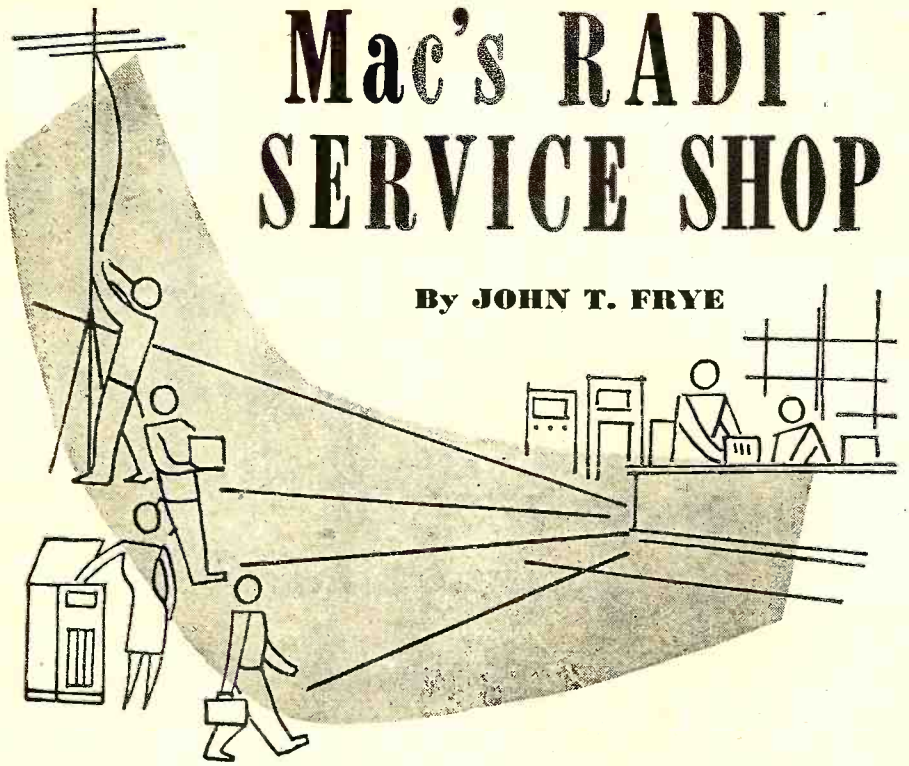
(*Continued on page* 108)

Fig. 3. In the case of record changer units which are to be used to play both Microgroove and standard recordings, it is advisable to install a second, separate pickup.



Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



BARNEY IS A BIG BOY NOW

A SUDDEN January thaw had melted the snow into a slushy mess; and as Barney returned to work at Mac's Radio Service Shop after his lunch hour, he had to pick his way carefully around the soot-covered puddles standing on the sidewalks. The dazzling sunshine and the bright blue sky overhead, though, were the things that struck a responsive chord in Barney's naturally cheerful nature; and he was doing his whistling best to recall last summer's hit of "Woody Woodpecker" as he stepped inside the shop.

Mac was sitting on Miss Perkins' desk talking to her, and Barney had the uncomfortable feeling that they had been talking about him. What led him to this intuitive conclusion was the fact that they were still doing it. Mac was saying:

"But he has to know sometime. He can't go on being just a big, innocent, trusting lummox all his life. He is a big boy now, and it is better that he should hear things from me and get them straight than to pick them up goodness knows where."

Miss Perkins looked wistfully over her glasses at Barney standing pop-eyed in the door and said in her best soap-opera imitation, "Yes, I suppose you are right, but I can't bear to see that innocent, carefree expression go out of those lovely, lovely blue eyes. But go ahead. Take him into the back room and tell him all, but please, please close the door behind you!"

"Hey, look, you two—" Barney began to protest as Mac took him gently by the hand and led him into the service department. "I'm not so—I mean I know—"

"Yes?" Mac encouraged as he shut the service room door and leaned against it.

"Well, doggone it," Barney spluttered, "why are you giving me this bees-birds-and-flowers routine?"

"What*ever* are you talking about, Barney my boy? I was just telling Miss Perkins that I thought it was high time you learned something about the seamier side of servicing, or intermittent radios," Mac explained blandly.

"Is *that* all!" Barney said with a sigh of relief as he stretched his lanky frame out on the service bench and waited with a stubby pencil poised over his dog-eared notebook.

"Don't dismiss the subject of 'intermittents' so lightly," Mac told him. "Radio men spend more time 'cussing' and discussing such sets than they do on any other subject. The discussing is fine, but I think the 'cussing' is rather shortsighted and foolish."

"Why 'shortsighted'?" Barney wanted to know.

"Well, if the servicemen would stop and think a bit, they would be grateful for the intermittents. Since these sets are the most difficult to repair and take the most experience and good equipment to solve, they separate the men from the boys in the service game. If the only troubles that radios ever had were burned out tubes and blown bypass condensers, anyone could learn to be a serviceman in a month, and all the equipment he would need would be an ohmmeter. It is the tough sets, such as the intermittents, that serve as a challenge and give a fellow a chance to prove just how good a serviceman he really is—or isn't!"

"What do you call an 'intermittent,' Boss?"

"That depends upon how long I have been working on it," Mac said with a slow grin; "but seriously, an intermittent is any set that suffers abrupt changes in the quality of reception at irregular and unpredictable time intervals. That phrase 'change in the quality of reception' may cover everything from slight changes in volume or tone-quality to the set's going completely dead; or it may be a noise that comes and goes along with normal reception. The time interval may be every few seconds or once or twice a week. The significant point is that the objectionable feature is only present part of the time."

"What's the most common type?" Barney asked.

"I'd say that the set that changes volume abruptly shows up the most often. This is the radio that the customer usually brings in with the remark, 'This set will be playing along just fine until someone flips on a light in the house or the refrigerator starts up, and then it will blare out and scare you half to death. You turn it down, and then a few minutes later the volume drops so low you can't hear it.'"

"I can't see what makes such sets so hard to fix."

"You will, my boy, you will!" Mac promised. "For one thing, almost any part that is used in a radio can cause just such a symptom: a bad tube, a defective coil winding, a poor resistor, or almost any condenser in the circuit can be the culprit. It is like having an oleomargarine salesman sandbagged at a dairymen's convention; there are lots of suspects!"

"Another thing that complicates matters," Mac went on, "is that the intermittent is touchier than a sunburned rattlesnake. Often the slightest jar, the smallest voltage surge, or the least circuit-loading, such as is caused by using a voltmeter or a signal tracer, will cause the low-volume condition to disappear for the rest of the day."

"What is the best instrument with which to tackle such a set?" Barney wanted to know as he scribbled away at his notebook.

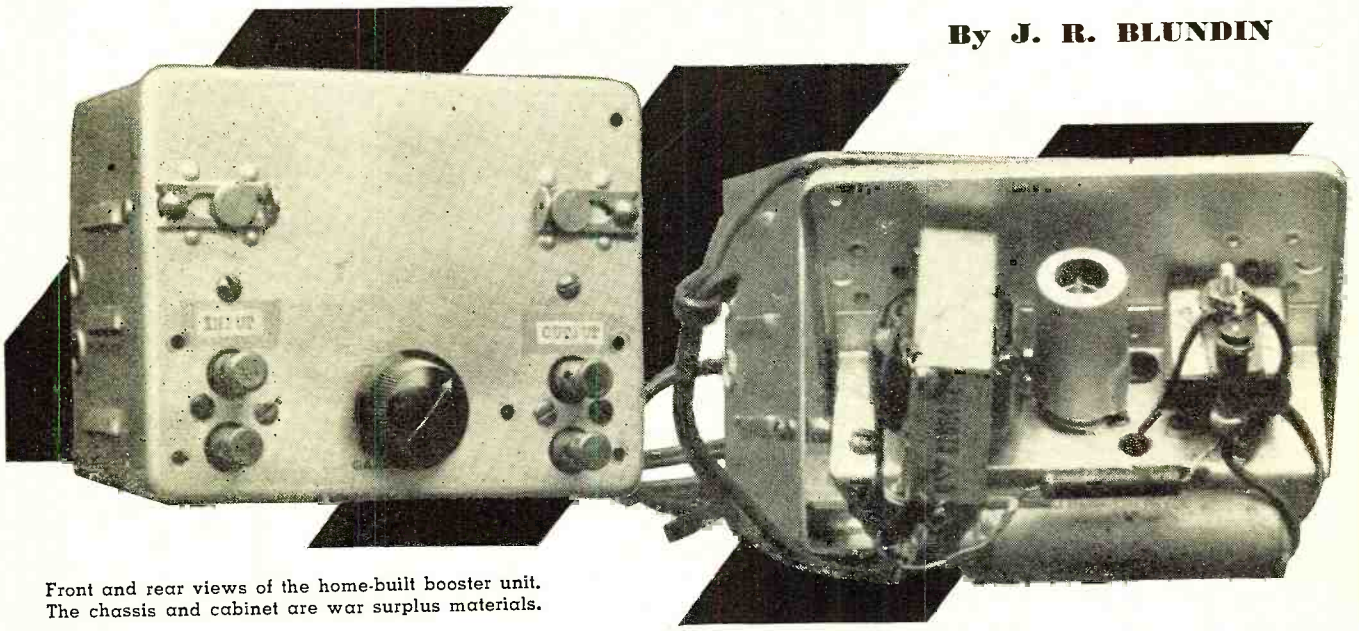
"I use every instrument in the shop on some of them," Mac replied, "but I honestly believe that the best service instrument of all is good old-fashioned horse sense. The best way to find the cause of an intermittent condition is to corner it. By that I mean that you must use a process of elimination. Let's take one of those sets that hop up and down in volume as an example:

"The first thing to do is to determine whether the trouble lies in the r.f. or the audio section. A signal tracer, a v.t.v.m., a scope, or even a pair of headphones in series with a condenser across the detector output will tell us this. If the signal drops at this point when it does in the speaker, our trouble lies in the r.f., oscillator, or i.f. circuits; if not, we know it is in the audio section. In the latter event, we can move our testing equipment from point

(*Continued on page* 138)

A Simple PREAMPLIFIER for Boosting TV Signal Strength

By J. R. BLUNDIN



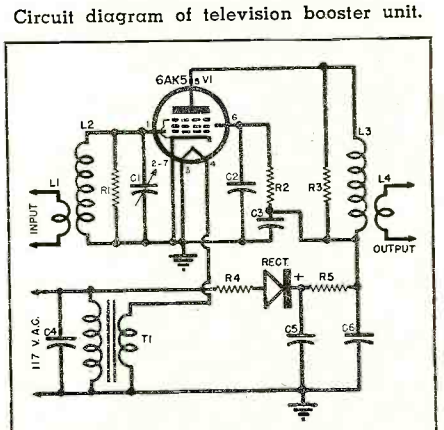
Front and rear views of the home-built booster unit. The chassis and cabinet are war surplus materials.

Construction details covering a booster unit for use in fringe areas, and with indoor TV antennas.

WHEN the television set owner is not located near one of the metropolitan areas, good television reception becomes somewhat of a hit and miss proposition. All sorts of tricks must be tried in order to capture that elusive bit of signal that may mean the difference between seeing a picture or just hearing sound. The booster described in this article was designed for such a purpose.

A "booster" is nothing more nor less than a wide-band preamplifier capable of amplifying the television signal, without distortion, before it reaches the TV receiver. The front end of a television receiver must pass a band of frequencies approximately 6 mc. wide in order to provide good picture resolution, and this wide-band response must be preserved in any preamplifier, r.f. stage or booster that may be used ahead of the TV receiver. In order to achieve this wide-band response some sacrifice in gain must be made and the selectivity curve must be flattopped by the use of low *"Q"* coils. This is exactly opposite to a selective radio receiver where high *"Q"* and sharp selectivity is desired. This wide-band requirement has several disadvantages. For one, it takes several stages to equal the over-all gain of a conventional amplifier. This causes complications in isolating each stage to prevent feedback and regeneration which tend to sharpen the bandwidth and defeat the purpose. Another thing which is prevalent in TV receivers is the "wide open" front end which has the characteristic of picking up signals of all frequencies, in the band in which it is operating, along with noise and amplifying them. It therefore becomes necessary to provide additional preamplification to increase the signal-to-noise ratio in weak areas.

Circuit diagram of television booster unit.



R_1—6800 ohm, ½ w. res.
R_2—10,000 ohm, ½ w. res.
R_3—2000 ohm, ½ w. res.
R_4—50 ohm, 1 w. res.
R_5—1500 ohm, ½ w. res.
C_1—50 μμfd. var. cond.
C_2—50 μμfd. ceramic cond.
C_3, C_4—1000 μμfd. mica cond.
C_5, C_6—20/20 μfd., 150/150 v. elec. cond.
L_1, L_2, L_3, L_4—See text
T_1—6.3 v. fil. trans.
Rect.—Selenium rectifier

Construction

The booster consists of a one-tube preamplifier designed to pass a band of frequencies 6 mc. wide from 44 to 88 mc. with continuous tuning. A 6AK5 tube is used as a conventional r.f. amplifier with coils shunted by resistors to lower the *"Q"* and give broad-band response. A war surplus chassis and cabinet lent itself nicely to the housing of this unit, however any suitable chassis and box the experimenter may have handy will do.

As can be seen from the schematic diagram the booster is of the a.c.-d.c. variety and one side of the power line is connected to the chassis, making it hot to ground if the power plug is inserted incorrectly. This makes little difference in the operation of the unit but may present a shock hazard if a grounded object should be touched at the same time as the booster. It may be advisable to use an insulated panel and cabinet to prevent this. The input and output circuit is isolated from ground making it possible to use the booster with any type of TV receiver.

The input and output binding posts are mounted on Plexiglas strips and clearance holes are drilled in the front panel to insulate them. The grid coil L_2 consists of a self-supporting coil ¼" i.d. closewound with 8 turns of #18 enameled wire. The input coil, L_1 is wound over the ground end of L_2

(*Continued on page* 106)

SINGLE TURN LOOP

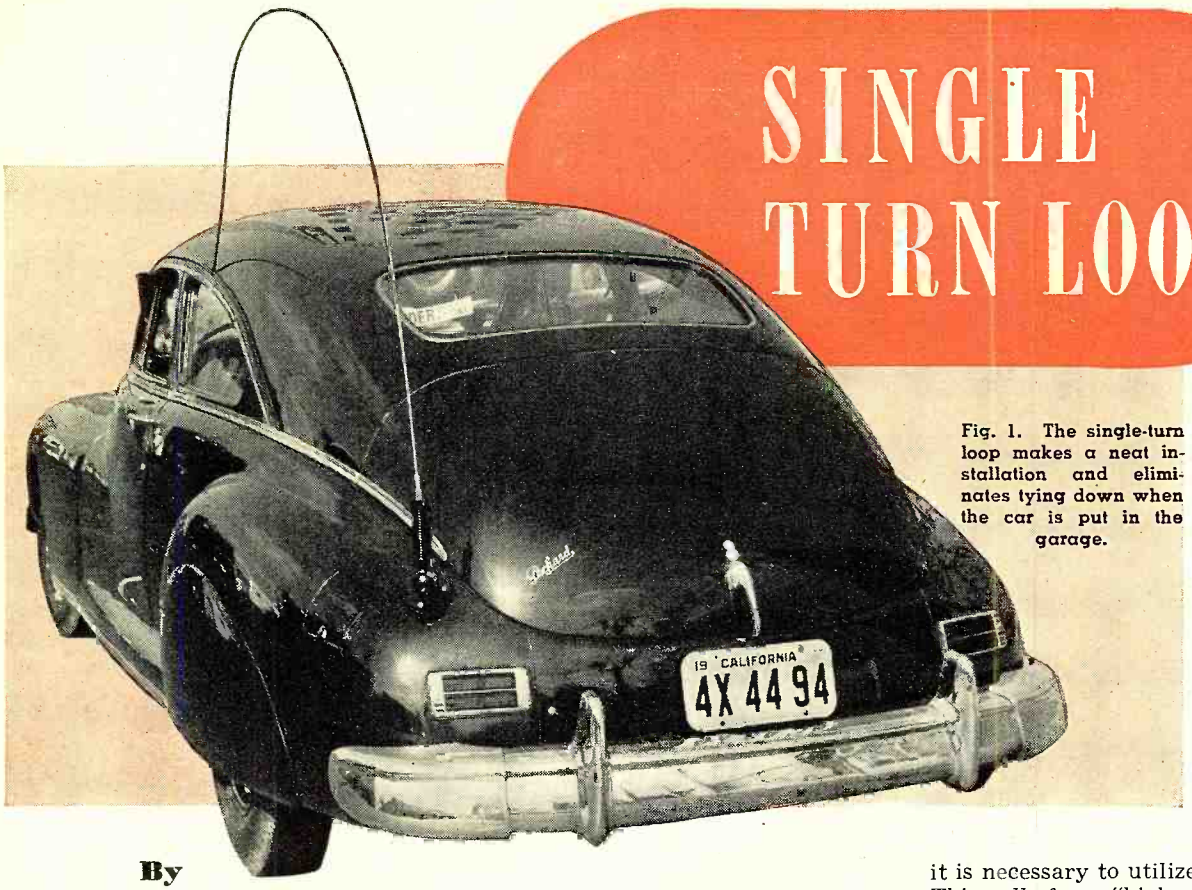


Fig. 1. The single-turn loop makes a neat installation and eliminates tying down when the car is put in the garage.

By
WOODROW SMITH, W6BCX
Author, "The Antenna Manual"

Designed for 75 meter mobile operation—it delivers a much stronger high-angle sky wave than a vertical whip.

WITH mobile 75-meter phone operation now authorized, many amateurs are wondering just what the possibilities are with regard to "getting out" on 75 from a car, and those contemplating such operation (as well as those who already have taken a fling at it) are, of course, vitally interested in the question: "What is the best type of radiator?"

First, it is perhaps well to review some of the pertinent considerations involved. The problem is primarily one of obtaining good radiation efficiency, good "transfer" efficiency, and a suitable vertical directivity pattern. It may be assumed that if a certain mobile antenna makes an effective radiator at 4 mc., it can be made to serve as a satisfactory receiving antenna.

The Sky Wave Does It

It is important that the reader realize that the ground wave telephony signal range at 4 mc. for 10 to 25 watts of transmitter power (which includes the range of power employed in the great majority of amateur mobile installations) is not more than approximately 20 miles in the daytime, or 5 miles at night, over typical, moderately irregular terrain of average conductivity when using an 8-foot vertical whip. The range is greater in the daytime than at night because of the lower atmospheric noise level existing in the daytime.

While much greater ground wave ranges are possible when the path is entirely over sea water or salt marsh, this represents a special case, seldom encountered, and for amateur mobile work the important thing is the range when the transmitter and receiver are separated by typical, irregular (rolling) terrain of average conductivity, and neither transmitter nor receiver is in an elevated location. A well elevated location for the transmitter or receiver, or both, will extend the range somewhat, but not nearly as much as on 10 meters.

The big difference between ground wave propagation on 10 and on 75 is explained by the fact that a 75-meter ground wave is primarily a "surface wave," while a 10-meter ground wave is primarily a "space wave." Exceptions would be 10-meter propagation over salt water with both antennas located close to the water, or 75-meter propagation between two mountain peaks separated by a flat valley. However, it is obvious that these are special cases.

For reliable 4 mc. phone communication over distances exceeding a few miles when the radiated power is low, it is necessary to utilize the *sky wave*. This calls for a "high angle" radiator.

The radiation pattern of a conventional whip radiator is such as to make it a poor "high angle" radiator. The high angle radiation usually will be somewhat greater when the whip is mounted on a vehicle than when mounted on a flat ground screen, due to the asymmetrical mounting and the irregularities of the car body, but even so, only a small portion of the total radiation will be directed upwards at high angles.

At 100 miles the field strength of a short vertical whip is much weaker than for the same whip in a horizontal position when transmission is via the *F2* layer (as at night), and considerably weaker when transmission is via *E* layer (as during the daytime when the *E* layer *MUF* exceeds the operating frequency). The inferiority of vertical orientation of a whip for sky wave communication becomes more pronounced as the distance is decreased. Tilting a vehicular whip away from the vehicle helps the high angle radiation some, but the performance still is inferior to that of the same whip in a horizontal position.

In addition to the inappropriate vertical pattern of a vertical whip, a big drawback to the use of a short whip on 75 is its poor efficiency. Only about 1 or 2 per-cent of the transmitter output power actually is radiated by a typical 8-foot whip at 4 mc. The extremely low radiation resistance results in low radiation efficiency. Also, the required impedance matching device has a low "transfer efficiency" because of the high value of reactance it must "match." As a result, all but a very

small portion of the transmitter output power is wasted in heating up the antenna and the antenna matching network inductance. The efficiency may be increased slightly by "top loading" of the whip, but it, nevertheless, is still distressingly low.

Advantages of a Loop

In the accompanying illustrations are shown details of a single-turn loop installation which has definite advantages compared to a whip for 75-meter mobile operation.

First, there is a physical advantage. The loop will not bang against as many low overhanging branches as will a whip, and it does not require tying down before putting the car in a garage.

Second, the pattern of the loop makes it an effective "high angle" radiator in all compass directions, yet still permits ground wave operation except directly broadside to the line of the loop.

Third, the over-all efficiency (radiation efficiency and transfer efficiency combined) is somewhat better than that obtained with a typical whip installation.

The loop may consist of either a standard 8-foot whip sprung to provide as open a "loop" as possible, or it may be made up from a length of ½-inch diameter 24ST aluminum or dural tubing. If a commercial whip is used, it preferably should be of the one-piece variety in order to avoid the possibility of poor contact developing at section joints. Very heavy current flows in the loop, and the r.f. resistance should be kept as low as possible in order to minimize I^2R losses. For the same reason, chrome plating is preferable to other types of commonly used plating, such as nickel.

The loop is attached physically and electrically to a suitable point on the rain gutter common to practically all "hard top" cars. To avoid damage to the gutter, the loop is attached to it via about 6 inches of heavy, flexible copper braid, and is first formed or sprung (if aluminum tubing is used) so that it takes the desired open shape under slight tension when the "fed" end is mounted whip fashion on the rear bumper or rear fender (or "bustle" if the car is of the "new look" variety and has no rear fenders in the usual sense). The complete installation resembles a tied-down whip except for making electrical contact to the car body at the unfed end of the whip. The exact method of making a low-resistance electrical contact to the rain gutter will be left to the discretion of the reader, as some methods require less defacing of the car than others, some are simpler than others, and different owners have different ideas about such things. Also, the tools or available facilities will have a bearing on the matter.

A piece of Vinylite sleeving should be slipped over the loop element before attachment to the gutter and later slid down over the flexible braid in order to prevent scratching of the car top when the loop gets shaken around.

It should be noted that the car body itself serves as part of the closed loop circuit, and must pass heavy current. The fact that it is steel is not serious, because there is so much of it that the effective r.f. resistance is low. However, if the body construction is not such that the portion between the "tie down" point on the gutter and the point at which the transmitter chassis is grounded to the car body is one continuous piece of metal (including welding), then the two or more pieces should be bonded together by means of suitable jumpers to insure low resistance contact between them. Likewise, all connections in the loop circuit should be well made in order to keep the resistance at a minimum.

Coupling to the Loop

Fig. 2 shows the method of coupling the loop to the transmitter and receiver. The coupling network serves at the same time as the tank circuit for the r.f. output stage, and also acts as an impedance matching device for the receiver.

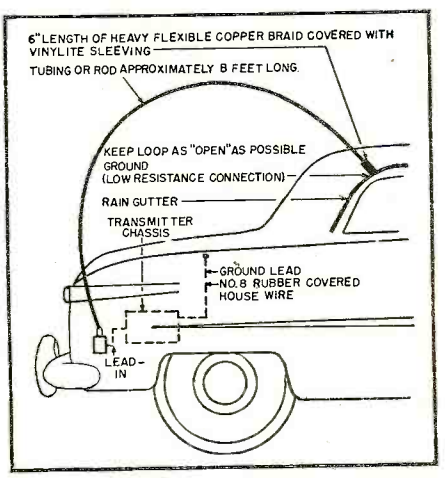
The circuit presumes a power pentode or beam tetrode single-ended output stage, which is by far the most popular arrangement for mobile work. If a triode were used, neutralization would be complicated by the plate circuit requirements.

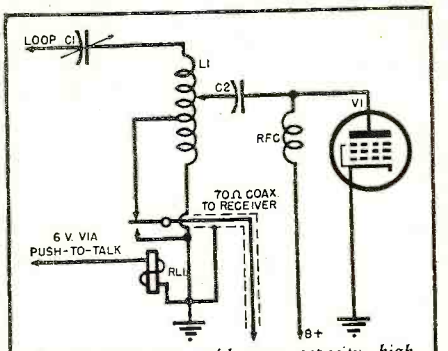
Shunt plate feed is used in order to avoid the necessity for a blocking condenser in series with the loop circuit, as a mica condenser at such a point is undesirable.

The r.f. voltage developed across C_1 and the current through L_1 will be very high considering the transmitter output power. However, the components are inside, out of the weather, and designing them for low losses, therefore, is not difficult.

For a transmitter power of 25 watts, plate modulated, C_1 should have 3000-volt spacing. 2000-volt spacing will suffice for a power of 10 watts or less. This makes a pretty husky condenser, considering the low transmitter power,

Fig. 3. Mechanical illustration showing how the single-turn loop is installed in car for 75 meter mobile operation.





C_1—At least 300 μμfd. max. capacity, high voltage spacing (see text). Must be mounted on standoffs and provided with insulated shaft extension.
C_2—Plate blocking condenser, .001 or .002 μfd. @ 400 v.
L_1—High Q inductor, approximately 3.5 μh. (refer to text for construction).
RL_1—S.p.d.t. relay (need not have heavy contacts or high voltage insulation).
V_1—Pentode or beam tetrode final r.f. amplifier
RFC—2.5 mh. r.f. choke

Fig. 2. Coupling network and tank circuit for use with single-turn loop of Fig. 3.

but that is what is required for the job. The rotor of the condenser is "hot" to ground, and, therefore the condenser should be mounted on standoff insulators and provided with an insulated extension shaft. The condenser should be provided with a rotor lock in order to insure preservation of the setting when the vehicle is in use.

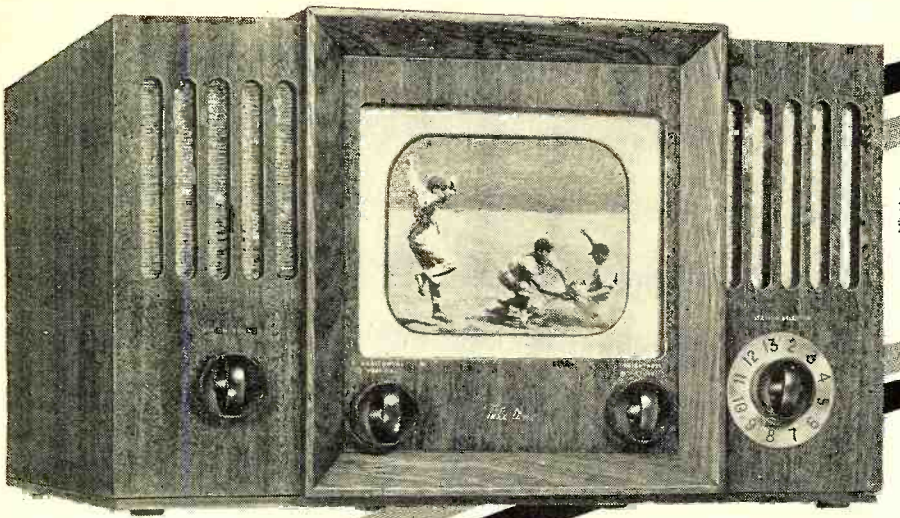
The inductor L_1 likewise must be much huskier than ordinarily would be employed in the plate tank of a low powered transmitter. This is necessary not only to handle the very heavy circulating current without overheating, but also in order to obtain the highest practicable *"Q."*

It is recommended that the coil be space wound with No. 8 bare copper wire or ⅛ inch copper tubing on a ceramic form. The required inductance is approximately 3.5 microhenries, the value being determined by the exact length and diameter of the loop material, the length of the lead-in, and other factors which will vary with the installation. About 9 turns on a 2½-inch form will be required, but the safe procedure is to wind on a few extra and then remove them as required in order to obtain resonance with about 300 μμfd. at the low frequency edge of the band. Yes, the coil will look more like a plate tank coil for a kilowatt stage, but its use here is justified by a substantial increase in the "transfer efficiency" and, therefore, in the percentage of the transmitter output power radiated by the loop.

It will be noticed that the circuit tunes quite sharply, which is to be expected when the very high *"Q"* of the circuit is considered.

The transmitter loading is adjusted to the desired value by tapping the plate connection up or down on the coil. The loading is increased by moving the tap towards the ground end of the coil. One adjustment will hold for the entire band.

(*Continued on page* 162)



A table model Tele-Tone television receiver housed in a wooden cabinet.

MODERN *Television* RECEIVERS

Part 10. Covering several different types of a.g.c. systems currently found in present-day video receivers.

By MILTON S. KIVER

AUTOMATIC volume control is now standard equipment in all AM sound receivers. Through its use, a fairly constant radio output is obtained for wide variations in input signal, thereby reducing the effects of fading and blasting when tuning from one station to another. For television, the counteracting of fading is not very important because fading is negligible at the high frequencies used. However, automatic gain control (a.g.c.) is still advantageous for maintaining the output signal level constant when switching between stations and for stabilizing the synchronizing circuits. The a.g.c. is especially helpful when the sync circuits do not incorporate any form of automatic sync control.

For those readers who might be confused by the seemingly interchangeable use of a.v.c. and a.g.c., it should be recalled that a.v.c. is really a method of automatic gain control since the controlling voltage delivered to the tubes by the a.v.c. system regulates their gain. Of course, as a consequence of gain variation, the output volume varies, but this is a secondary effect. However, the term a.v.c. has been more frequently employed so that now one seldom finds the term a.g.c. used in conjunction with sound systems. In television, the notation "a.g.c." is the only proper one to employ since a.v.c. has no significance. Yet, in spite of this, some manufacturers still cling to the a.v.c. notation, even in video systems.

In a sound AM receiver, the a.v.c. voltage is obtained at the second detector and a circuit frequently used is illustrated in Fig. 1. It will be remembered that the objective in an a.v.c. network is not to feed the instantaneous audio variations back to the r.f. and i.f. stages, but rather to apply an average voltage that is related to the carrier level. Such an a.v.c. voltage is derived from the average voltage developed across the load resistor of the second detector. The detector output consists of a pulsating d.c. voltage that can be separated into an audio voltage and an average d.c. voltage dependent upon the carrier strength. The audio signal is filtered out in the a.v.c. line (by R_1 and C_1 of Fig. 1) and only the average d.c. voltage reaches the grids of the controlled tubes.

The objectives of automatic gain control systems in television receivers are similar to those of AM sound systems. The method for obtaining the necessary voltage, however, is different because of the different character of the video signal. A study of the television modulated signals (Fig. 2) reveals that, as far as a.g.c. is concerned, the average video voltage is of no use to us. This average video voltage is the resultant of two voltages: (1) an instantaneous or a.c. component which gives the detail information of the image, i.e., the persons, objects, and scenery in the picture, and (2) a so-called d.c. component which provides information concerning the background shading of the scene, i.e., whether the background is bright or dark. The same people and objects can be placed against a bright background or a dark one; the a.c. video component remains the same in either instance. Only the d.c. components of the two scenes would differ. Note, however, that the d.c. component changes with each scene and is in no way related to the strength of the carrier. Thus, neither the a.c. nor the d.c. components of a video signal are suitable for furnishing the necessary a.g.c. voltage. What we require is some component in the incoming signal which is indicative of the strength of the carrier and yet which does not change with anything but the carrier.

With the present system of transmission, the carrier is always brought to the same level at the synchronizing pulses. See Fig. 2. Thus, as long as the signal being received is constant in strength, the synchronizing pulses will always reach the same value. If something should affect the carrier level, the amplitude of these pulses would likewise change. Hence, the strength of the synchronizing pulses will serve nicely as a reference level for an a.g.c. system and all receiver a.g.c. systems in use today develop control voltages which are derived, in one way or another, from the sync pulse level of the incoming signal.

A simple yet effective method of developing a suitable a.g.c. voltage is employed in the *Farnsworth* Model GV-260 television receiver. See Fig. 3. The a.g.c. diode is one section of a 6H6 and receives the incoming signal from the video i.f. system through a

.5 μfd. condenser, C_1. The load for the a.g.c. tube is R_1, a high-valued resistor of 1 megohm. To better understand the operation of this circuit, consider the equivalent diagram shown in Fig. 4. (The cathode resistor and condenser are omitted from the equivalent diagram because they do not affect the a.g.c. voltage development.) The a.g.c. tube will not conduct until its plate is driven positive with respect to its cathode. When this occurs, electrons flow from the cathode to the plate of the diode and into C_1 where the negative charge is stored. Very few electrons attempt to go through R_1 because of its high value. Due to the low impedance offered by the tube when it is conducting, C_1 charges up to the peak of the applied voltage which, as we note from Fig. 2, is the value of the synchronizing pulses.

During the negative excursion of the incoming signal, the plate of the diode is driven negative with respect to its cathode and no conduction through the tube occurs. However, if we examine Fig. 4, we see that a complete circuit exists with C_1, R_1, and the input coil all in series. Since a voltage exists across C_1 and a complete path is available, current will flow with the upper end of R_1 becoming negative with respect to ground. Due to the long time constant of R_1 and C_1, the charge accumulated across C_1 will discharge slowly across R_1, so slowly, in fact, that only a small percentage of the voltage across C_1 will be lost during the interval when the tube is nonconducting.

When the incoming signal becomes positive again, the tube does not immediately conduct. This is so because the applied signal voltage must first overcome the negative voltage existing across C_1. Since C_1 has lost but little of its voltage, tube conduction will occur only at the very peaks of the positive cycle. These peaks, of course, are the synchronizing pulses. Thus the voltage across C_1 is governed entirely by the sync pulses and this is what we desire. The negative voltage across R_1 is filtered by R_2 and C_2 to remove the 15,750 cycle ripple of the horizontal sync pulse and then fed to the video i.f. amplifiers as the control voltage. It is interesting to note that the same diode also supplies the sync pulses to the horizontal and vertical sync systems. Since current only flows through this diode at the sync pulses, voltage pips will appear across the 4700 ohm resistor in the cathode leg of the tube at these times. These pips are tapped off and applied to the sync separating circuits.

The a.g.c. system of *Belmont* television sets, Fig. 5, closely parallels that of the *Farnsworth* receiver.

In *Garod* television receivers, the contrast control is incorporated into the a.g.c. network, Fig. 6. The negative voltage of the contrast control is fed to two points; the r.f. amplifier and the a.g.c. section of a 6AL5 duodiode. Since the voltage at the contrast control is negative and it is applied to the cathode of the a.g.c. tube, this tube will conduct, even in the absence of a signal. The tube current, flowing through the 1 megohm plate resistor, R_2, will cause a negative voltage (with respect to ground) to appear here. This negative voltage is then transferred through a low-pass filter (R_1 and C_2) to the grids of the second, third, and fourth video i.f. amplifiers. Thus, even in the absence of a signal, the bias on these tubes is directly controllable by the contrast control.

When a signal arrives at the second detector, it is applied to the a.g.c. diode through a 100 μμfd. condenser. On the negative peak of each signal, the cathode will be driven even more negative causing additional current to flow through the tube and increasing the

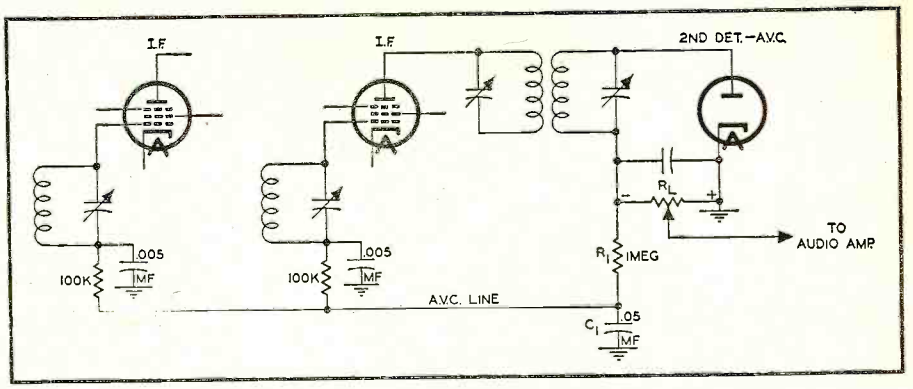


Fig. 1. A typical a.v.c. network found in standard broadcast AM receivers.

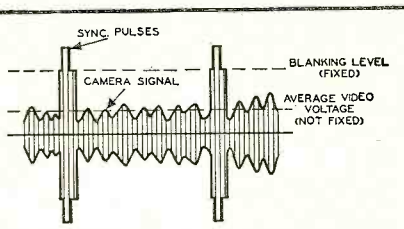


Fig. 2. Only the blanking and the sync pulse level of a television signal are indicative of the true carrier level.

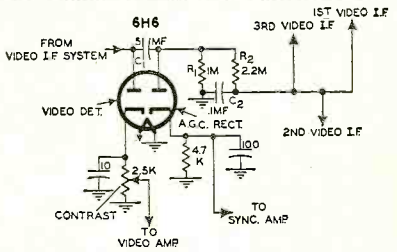


Fig. 3. The a.g.c. network in Farnsworth television receivers (the Model GV-260)

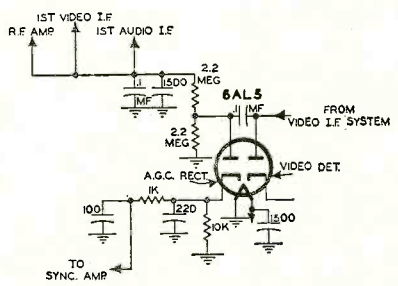


Fig. 5. The a.g.c. system used by Belmont. It is similar to the Farnsworth system.

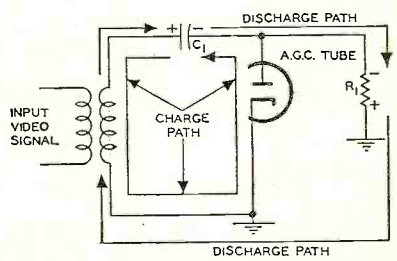
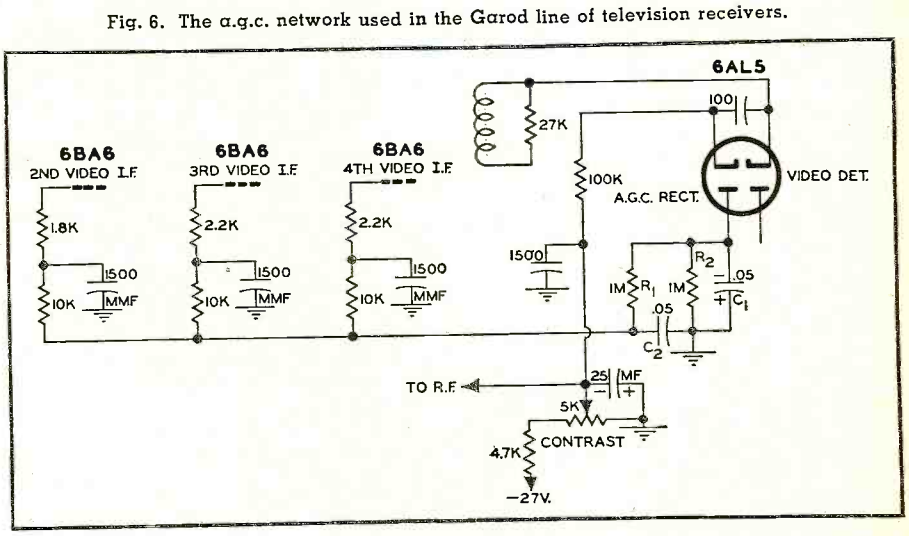


Fig. 4. The equivalent a.g.c. network of Fig. 3, and its mode of operation.

Fig. 6. The a.g.c. network used in the Garod line of television receivers.



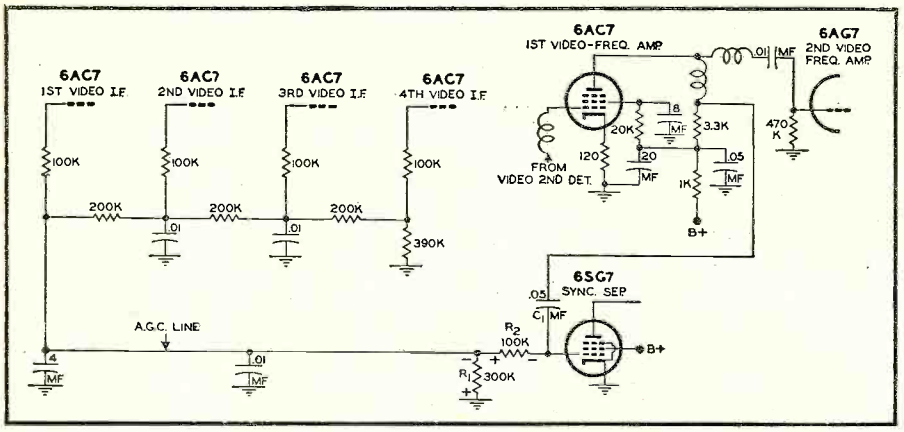


Fig. 7. The a.g.c. network used in Tele-King television receivers.

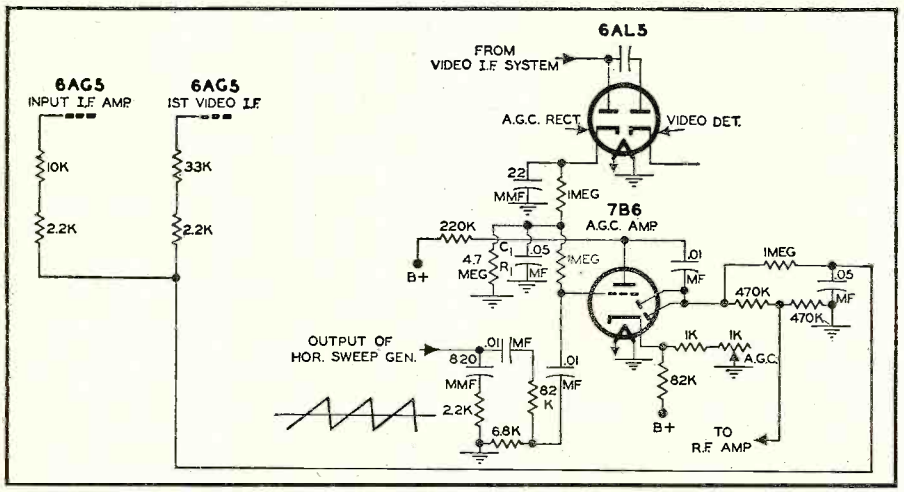


Fig. 8. The special a.g.c. network found in Philco television receivers.

negative charge on C_1 and the negative voltage across R_2. If the signal arriving at the a.g.c. diode is strong, the additional negative voltage across R_2 will be high. If the signal is weak this additional negative voltage will be small. In this way, the signal will add to the contrast control voltage and form an automatic regulator of the control grid bias. By inserting C_1 in the plate circuit of the diode, only the sync pulse peaks of the signal will be effective in changing the a.g.c. voltage.

In operation, the contrast control is adjusted for normal picture contrast with a signal coming in. If the signal should increase, more negative bias will be applied to the controlled stages from the a.g.c. diode, lowering the gain available to the signal and reducing the signal to the level desired by the set observer. With a lowering of the signal, we have a corresponding decrease in negative voltage across R_2, C_1 and the gain of the system rises. Thus, the average desired level is determined by the setting of the contrast control and the average level of the incoming signal. Any deviation from this is then automatically adjusted by the a.g.c. action.

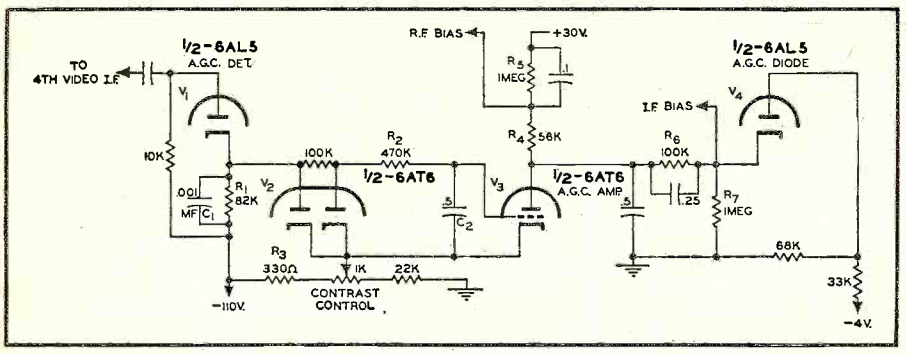
A novel yet simple arrangement for the development of a.g.c. voltage is employed in *Tele-King* television receivers. See Fig. 7. The entire video signal (containing signal voltages and sync pulses) is tapped off from the output circuit of the 1st video-frequency amplifier (6AG7) and applied to a 6SG7 sync separator tube. The a.g.c. voltage is developed at the grid of the 6SG7 tube due to the grid-leak biasing arrangement employed here. The 6SG7 tube has no fixed bias of its own. Hence, when a signal is applied through C_1, grid current flows, the amount dependent upon the strength of the signal voltage. Due to the high value of R_1 and R_2, the grid electrons flow into C_1, charging this to the peak value of the applied signal. This peak value, of course, is set by the sync pulses. The voltage developed across C_1 then discharges slowly through R_1 and R_2, developing a bias across these two resistors which is negative with respect to ground. Due to the long time constant of the grid network, the charge on C_1 leaks off slowly and only the sync pulses of the signal are able to overcome its negative charge and cause current to flow in the 6SG7. Thus, the voltage developed across R_1 and R_2 is governed by the sync pulses. The voltage across R_1 is applied, through a suitable filter network, to the four video i.f. amplifiers as an automatic bias. The 6SG7 tube is known as a sync separator because only the sync pulses appear in its output. All the rest of the video signal is without effect because of the high negative grid-leak bias.

A system which is considerably more complex and involves the use of a special a.g.c. amplifier is found in *Philco* receivers, Fig. 8. As before, the incoming video signal is received from the video i.f. system and applied to the video second detector and the a.g.c. rectifier. In the cathode leg of the a.g.c. diode section of the 6AL5, we have the long time constant network of R_1 (4.7 meg.) and C_1 (.05 μfd.). Initially the condenser charges up to the peak value of the incoming sync pulses and thereafter discharges slowly through R_1 during those intervals when the diode tube does not conduct. Since the discharge is very slow, due to the time constant of the circuit, much of the voltage established across C_1 will remain. Hence, only at the sync pulse tips will current flow through the tube. The voltage, then, established across C_1 and R_1 will be governed by the level of the sync pulses in the incoming signal.

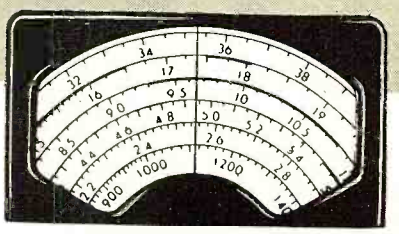
Due to the path of current flow through the a.g.c. rectifier tube, the voltage at the ungrounded end of R_1 is positive. This voltage is fed to the grid of the triode section of the 7B6 a.g.c. amplifier. This positive voltage, however, is offset by an even greater positive voltage that is obtained from the "B +" power supply and applied to the cathode. Thus, the effective control grid bias for the a.g.c. amplifier is negative although the value of this negative voltage varies in accordance with the voltage obtained from R_1 and C_1. The purpose of this arrangement is to vary the bias of the 7B6 in accordance with the strength

(*Continued on page* 102)

Fig. 9. The elaborate a.g.c. system employed in RCA projection receivers.



International SHORT-WAVE



Compiled by KENNETH R. BOORD

"JACKO," *Radio Australia's* laughing Kookaburra (otherwise known as the *"Laughing Jackass"),* whose cheery laughter rings out at the beginning of transmissions from the Australian overseas short-wave stations, is probably one of the most famous birds, in the world. At least, his voice is known to countless thousands of listeners as the signal for the commencement of programs beamed from *"Down Under."*

Robin Wood, *Radio Australia's* program manager, has a private problem concerning a cousin of *"Jacko."* It seems that a certain Kookaburra has taken to occupying the radio mast at the Wood household, and settles down there as dawn breaks each morning.

Mr. Wood, in the manner of all program managers, invariably tunes to *Radio Australia* in the morning, and with the opening of the early transmission, out booms the laughter of the *recorded "Jacko."*

This is the signal for Friend Kookaburra outside the house to become most agitated. He flies at windows, answers the call of the *Radio "Kooka,"* and generally suffers a severe mental upset. His chief ambition, of course, is to get inside the house and take a look at the other fellow—and this is probably the only instance on record where the laugh has been on the *"Laughing Jackass!"*

* * *

From Hawaii

According to *"The Listener In,"* Australia, the National Bureau of Standards has begun broadcasting of standard frequency, standard tone, and time signals from Hawaii.

The new station is located at Puuene, Maui, and has been allocated the call-sign WWVH. Frequencies are one of 5, 10, and 15 megacycles. Power is approximately 400 watts.

The transmission will be continuous, except for a short period each day when the transmitters will be off the air so that the oscillators may be checked with the American station WWV (Washington, D. C.).

Transmissions will consist of 4000 cycles and 440 cycles tone signals, interrupted for one minute every five minutes during which the call WWVH and the time in *GMT* is to be sent in telegraphic code. A "tick" is broadcast every second, except the fifty-ninth. The first "tick" after the skip marks the beginning of a new minute. Tone comes on exactly on the hour and every five minutes thereafter. The accuracy of WWVH will not be quite as precise as WWV which is one in fifty millions, but it is expected to maintain an accuracy of one in ten millions.

Operation of WWVH was to have been somewhat irregular until November 1 when it was proposed to have three frequencies in continuous operation—except for the calibration checks made against WWV.

This is the beginning of a new service which will eventually increase power to 2500 watts. WWVH will confirm reports from Engineer-in-Charge, Field Station, National Bureau of Standards, Box 901, Puuene, Maui, Hawaii. (Major, Western Australia)

* * *

Verification Data

Radio Moscow is again asking for reception reports and "promises" to verify and to send data on the U.S.S.R. to anyone who writes in to Radio Moscow, Overseas Service, Moscow, U.S.S.R. Has a Mailbag Program around 2115 on Saturdays (see "This Month's Schedules" for frequencies in use). (Dallmeier, N. Y.)

QRA of the short-wave station at Makassar is now Radio Indonesia, Makassar Studio, Strandweg Zuid 2, Makassar, Celebes, State of East Indonesia. (Kary, Pa.)

Address of commercial phone stations in Iceland is Ministere des Communications, Direction Generale des Postes et des Telegraphes, Rayjkavik, Iceland. (Kary, Pa.)

VLT2, 7.280, Port Moresby, Papua (British New Guinea), sent verie-card from Brisbane Engineering Department of the Australian Broadcasting Commission, Brisbane, Queensland, Australia, after initial verification by letter direct from the station; power of both VLT5 and VLT7 (9.52) is 2 kw., not 500 watts as previously listed; returned IRC. (Kary, Pa.)

Verification cards received from the *new* overseas s. w. outlets of New Zealand are quite attractive (differ greatly from former plain, pink card issued by old ZLT7, 6.715). (Kary, Pa.) Address is P. O. Box 3045, Wellington, New Zealand.

QRA for TGLA, 6.290, is Radio Periodico y Difusora, La Voz de Centro America, 10a Calle Oriente No. 22, Guatemala, Guatemala; QSL'd by letter in Spanish. (Kary, Pa.)

Address of RIAS, Berlin, is RIAS-Berlin, Schoeneberg, Kuffsteiner Str., RIAS-Haus., Germany. (Miers, Germany)

Oslo verifies with a nice card bearing picture of Oslo on one side; takes about 4 months regular mail. Leopoldville, Belgian Congo, replies in about 90 days, with folder type card and letter. (Underwood, N. J.)

* * *

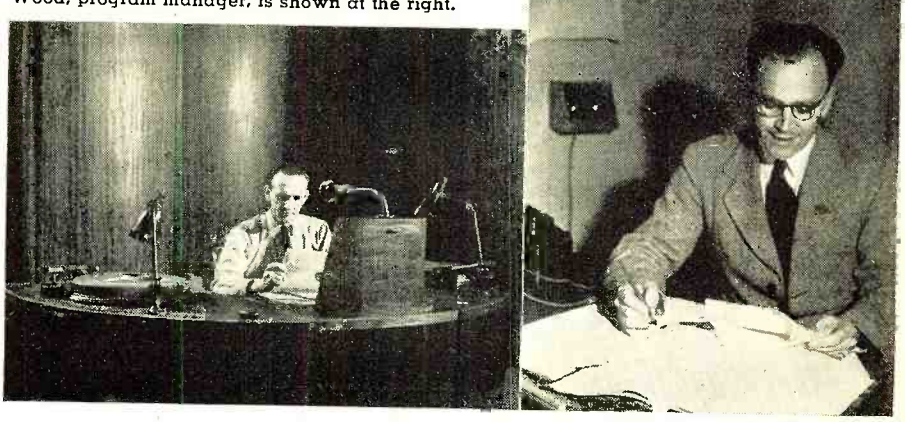
Club Notes

England—U. S. representative of the *International Short Wave Club* (London) is Jack E. Gardner, 1449 E. 15th St., Jacksonville 6, Florida; New Zealand representative is Albert F. Lark-

(*Continued on page* 126)

(Note: Unless otherwise indicated, all time herein is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.)

Graham Hutchins, DX Editor, is shown at the microphone at Radio Australia while Robin Wood, program manager, is shown at the right.



New 2-Way Radio Equipment for Metropolitan Police

By
DONALD P. WHITACRE, SR.
Chief Eng., Vetric, Inc.
and
LESLIE BAIRD

A test installation of the Vetric two-way radio unit on a two-wheel police motorcycle.

Equipment especially designed to withstand hard mobile use is being "road-tested" in Los Angeles.

CRIME prevention and detection will get a boost in Los Angeles with installation of new two-way radio equipment for all its motorcycle police. Receivers have been in use for some time by many motorcycle police departments over the country, but two-way equipment has been used in very few instances. The California Highway Patrol has used a few motorcycles with two-way sets and some smaller California cities such as South Gate, South Pasadena, Beverly Hills, and Santa Monica, and Newport Beach have found them successful.

Paramount among the requirements of such equipment are ruggedness of construction to withstand extreme vibration, light weight, and moisture-proof housing. Also important are the specially covered cables to resist splattering of gas and oil, and sufficient audio output for open motorcycle use in the heaviest acoustical noise areas. Of contributing importance are the quick disconnect plugs. One plug on the control head having a latchlock device to avoid accidental disconnection and to maintain positive contact at all times, and several connectors at the receiver, transmitter, and junction box serve to facilitate removal of all units when servicing and checking.

Metropolitan police departments are intensely interested in this new communication development, as greatly increased efficiency in employment of their motorcycles has become possible through the use of two-way radio. The greatest stumbling block in the past has been the difficulty in designing radio equipment which could "live" while absorbing the terrific pounding and vibration encountered when motorcycle mounted—aircraft vibration problems are mild by comparison.

Low center of gravity, light weight, and security of mounting were additional problems difficult of solution in themselves.

Nearly every law enforcement agency in Southern California cooperated in the design of this equipment and deepest appreciation and gratitude must be expressed to the various members of the American Police Communication Officers Association for their suggestions, criticism, and encouragement. The contributions of Mr. Hirshel Calvert of the Pasadena Police Department, Mr. R. A. Kridler of the California State Highway Patrol, and Mr. Fred Crowder of the Los Angeles Police Department (who operated the pilot models on test) have been most outstanding.

Vetric, Incorporated, of Los Angeles, has designed equipment, type CM-1, in various models to cover both AM and FM bands, the particular installation described here being AM. All units operate from a 6 volt d.c. storage battery source and are controlled from a control head assembly of the headlight type arranged to mount on the motorcycle handlebars, either right or left. This equipment is now undergoing tests by the Traffic Bureau of the Los Angeles Police Department.

Control Head

The control head has a number of unusual features, such as; light rugged cast aluminum housing finished in black wrinkle to avoid light reflection, microphone hanger, transmitter filament switch, locking type master switch controlling all equipment, volume control, squelch control, and "XL" microphone cable connector of the quick-disconnect, vibration and moisture-proof type. A receiver "on" signal light, transmitter "on" signal light, a moisture-proof modified 5" heavy-duty PM speaker acoustically modified to match the housing and employing a large Alnico V magnet for unusual sensitivity, hardware for mounting and Vinylite covered cable to reach to the junction box mounted on the rear fender above the battery are also included.

The Receiver

The 2AR-1 receiver is a 7-tube single conversion superheterodyne designed for reception of amplitude modulated signals in the frequency range of 1½ to 2½ megacycles, with the following type line-up: 6C4—crystal oscillator; 6BJ6—r.f. amplifier;

6BH6—converter; 6BJ6—i.f. amplifier; 6AQ6—squelch amplifier and first detector; 6AQ6—first audio amplifier; and 6AK6—final audio amplifier.

No paper tubular condensers are used, all being either ceramic or mica, with the exception of the filter components which are hermetically sealed electrolytics rigidly mounted by brackets on the chassis.

All i.f. transformers over 1" in their greatest mounting dimension are mounted with four bolts, 6/32 or larger, and in a vertical position. Sockets are ceramic and are built so that spring-loaded shields hold the tubes firmly in vertical position at all times. Resistors and bypass condensers are rigidly mounted on heavy phenolic terminal boards.

A variable sensitivity control is available on the chassis for installation adjustment only. In cases where the extremely high sensitivity of the receiver is not needed, a considerable reduction in conversion hiss can be had by reducing the r.f. stage gain. This results in the receiver having an unbelievably "dead" sound, when no signal is being received, even with the squelch wide open. The receiver chassis "plugs" into a ¼" base plate, 13⅝ x 4⅝", by means of Type K *Cannon* plugs, making the unit easily removable for service or replacement, without use of tools.

The metering jack and selector switch on the chassis provide for metering: (1) crystal activity; (2) a.v.c. bus; (3) audio output; and (4) plate voltage.

All critical alignment and tuning adjustments are available from the top of the chassis; while the three service alignment adjustments are readily available from the underside. Receiver sensitivity of the order of one microvolt is obtained with a supply voltage and current of 150 v. d.c. at 40 ma. The chassis control varies the sensitivity from 1 to 24 microvolts. The efficiency of the receiver may be appreciated by the fact that there is a measured gain of 200 in the r.f. stage alone. Squelch action can be varied over a range of from zero to 90 microvolts input to fully open the receiver.

Efficient a.v.c. action maintains the audio output essentially constant with an input of from 3 microvolts to 0.1 volt at the antenna. The distortion is less than 10% over audio range of from 200 to 4000 cycles, at 1 watt output, which has proven to be more than adequate. Current drain of the receiver at 6 volts is only 2.2 amperes or less. This low drain is of utmost importance as motorcycle batteries are only rated 22 ampere hours.

The complete receiver unit consists of the receiver chassis, CMR-1 vibrator power supply, mounting plate, and dust cover.

The base plate and dust cover are finished in baked black enamel or anodized finish, and snap catches make the dust cover instantly removable.

The reversibility of the synchronous vibrator in its socket permits operation on vehicles with either positively or negatively grounded battery. All components in the vibrator supply are rigidly mounted and all condensers are mica with the exception of one inductively wound tubular condenser which works at 6 volts and is rated 50 volts working. The receiver power pack supplies part of the transmitter plate supply when transmitting; being transferred by the relay in the transmitter when the mike "talk" button is operated.

The receiver connector receptacle, attached to the base plate, terminates the inter-connecting cable from the junction box. Coaxial antenna fittings of the RG8/U cable or equivalent are furnished. The receiver is designed to operate on all lengths antenna from a one foot whip, where the receiver only is installed, to a quarter-wave transmitter antenna, when the equipment is used with any type CM-1 transmitter.

The Microphone

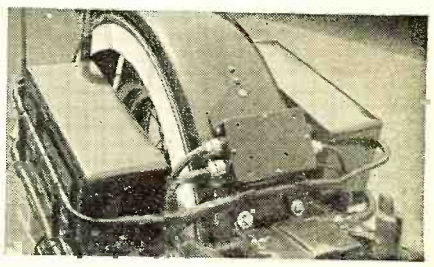
The microphone is a specially designed waterproof "close-talking" carbon mike in a rugged phenolic case. A coiled, retractable type cord, and a waterproof, instantly detachable, latchlocking plug with special rubber gasket completes the mike assembly. The case contains the "push-to-talk" switch. The frequency response of this mike is matched to the transmitter to obtain maximum clarity and intelligibility over the voice frequency spectrum.

The Transmitter

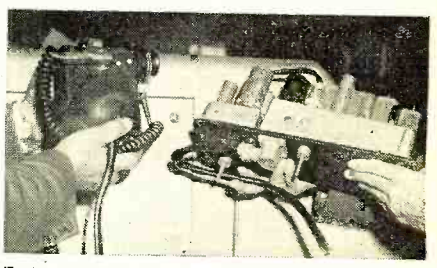
The 40AT-1 transmitter, 4-tube, amplitude modulated, is designed as a companion unit to any CM-1 receiver, and may be operated on any assigned frequency between 30 and 50 mc. Each transmitter must pass an

(*Continued on page* 138)

Rear view of complete assembly showing control head, mike, xmtr.-receiver, and antenna.

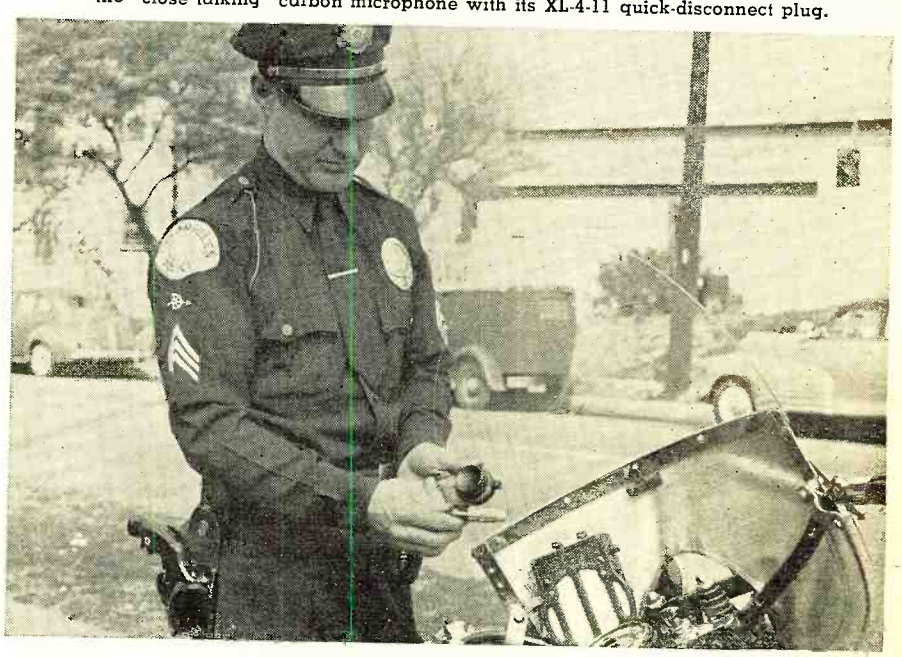


Closeup of installation showing junction box, transmitter (left), and receiver (right). Each unit has its own complete power supply.



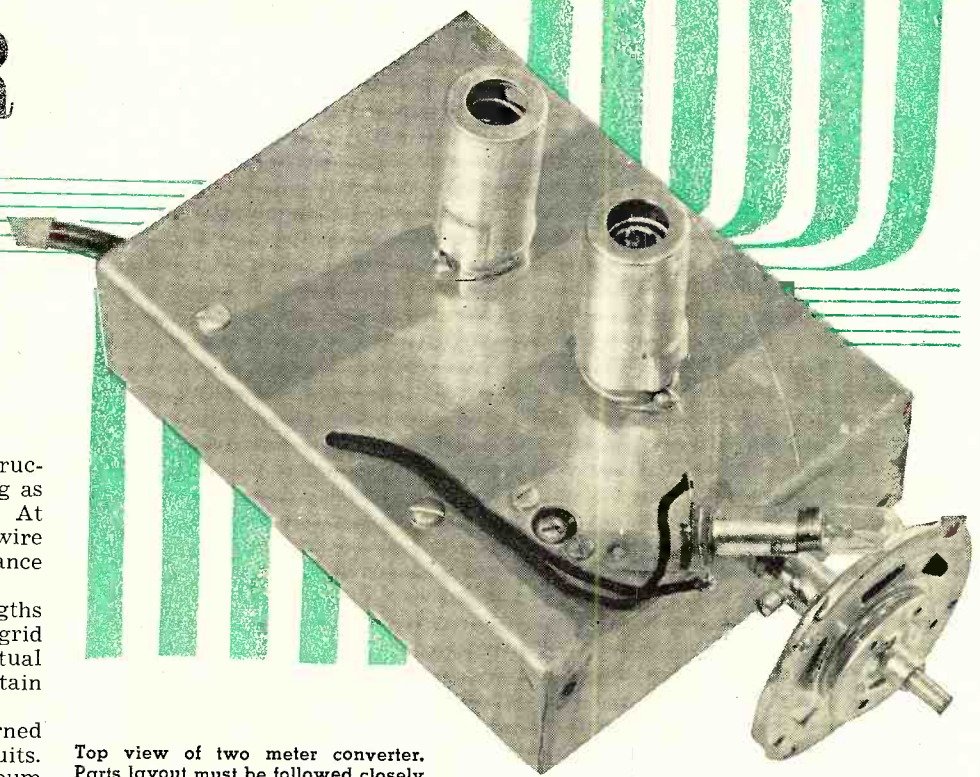
(Left) control head, and (right) transmitter. Control head mounts on handle bars, while transmitter is mounted on the rear cycle rack.

Sgt. D. McLean of the Traffic Division Los Angeles Police Department, holds the "close talking" carbon microphone with its XL-4-11 quick-disconnect plug.



Build Your Own COMMUNICATIONS RECEIVER

By
J. T. GOODE
Standard Coil Products Co.



Top view of two meter converter. Parts layout must be followed closely in order to insure correct operation.

Part 6. Construction details covering the two meter converter to be used with home-built set.

HIGH frequency tuner construction becomes more exacting as the frequency is increased. At 146 mc. the length and size of wire used in coils determines the inductance more than the number of turns.

Such being the case, lead lengths become vitally important. Long grid and plate leads will reduce the actual inductance required to tune a certain frequency.

Gain per stage is largely governed by the impedance of the tuned circuits. Maximum inductance gives maximum gain.

By careful chassis layout, lead length can be held to a minimum. Proper location of parts will reduce the possibility of regeneration.

There are several ways of designing high frequency converters. One method is to design the grid and plate circuits for broad-band operation with a fixed frequency oscillator. Tuning is accomplished by varying the i.f. frequency.

This type of design lacks gain due to the broad-band characteristics of the mixer plate circuit. Another disadvantage is the variation of gain over the tunable range.

A more conventional type circuit is one where all tuned circuits are tracked by using a multi-section variable condenser. The main disadvantage of this type of circuit is the minimum capacity of variable condensers. Although this minimum capacity may be in the order of 2 $\mu\mu$fd., the impedance of the circuit is reduced resulting in less gain.

Another problem is the ability of the builder to get such a circuit to track and keep the regeneration out due to the added lead length.

Another design somewhat parallels television tuners. Here the circuits are pretuned to give required sensitivity and selectivity over a band of frequencies. By using some of the ideas of a television tuner a simple high gain two meter converter can be designed.

Bandwidth is calculated percentage-wise. By dividing the center frequency of the two meter band (146 mc.) into the bandwidth (4 mc.) the result is 2.7%. At six meters the result is 8%.

By pretuning the grid and plate coils to 146 mc. the loss in gain at 144 and 148 mc. is in the order of 1 db. This amount of variation in gain for all practical purposes is negligible. Since the only capacity in the tuned circuits is tube capacity, the coil inductance is maximum resulting in maximum gain.

This same design can be used at six meters but the *"Q"* of the tuned circuits must be reduced if the sensitivity of the tuner is to remain comparatively flat over the tunable range. This can be accomplished by shunting the tuned circuits with resistors. This results in reduced gain and image ratio.

While this type of design is considered satisfactory for television tuners it is a serious compromise from a communications standpoint.

The sensitivity of the two meter converter to be described is in the order of one microvolt with a signal-to-noise ratio of fifteen-to-one. The image ratio is one hundred-to-one.

Sensitivity measurements were made using a *Ferris* Model 18-C signal generator. The sensitivity of the converter was such that it exceeded the leakage of the generator and absolute measurements could not be made.

An interesting sidelight was the reception of a San Diego amateur station while calibrating the converter. The antenna consisted of a shielded lead going to the frequency meter. This was a distance of approximately one hundred miles.

The design of the converter is as follows; tuned-grid tuned-plate 6AK5 r.f. amplifier, and 6J6 mixer-oscillator.

L_1 is the antenna coil and this is tuned to 146 mc. The only capacity in this circuit is the tube capacity. Tuning is accomplished by spreading the turns of the coil. The primary winding consists of three turns of number 22 hook-up wire wound tight around the grid coil.

L_2 is the plate coil and this is tuned in the same manner by adjusting the spacing of the coil. The capacity of

this circuit is that of the plate of the 6AK5 and the grid of the 6J6. Since two tube capacities shunt this coil it has less turns than the grid coil.

L_3 is the oscillator coil. This circuit is unique because of its simplicity. C_3 is a *Johnson* 160-203, 1.72 to 3.3 $\mu\mu$fd. butterfly condenser. The tuned circuit is shunted by a 5 $\mu\mu$fd. N300 ceramic condenser. The action of this condenser is twofold. First it corrects frequency drift and second, it spreads the two meter band over approximately 90 per-cent of the condenser rotation. The tuning condenser has a rotation of 90 degrees from minimum to maximum capacity.

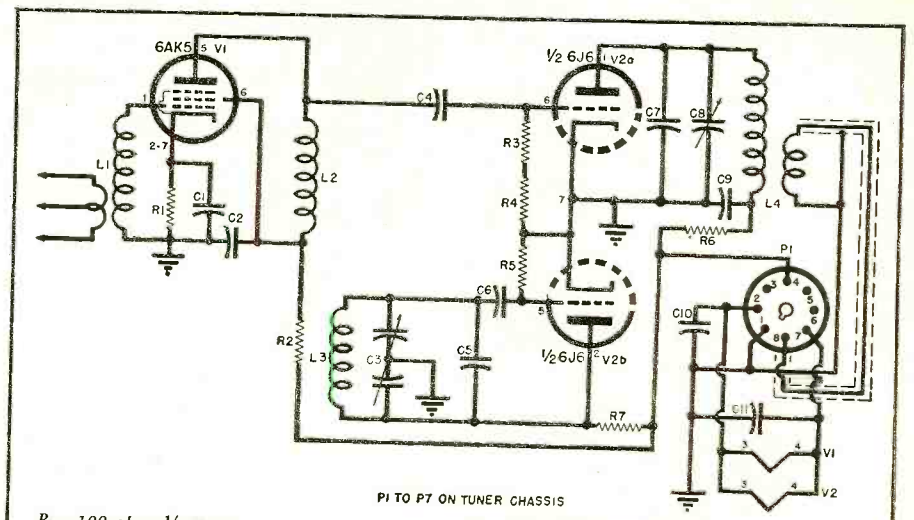
L_1 is the low impedance i.f. transformer tuned to 14 mc. This circuit is tuned by shunt capacity, C_7, and variable condenser C_8 giving a total capacity of approximately 60 $\mu\mu$fd.

The construction of this coil is as follows. It is wound on a ⅜ inch form approximately one inch long. The primary winding consists of 18 turns of number 22 enameled wire closewound. The secondary winding consists of 3 turns of number 22 silk enameled wire closewound around the "B plus" end of the coil form. A terminal board is secured to the end of the coil form. All leads terminate at tie points on this terminal board. The average junk box will yield sufficient material to make this coil.

Wire size is not important. Two wire sizes above or below number 22 should make little or no difference. If insulated wire is not available for the secondary winding, cover the primary winding with clear Scotch tape and wind the secondary over this tape. This will provide sufficient insulation between the windings. Secure the windings in place with some type of insulating varnish or coil dope.

This type transformer can be used in place of the one described for the six meter converter.

Oscillator injection voltage is coupled to the grid of the mixer by capacity between the elements of the 6J6. The amount of injection voltage can be read by connecting a v.t. voltmeter at the center point of the mixer grid resistors R_3 and R_4 and ground. The voltage appearing at this point should be in the order of one volt.



R_1—100 ohm, ½ w. res.
R_2, R_6, R_7—4700 ohm, ½ w. res.
R_3, R_4—100,000 ohm, ½ w. res.
R_5—10,000 ohm, ½ w. res.
C_1, C_2, C_9, C_{10}, C_{11}—1000 $\mu\mu$fd. ceramic cond.
C_3—1.72-3.3 $\mu\mu$fd. cond. (Johnson 160-203)
C_4—100 $\mu\mu$fd. ceramic cond.
C_5—5 $\mu\mu$fd. N300 ceramic cond.
C_6—20 $\mu\mu$fd. ceramic cond.
C_7—30 $\mu\mu$fd. ceramic cond.
C_8—35 $\mu\mu$fd. var. midget cond.
L_1—8 t. #20 tinned, 7/32 i.d., 1/32" spacing. Pri. 3 t. #22 hook-up wire
L_2—5 t. #20 tinned, 7/32" i.d., 1/16" spacing
L_3—5 t. #20 tinned, 7/32" i.d., 1/32" spacing
L_4—See text

Circuit diagram and parts list for the two-meter converter unit.

Mechanical Construction

The actual layout of parts should closely follow that shown in the photograph. The oscillator tuning condenser mounts on the front of the chassis. The 6J6 oscillator and mixer tube is mounted one and a half inches back from the front edge of the chassis in a straight line behind the variable condenser.

The 6AK5 tube socket mounts one and a half inches behind the 6J6 socket. The antenna input terminal board mounts on the back side of the chassis in direct line with the tube sockets.

The oscillator coil mounts directly across the butterfly condenser. Condenser C_5 also shunts this coil by connecting directly to the tuning condenser. One side of the butterfly condenser connects directly to the plate of the 6J6. Condenser C_6 goes from the other side of the tuning condenser to the grid of the 6J6.

Condenser C_7 connects directly across C_8 and the upper end connects to the plate and hot side of L_1.

Note the location of L_2 in the photograph. This coil is mounted in such a way to be at right angles to the grid coil L_1. The plate of the 6AK5 connects to the end of the coil that is nearest the 6J6 tube socket. Condenser C_4 connects to the coil at the nearest point and to the grid of the 6J6. This coil is supported by the plate and screen connections of the 6AK5 and condenser C_4.

L_1 grid coil is supported by its own leads connecting to ground and the grid of the 6AK5. The primary winding connects to the antenna input terminals further aiding the support of this coil. A coil form is inserted in this coil. When final adjustment has been made coil dope is used to cement the turns to the coil form.

A solder lug is mounted under the tube mounting screws and all grounds go to these points.

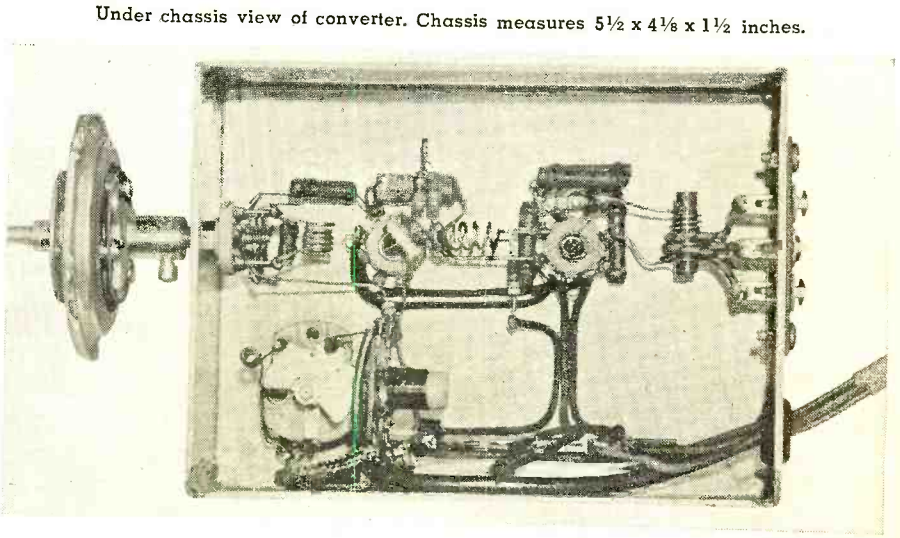
Tuning Procedure

If the coils are wound according to the information given, final adjustment should consist of varying the spacing slightly. The coils were designed and tuned by using an accurately calibrated grid dip meter with the coils wired into the unit. The unit was then turned on and found to be within two megacycles of the desired frequency.

Connect the two meter converter to the all-wave tuner plug, through P_1, shown in diagram. Tune the all-wave tuner to 14 mc. Connect a signal generator to the antenna terminals of the two meter converter and tune the signal generator to 14 mc. Increase the signal generator output to maximum. With this high level sufficient

(*Continued on page* 114)

Under chassis view of converter. Chassis measures 5½ x 4⅛ x 1½ inches.



SYNTHETIC REVERBERATION

By
J. F. DUNDOVIC

A converted magnetic recorder is used to introduce artificial reverberation into musical reproductions.

WITHIN the past few years many orchestras have been making their recordings in "live" studios, thereby enhancing the color and quality of the music. One way in which one might give an ordinary record this "live" effect would be to place the loudspeaker in a large room such as an auditorium. The sound waves being reflected back and forth from wall-to-wall and mingling with the original music would constitute the natural form of reverberation.

A method more practicable for most cases is to introduce electrically a train of decaying echoes into the reproducing system. A very close approximation to natural reverberation may be obtained through the medium of a magnetic recorder, which stores the sound for a fraction of a second and then re-introduces it into the amplifier as a succession of echoes. One such system, shown pictorially in Fig. 1, uses a recording head followed by a number of spaced pickup heads.[1] The output from each pickup is attenuated to a lower value than the one ahead of it so that the echo train decays to zero in from one to two seconds. The spacing between heads, and the tape speed should be such that the time it takes a portion of the tape to travel from one head to the next is less than one-sixteenth of a second. Otherwise, instead of a smooth blending, the ear will hear distinct echoes and the total effect will not be so pleasing.

The system designed by the writer is illustrated in Fig. 2, and uses but one recording and one playback head. To obtain the succession of echoes, delayed regenerative feedback is used in a manner somewhat similar to the old regenerative detector. A sound appearing across the output of the amplifier comes through the loudspeaker and is also recorded on the moving tape. A fraction of a second later the recorded sound is picked up by the playback head and fed into the amplifier input at a slightly lower level than the original sound possessed. This "echo No. 1" appears at the loudspeaker and is re-recorded upon the tape. As "echo No. 2" it is again picked off the tape at a still lower level. The process is repeated until the train of echoes has become inaudible. The advantages of this system over the aforementioned one are its simplicity and its effect of achieving an indefinitely large number of echoes.

A *Brush* "Soundmirror" was modified by the writer for an experimental model, and the results obtained have been quite satisfactory. The effect upon music is to give an illusion of third dimension or depth to the reproduced sound. More reverberation can be tolerated with music than with speech. For example, a radio announcer sounds as if he were speaking from the middle of a huge, empty room when an excessive amount of reverberation is added.

Any wire or tape recorder may be used as a basis for a synthetic reverberation system provided it is possible to place another pickup head adjacent to the regular one. Due to the fact that the recorder is immobilized for any normal recording and playback while being used for reverberation purposes, it might be well to consider making up a special assembly. Constructing a recorder for this purpose would be a somewhat simplified undertaking as there is no need for the supply, takeup, and rewind mechanisms. A recent issue of RADIO NEWS [2] featured an article concerning the construction of a tape recorder which would serve admirably as the basic unit for a synthetic reverberation system.

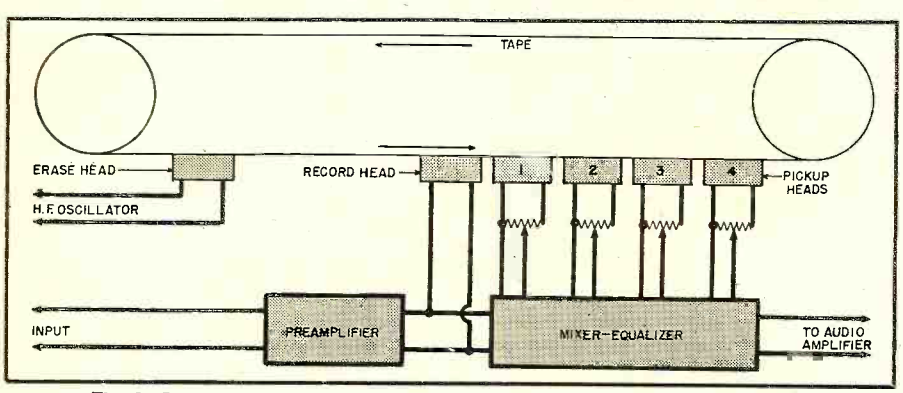
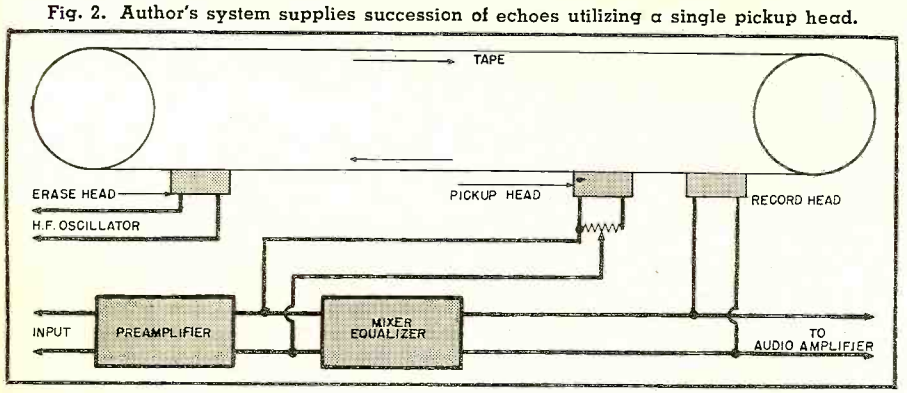


Fig. 1. Diagram shows conventional system (not described in text) whereby four individual pickup heads are used to supply reverberation effect.

Fig. 2. Author's system supplies succession of echoes utilizing a single pickup head.



Conversion

For those who possess a "Soundmirror" and would like to use it for experimentation with artificial reverberation, the following modification used by the writer may be of interest. First, the erase head is removed and another record-playback head is

mounted in its place. These heads can be obtained from "Soundmirror" dealers.

The amplifier circuit changes are shown in Fig. 3. The shielded lead of the regular record-playback head is unsoldered from the "record-play" switch and is then soldered to the lug of the switch that is connected directly to the grid of the 6SJ7 input tube. This head is now to be used for playback only. The shielded lead of the new head is connected to the lug from which the other lead was removed, so that the new head receives the output of the driver tube and is used only to record.

The grids of the 6SN7 are removed from the volume control sliders and connected to the high ends of the controls. The "play" volume control now regulates the feedback and hence amount of reverberation, while the "record" control still sets the tape recording level. If the audio amplifier used does not have an input volume control, the tone control of the recorder may be used as a volume control by shorting out the .0001 μfd. tone control condenser.

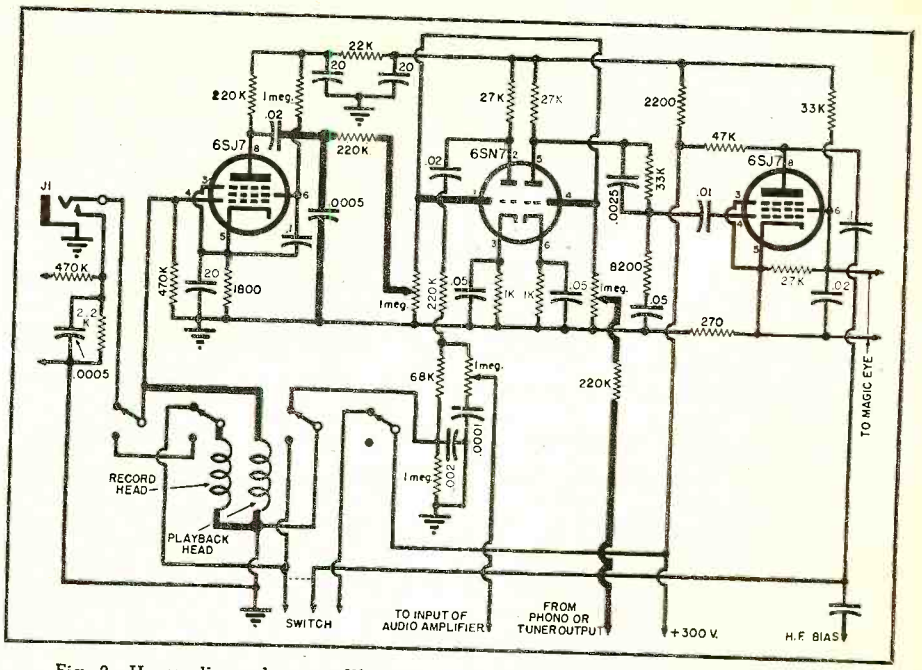


Fig. 3. Heavy lines show modifications made in author's "Soundmirror" recorder.

Tape Drive

To guide the endless loop of tape, an empty sewing-thread spool is mounted on the takeup motor spindle, as shown in Fig. 5. A spool of the variety which is 1-inch in diameter by 7/16-inch in height works nicely. Another spool is bolted to the surface just behind the magic eye. The tape passes from the capstan to the spool on the takeup motor, around the fixed spool, past the heads, and back to the capstan.

The takeup motor is no longer needed, and one lead should be disconnected so it does not run. To furnish a more positive drive for the tape, a rubber-rimmed phonograph turntable drive wheel is mounted on a hinged aluminum bracket and held against the capstan by a light spring. Without this device the tape will slip on the capstan and refuse to move. If the loop is rather loose it will be necessary to tie down the forward "Micro Switch" so that the drive motor will run.

In order to approach the correct time delay between the recording and playback heads, the tape speed must be increased to at least 15 inches per second with the head spacing used here. This can best be accomplished by using a high-speed capstan. The experimenter can have this capstan machined, or else it may be obtained from the *Amplifier Corp. of America* for the price of $25.00. A makeshift method of temporarily increasing the tape speed is to place a suitable rubber grommet or bushing over the drive shaft of the motor. This effectively doubles the diameter of the drive shaft and hence the speed of the capstan. However, the rubber will deteriorate in time due to the heat of the motor.

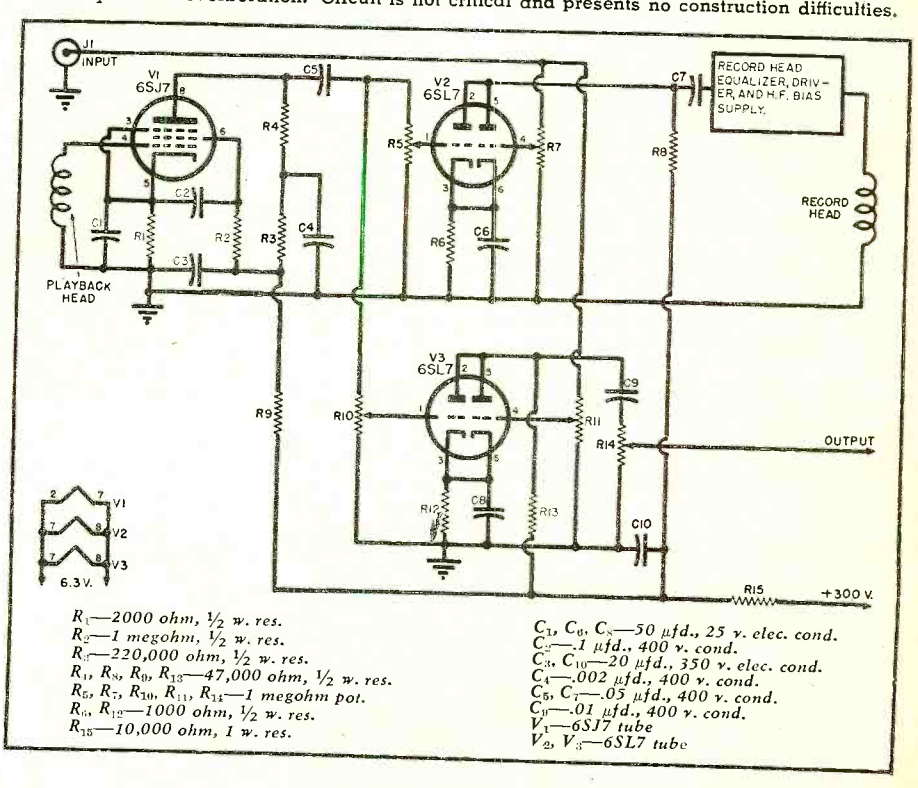
A pair of small horseshoe magnets are used to erase the tape. The original high frequency erase is of course preferable if a suitable position can be found for mounting the head. However, the magnetic erase does an acceptable job, especially when a second magnet is used to demagnetize the tape and thereby greatly decrease the noise level. The magnets are mounted on small wooden blocks. It was found necessary to use thin plastic sheets above and below the pole pieces of the first magnet to guide the tape. The edges of the pole pieces should be rounded off, if possible, and the tape allowed to slide in contact with the faces. The second magnet is adjusted for minimum clicks (caused by the tape joint) and noise level.

Operation

The recorder is operated while in the "record" position. With a signal at the input, the "record" volume control should be adjusted for a slightly higher than normal level on the magic eye. This control will also affect the volume of the output signal, but once it is set very little adjustment will be necessary. The "play" control can then be varied to give the amount of reverber-

(*Continued on page* 165)

Fig. 4. Circuit diagram of a recording amplifier that may be built as a special unit to provide synthetic reverberation. Circuit is not critical and presents no construction difficulties.



R_1—2000 ohm, ½ w. res.
R_2—1 megohm, ½ w. res.
R_3—220,000 ohm, ½ w. res.
R_4, R_8, R_9, R_{13}—47,000 ohm, ½ w. res.
R_5, R_7, R_{10}, R_{11}, R_{14}—1 megohm pot.
R_6, R_{12}—1000 ohm, ½ w. res.
R_{15}—10,000 ohm, 1 w. res.

C_1, C_6, C_8—50 μfd., 25 v. elec. cond.
C_2—.1 μfd., 400 v. cond.
C_3, C_{10}—20 μfd., 350 v. elec. cond.
C_4—.002 μfd., 400 v. cond.
C_5, C_7—.05 μfd., 400 v. cond.
C_9—.01 μfd., 400 v. cond.
V_1—6SJ7 tube
V_2, V_3—6SL7 tube

SERVICING Simplified

By
S. J. RICHARD
Radio Div., Delehanty Inst.
and
J. T. CATALDO
General Research Laboratories

Servicing receivers by means of a circuit disturbance test is easy and time-saving.

MUCH has been written in the past five to ten years on methods of radio servicing. Various authors have their preferences as to circuit isolating by means of signal substitution, signal tracing, etc. The object of this article is to discuss a simplified method of servicing a radio receiver by using a no more impressive and expensive test equipment setup than the common screwdriver and a voltohmmeter. Even now, the cries of "screwdriver mechanic," "Butcher," and "Ham and Egger" fill the air. It should be noted that the authors do not imply that the screwdriver method is the only acceptable means of servicing a radio. It is merely intended to demonstrate that a radio technician, should the need arise, can localize the trouble and repair the defective set by means of a screwdriver, a voltohmmeter and some knowledge of a radio circuit. The techniques employed conform to good engineering practices and the radio technician should feel no shame in employing them. In fact he should, instead, feel proud in that he has repaired a receiver with inexpensive test equipment.

The intelligent man neither accepts nor condemns before he has heard the evidence in the case. Therefore, if you will peruse the following discussion and consider the logic of the technique, it is certain that you will adopt circuit disturbance tests as part of your radio techniques in order to save you time. The theory behind these techniques rests on the fact that the radio receiver (superheterodyne) consists of three distinct amplifiers (viz. r.f., i.f. and audio) and two detectors, commonly termed "mixer" and "sound detector." If the set is inoperative and the power supply is not defective, only one of the five above-mentioned channels will be found defective in approximately ninety per-cent of the radios.

Let us take a hypothetical case of a six-tube a.c. receiver and start troubleshooting from the speaker end, working toward the antenna. Invert the set in the customary manner and turn on the receiver to full volume.

With the screwdriver, short the cathode of the output (6V6) stage to ground. This removes the bias from the output tube and should result in a click in the speaker. If the click is not heard after performing this test a few times, one of five things may be wrong with the receiver:

A-1. Speaker voice coil is open.

B-1. Speaker field coil is open (in electrodynamic speakers).

C-1. Output transformer is shorted or open (in primary or secondary).

D-1. Output tube is defective.

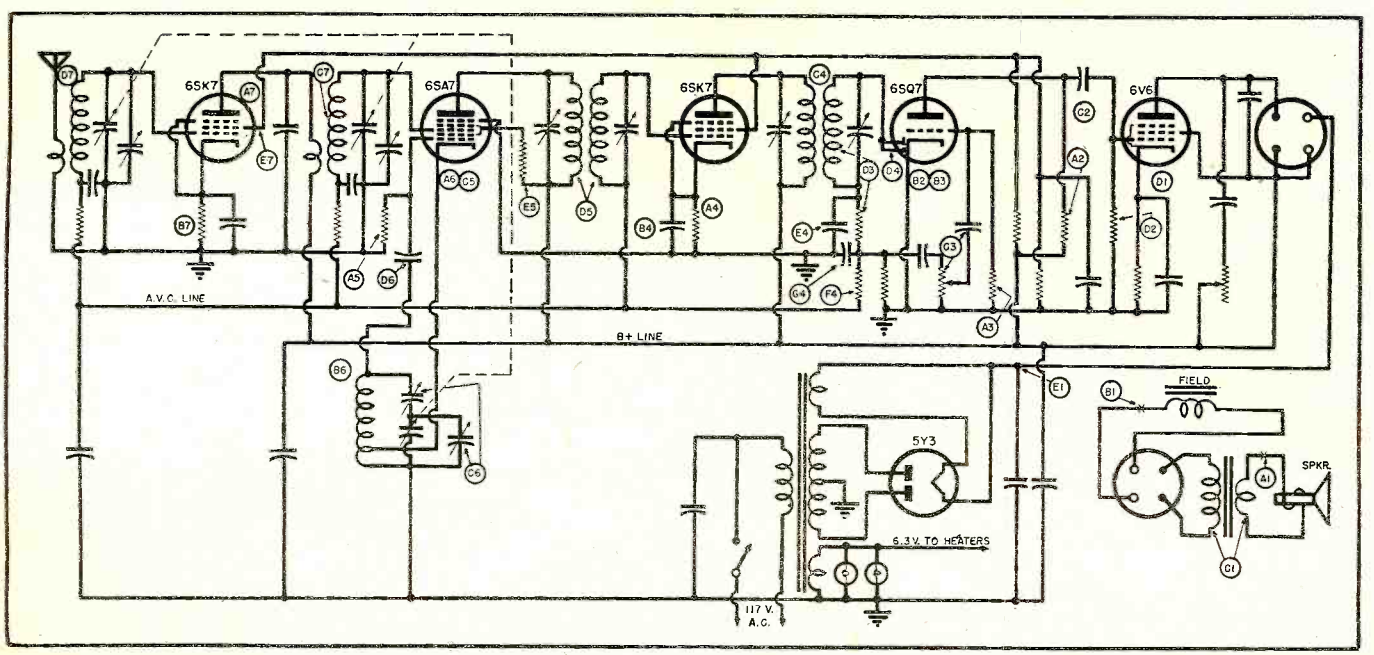
E-1. No "B plus."

Defect *D-1* above can easily be ascertained by substituting a new tube or testing the suspected one in a tube tester. The other components may be tested with a voltohmmeter in a few minutes and the repair or replacement of the defective component may be effected.

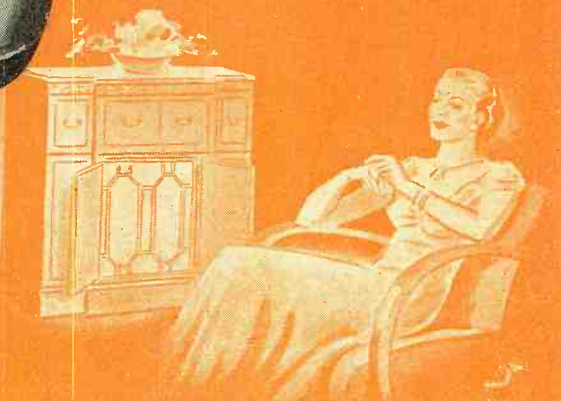
However, if the click is heard when the bias is removed, this indicates that the output stage, including the speaker and at least part of the power supply circuit, is functioning. With the audio output stage functioning, we can amplify any circuit disturbances which we will create in the forward stages of our receiver.

Next, we short the plate circuit of the voltage amplifier (6SQ7) to ground. This may be done without harming the receiver as the load resistor in this circuit (in conventional receivers) is on the order of 250,000 ohms or more and the increase in plate current which would flow because of this short would not be greater than one milliampere. This short removes

Circuit diagram of the six-tube superheterodyne used by the authors to demonstrate "circuit disturbance" testing techniques.



MAKES FRIENDS...AND KEEPS THEM!



GENERAL ELECTRIC

161-HA2-6650

FIRST AND GREATEST NAME IN ELECTRONICS

the charge from the coupling condenser and a surge of current flows through the grid resistor of the output stage. If the characteristic click or noise is not heard, we have localized the trouble as:

A-2. Open plate load resistor.
B-2. Shorted voltage amplifier tube.
C-2. Open coupling condenser.
D-2. Shorted output stage grid resistor.

If we hear the noise with which we have become familiar, we will continue working toward the antenna end of the receiver by shorting the grid of the voltage amplifier tube to ground. The small bias (contact bias) of 0.5 to 1.0 volt is removed from the grid. The absence of an audible click or disturbance noise indicates that the defective part is:

A-3. Contact bias resistor is shorted.
B-3. Tube (6SQ7) inoperative.
C-3. Shorted volume control.
D-3. Short in the diode load circuit.

The failure may be determined as noted previously with a voltohmmeter. Assuming that the click is audible, we have established, with a reasonable amount of certainty, that the audio section of the receiver is operative and we now have a two-stage audio amplifier at our disposal to further probe into the intricacies of the forward receiving circuits.

Now assuming that the audio section has been checked by means of circuit disturbance and not found wanting by the absence of the customary noise which accompanies such an operation, we are ready to probe into the intermediate frequency stage of the receiver. We proceed by shorting the cathode of the i.f. stage (6SK7) to ground thus removing the bias from this stage. Incidentally, this operation checks the i.f. stage, i.f. transformer, second detector, and associated circuit components. Should we not receive an audible indication with this operation, then we may look for trouble at the following points:

A-4. Shorted cathode resistor.
B-4. Shorted cathode bypass condenser.
C-4. Open or shorted i.f. transformer (primary or secondary).
D-4. Inoperative diode.
E-4. Open or shorted r.f. condenser in diode return circuit.
F-4, G-4. Shorted a.v.c. filter.
Shorted diode load.

Should the customary disturbance noise be heard, we can reasonably assume that the electrical circuits are intact from the cathode of the i.f. stage to the speaker.

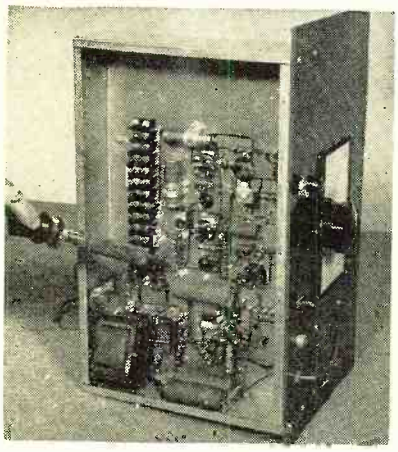
So it is forward again. We now apply our new technique to the mixer stage, shorting converter (6SA7) cathode to ground, thus sending an electrical disturbance through this section of the receiver. Should we hear the click we are on the home stretch. If there is no audible indication when we remove the bias from the mixer stage, check the following:

A-5. Open or shorted oscillator grid leak. (*Continued on page* 124)

OUR COMPLETE, SIMPLIFIED, PRACTICAL COURSE WILL MAKE YOU A HIGHLY TRAINED

RADIO TECHNICIAN

You build this V. T. Volt Ohmmeter.



You build this Standard A. C. Operated Superheterodyne Receiver.

From the standard radio parts you build your own experimental equipment.

OUR FAMOUS RADIO COURSES

Prepare You for a Money-Making Career in Commercial Radio and Its Allied Fields

NO RABBITS—NO HAT TRICKS—NO MAGICIANS—ANYBODY CAN LEARN THIS BUSINESS AND TAKE THEIR PLACE IN THE RADIO-ELECTRONICS INDUSTRY WHERE MEN AND WOMEN ARE IN GREAT DEMAND

Gigantic Boom Seen For Radio-Electronics Industry ...Technicians In Big Demand

Now, in a tried and tested school, celebrating their 50th year, you can prepare for a richly satisfying, money-making career in radio.

Now, for the first time, you can learn radio by modern methods of teaching in a highly-approved and accredited school.

MORE TECHNICIANS URGENTLY NEEDED

If any industry has gained terrific impetus as a result of the war—it has been radio and its allied fields—Electronics, Television, FM, Radar and Announcing. Never was there such a demand for radio technicians as now. Our employment office is flooded with calls for our graduates, especially in the combination Announcer-Engineer Field. Opportunities are almost unlimited.

But you must know modern methods. Times have changed. Equipment is being improved daily. That's why old-time instruction methods won't do. To be successful in radio today, you must know today's techniques as taught by the Tyler Commercial College.

NO "Q & A" BOOKS USED

The Tyler Commercial College Radio Courses emphasize all necessary phases of Radio Theory and Practice, including FM and Television, using a wide selection of the latest standard texts. Under no circumstances do they rely on "Q & A" books for license preparation. It is this fundamental principle that has made the Tyler Commercial College the leader in the Radio-Electronics Field. They added television, frequency modulation, and control room announcing to their General Radio Course, far in advance of the Federal Communication Commission Examination Changes.

This constant revision of courses to maintain the highest-possible level of instruction has kept the Tyler Commercial College leading all other schools in Radio Instruction.

Today's Methods Made Easy For You

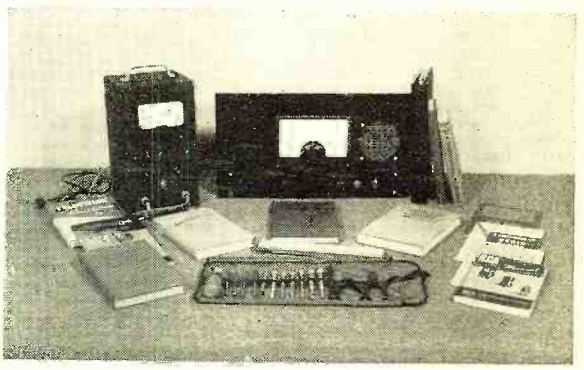
The famous Tyler Commercial College teaches these modern methods in a modern way. It is completely different and unique—excitingly different from any course you ever have seen or heard of. It is amazingly simple and fascinating, through step-by-step direction and instruction. Your progress should be rapid, for you learn by doing in our Radio Laboratories.

Get The Full Story

For students, who would like to cash-in on the foresight of this school, enrollments are now open. Write, wire or phone. Ask to see our Free Catalogue and Booklet showing Previews of the Tyler Commercial College. Discuss these courses with our representatives or come direct to the school. See our Radio Laboratories—check our methods of instruction—discuss your needs with the men of our Radio Department.

APPROVED FOR VETERAN'S TRAINING

All of our courses, including our Radio Courses, are available under the G. I. Bill of Rights and Public Law 16



All of the above equipment, supplies, and technical books become yours at the end of the course.

You learn by doing in one of our well equipped laboratories.

WRITE DEPARTMENT 21

TYLER COMMERCIAL COLLEGE

A SCHOOL OF BUSINESS ADMINISTRATION, SECRETARIAL SCIENCE, BOOKKEEPING, RADIO, RADAR, FREQUENCY MODULATION, AND TELEVISION

TYLER, TEXAS

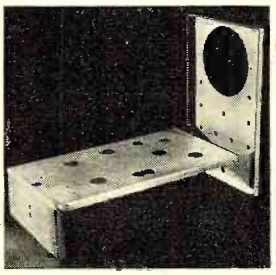
Features that make Heathkits the best kits . . . .

1 KITS THAT FIT

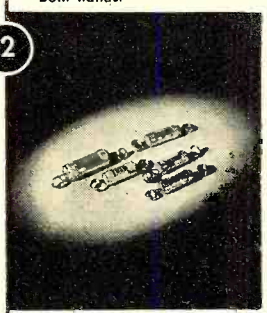
Heathkit chassis are precision punched to fit the quality parts supplied. The grey crackle aluminum cabinet and the two color panels are die punched to assure proper fitting.

Many builders have written marveling at the ease with which assembly can be accomplished.

The chassis are specially engineered for easy assembly and wiring — there are no small tight corners which cannot be reached — the ends of the chassis are left open in order that installation of parts and soldering can be done with both hands.



2 PRECISION PARTS



Wherever required, the finest quality 1% ceramic resistors are supplied. These require no aging and do not shift. No matching of common resistors is required. You find in Heathkit the same quality voltage divider resistors as in the most expensive equipment.

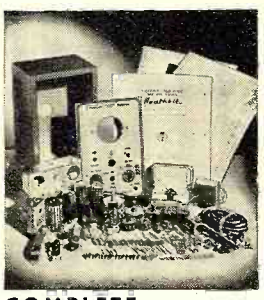
The transformers are designed especially for the Heathkit unit. The scope transformer has two electrostatic shields to prevent interaction of AC fields.

These transformers are built by several of the finest transformer companies in the United States.

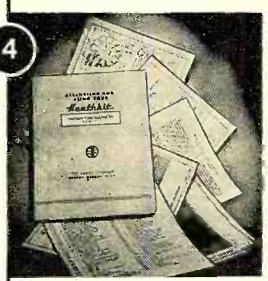
3 COMPLETE KITS

When you receive your Heathkit you are assured of every necessary part for the proper operation of the instrument.

Beautiful cabinets, handles, 2 color panels, all tubes, test leads where they are a necessary part of the instrument, quality rubber line cords and plugs, rubber feet for each instrument, all scales and dials ready printed and calibrated. Every Heathkit is 110V 60 cy. power transformer operated by a husky transformer especially designed for the job.



4 COMPLETE INSTRUCTION MANUALS



Everyone is pleased at the thoraugh instructions covering the assembly of each Heathkit instrument. Every detail of the assembly is covered, together with sections on the use of the instrument and trouble shooting instructions in case of difficulty. Actual photos of the assembled instrument enable fast and accurate assembly, clear schematics and pictorial diagrams of the confusing parts such as ratary switches enable the wiring to be completed quickly.

5 BEST OF ENGINEERING...

Heathkits are the result of many years experience in the test equipment field. Heathkit oscillascopes have been under development and test since 1943 and most other instruments now being produced have had over two years of thorough testing.

As proof of their design, Heathkits have been adopted by many of the largest Universities and laboratories in the United States. Thousands of engineering students are receiving their training using Heathkits.

6 BEST OF PARTS

You will find many famous names on the parts in your Heathkit. Mallory switches and filter condensers, Chicago Transformer Corporation and Electrical Assembly Transformers, Centralab Potentiometers, Belden Cable, IRC & Allen Bradley resistors, G.E. tubes, Cinch and Amphenol sockets with silver plated contacts, Defiance variable condensers, Eby binding post and many other quality parts. The finest of parts are used to assure long trouble-free service from Heathkits.

7 MODERN STYLING

Heathkits have brought a new conception of beauty to laboratories and service benches.

Many organizations have standardized on Heathkits to make their shops appear attractive and uniform.

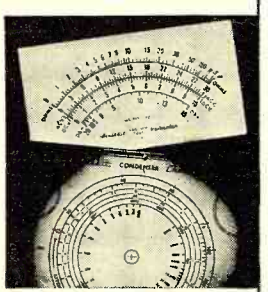
The panels ore produced in grey and maroon and the modern streamline aluminum handles give the instruments a pleasant professional appearance.

There is no waste space or false effort to appear large in Heathkits — space on service benches is at a premium and the size of Heathkit instruments is kept as small as is consistent with good engineering design.

8 LARGE EASILY READ CALIBRATIONS

No charts or calculations are necessary to use any Heathkit properly. All scales are simply and plainly marked.

The operator instantly knows the proper use of the instrument and can proceed confidently. No multiplication is required as each scale is calibrated independently of the others.



9 IDEAL FOR SCHOOLS

Heathkits have been adopted as standard equipment of many of the largest universities and colleges. The low cost plus the fact that the students learn by actual assembly make them ideal training mediums. Many high schools and small colleges are finding that they too can have a modern physics and electronics laboratory by using Heathkits.

Some of the largest technical schools recommend Heathkits to their students as the best means of securing the necessary equipment to start their own shops.

10 WHY NOT BUILD YOUR OWN...

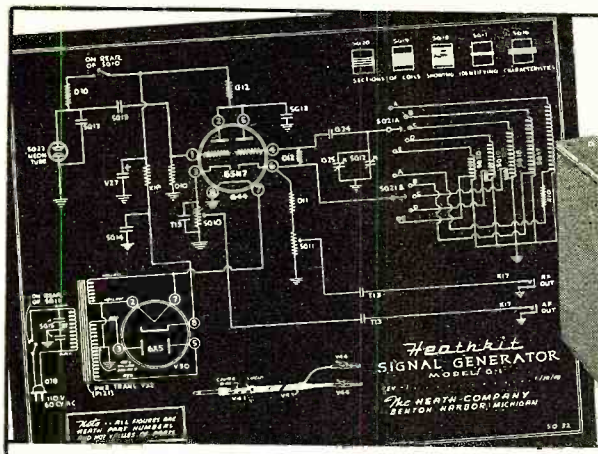
The great strides made in electronics during the war have made it hard for everyone to keep abreast of new developments. By actually assembling modern test equipment knowledge is gained in the most practical manner. Further a complete knowledge of the instrument allows greater flexibility of use and many possible uses suggest themselves.

Lastly with the cost of everything shooting upward any means of eliminating costs is welcomed. This reduction is a remarkable saving, as can be seen by comparing Heathkit prices with comparable built up test equipment.

ON THE FOLLOWING PAGES THE BEST KITS . . . ORDER DIRECT FROM THIS AD.

The HEATH COMPANY

. . . BENTON HARBOR 15, MICHIGAN



HEATHKIT RF
SIGNAL GENERATOR KIT

Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150Kc. to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V 60 cycle transformer operated power supply.

400 cycle audio available for modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large easy to read calibration. Convenient size 9" x 6" x 4¾". Shipping weight 4½ lbs.

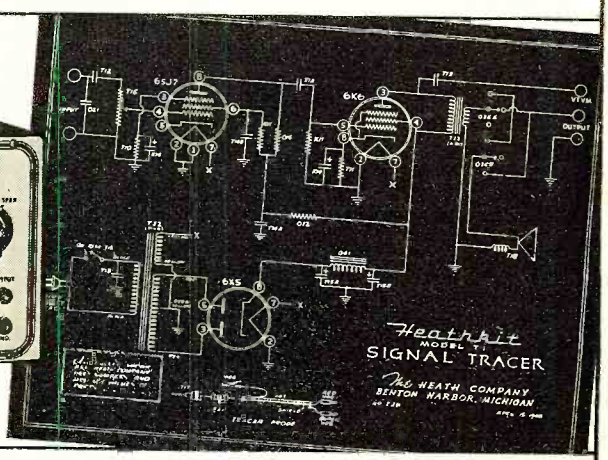
$19.50

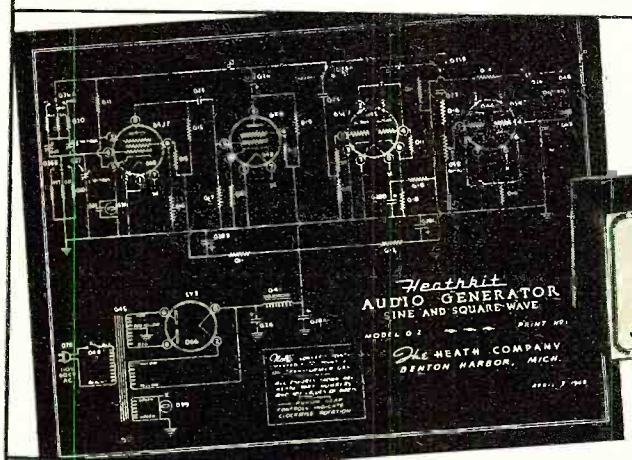
Nothing ELSE TO BUY

HEATHKIT
SIGNAL TRACER KIT

Let a Heathkit Signal Tracer do the tedious watching of intermittents while you go on to other profitable jobs. Follow the signal from the antenna to the defective part in a matter of seconds. Triples the repairs per man in many shops. A Heathkit Signal Tracer Kit pays for itself in a matter of days of operation. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows visual tracing and gain measurements. Also tests phonograph pickups, microphones, PA systems, etc. Frequency range to 200 Mc. Complete ready to assemble. 110V 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions. Shipping weight 10 lbs.

$19.50





HEATHKIT SINE AND SQUARE
AUDIO GENERATOR KIT

Experimenters and servicemen working with a square wave for the first time invariably wonder why it was not introduced before. The characteristics of an amplifier can be determined in seconds compared to several hours of tedious plotting using older methods. Stage by stage, amplifier testing is as easy as signal tracing. The low distortion (less than 1%) and linear output (± one db.) make this Heathkit equal or superior to factory built equipment selling for three or four times its price. The circuit is the popular RC tuning circuit using a four gang variable condenser. Three ranges 20-200, 200-2,000, 2,000-20,000 cycles are provided by selector switch. Either sine or square waves instantly available at toggle switch. All components are of highest quality, cased 110V 60 cycle power transformer, Mallory F.P. filter condensers, 5 tubes, calibrated 2 color panel, grey crackle aluminum cabinet. The detailed instructions make assembly an interesting and instructive few hours. Shipping weight 13 lbs.

$34.50

Nothing ELSE TO BUY

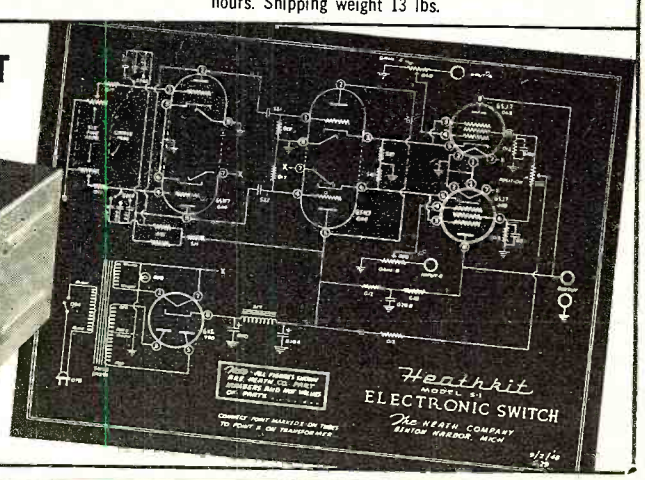
Heathkit ELECTRONIC SWITCH KIT

DOUBLES THE UTILITY OF ANY SCOPE

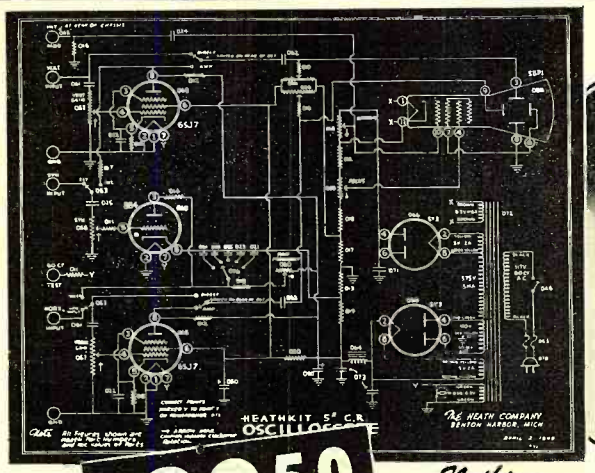
An electronic switch used with any oscilloscope provides two separately controllable traces on the screen. Each trace is controlled independently and the position of the traces may be varied. The input and output traces of an amplifier may be observed one beside the other or one directly over the other illustrating perfectly any change occurring in the amplifier. Distortion—phase shift and other defects show up instantly. 110 Volt 60 cycle transformer operated. Uses 5 tubes (1—6X5, 2—6SN7's, 2—6SJ7's). Has individual gain controls, positioning control, and coarse and fine sweeping rate controls. The cabinet and panel match all other Heathkits. Every part supplied including detailed instructions for assembly and use. Shipping weight 11 lbs.

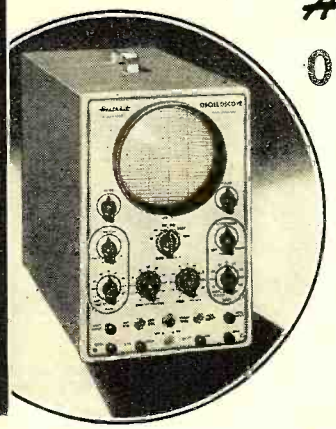
$34.50

Nothing ELSE TO BUY



★ ★ ★ The HEATH COMPANY
BENTON HARBOR 15, MICHIGAN





Heathkit 5 INCH OSCILLOSCOPE KIT

Features

- ★ Instant switching to plates or amplifier from front panel.
- ★ Sweep generator supplying variable sweep 15 cycles to 30,000 cycles.
- ★ All controls on front panel.
- ★ Cased electrostaticly shielded 110V 60 cycle power transformer.
- ★ AC test voltage post on front panel.
- ★ External synchronization post on front panel.
- ★ Deflection sensitivity .65V per inch full gain.
- ★ Frequency response ± 20% from 50 cycles to 50 Kc.
- ★ Input impedance 1 Megohm and 50 MMF.

The Heathkit 5" Oscilloscope Kit fulfills every servicing need. The husky cased power transformer supplies 1100 Volts negative and 350 Volts positive. Tubes supplied are two 6SJ7 amplifiers, 884 sweep generator, two 5Y3 rectifiers, and 5BP1 or 5BP4 CR tube. Grey crackle aluminum cabinet and beautiful grey and maroon panel. Chassis especially designed for easy assembly.

An oscilloscope provides almost endless sources of experimentation in radio, electronics, medicine and scientific research.

Detailed instructions make assembly fun and instructive.

$39.50

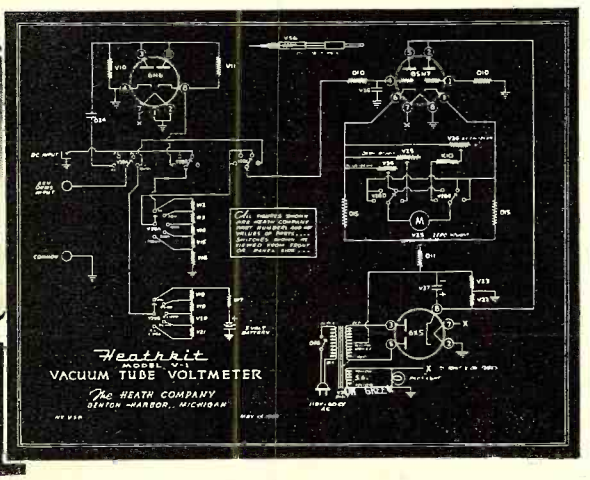
Nothing ELSE TO BUY

SHIPPING WT. 24 LBS. EXPRESS ONLY

Heathkit VACUUM TUBE VOLTMETER KIT

Everything you want in a VTVM. Shatterproof solid plastic meter face, automatic meter protection in burn-out proof circuit, push pull electronic voltmeter circuit assuring maximum stability. Linear DC and AC scales. Complete selection of voltage ranges starting with 3 Volts full scale up to 1,000 Volts. Isolated DC test prod for signal tracing and measurements of voltage while instrument is in operation. An ohmmeter section accurately measuring resistance of 1/10 ohm to one billion ohms with internal battery. Extremely high input resistance 11 megohms on all ranges DC and 6.5 megohms on AC. All these features and many more are the reasons hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V 60 cy power transformer, 500 microamp meter, tubes, grey crackle cabinet, panel, test leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now,

$24.50



Nothing ELSE TO BUY

Shipping weight 8 lbs.

HEATHKIT 3-TUBE ALL-WAVE RADIO

An ideal way to learn radio. This kit is complete ready to assemble, with tubes and all other parts. Operates from AC. Simple, clear detailed instructions make this a good radio training course. Covers regular broadcasts and short wave bands. Plug-in coils. Regenerative circuit.

110 Volt AC Operation

$8.75

Operates loud speaker. Add postage for 3 lbs.... $8.75
HS 30 Headphones per set $1.00
2½" Permanent Magnet Loudspeaker $1.95
Mahogany Cabinet $2.95

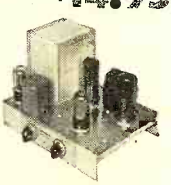
INTERPHONE 2-WAY CALL SYSTEM KIT

Ideal call and communication system for homes, offices, factories, stores, etc. Makes excellent electronic baby watcher. Easy to assemble with every part supplied including simple instructions. Distance up to 1/5 mile. Operates from 110V A.C. 3 tubes, one master and one remote speaker. Shipping weight 5 lbs.

$14.50

HEATHKIT HIGH FIDELITY AMPLIFIER KIT

$14.95



Build this high fidelity amplifier and save two-thirds of the cost. 110V 60 cy transformer operated. Push pull output using 1619 tubes (military type 6L6's), two amplifier stages using a dual triode (6SL7), as a phase inverter give this amplifier a linear reproduction equal to amplifiers selling for ten times this price. Every part supplied; punched and formed chassis, transformers (including quality output to 3-8 ohm voice coil), tubes, controls, and complete instructions. Add postage for 20 lbs.

12" PM Speakers for above..... $6.95

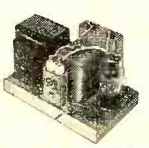
Mahogany Speaker Cabinet, 14½" x 14½" x 8"..... $8.75

110V.-A.C. MILITARY RECEIVER POWER SUPPLY KIT

Ideal way to convert military sets. 110V 60 cy. transformer operated. Supplies 24 Volts for filament — no wiring changes inside radio. Also supplies 250V D.C. plate voltage at 50-60 MA. Connections direct to dynamotor input. Complete with all parts and detailed instructions. Shipping wt. 6 lbs.

$5.95

110V.-A.C. TRANSMITTER POWER SUPPLY KIT



For BC-645, 223, 522, 274N's, etc. Ideal for powering military transmitters. Supplies 500 to 600 Volts at 150 to 200 MA plate, 6.3 C.T. at 4 Amps, 6.3 at 4 Amps. and 12V at 4 Amps. Can be combined to supply 3-6-9-12 or 24 Volts at 4 Amperes. Kit supplied complete with husky 110V 60 cycle power transformer, 5U4 rectifier, oil filled condensers, cased choke, punched chassis, and all other parts, including detailed instructions. Complete — nothing else to buy. Shipping Wt. 22 lbs.

$14.50

The HEATH COMPANY

BENTON HARBOR 15, MICHIGAN

HEATHKIT FM AND TELEVISION
SWEEP GENERATOR KIT

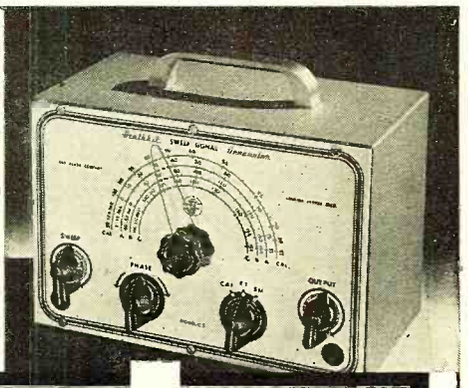
Features

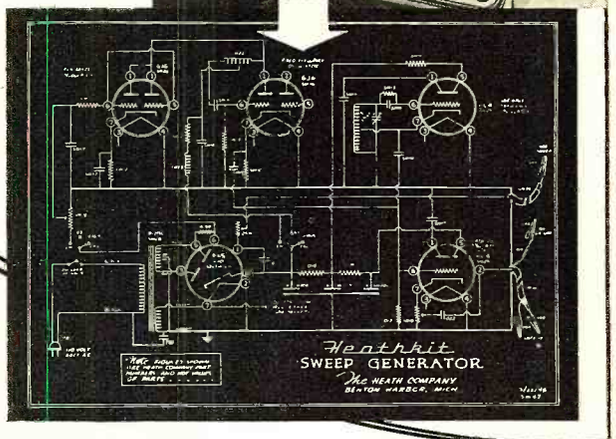
- ★ 5 tube Circuit.
- ★ Covers 2 Mc to 226 Mc.
- ★ 110V 60 cy transformer operated.
- ★ Supplies either RF or FM.
- ★ Variable sweep width 0 to app. 10 Mc.
- ★ Large calibrated dial.
- ★ Variable phasing control.
- ★ Sweep output for scope.
- ★ No band switching necessary.
- ★ Uses new miniature HF tubes.

A necessity for television and FM. This Heathkit completely covers the entire FM and TV bands. 2 megacycles to 230 megacycles. The unit is 110V 60 cy power transformer operated. Uses two 6J6 tubes, two 6C4 tubes and a 6X5 rectifier. An electronic sweep circuit is incorporated allowing a range of 0 to 10 Mc. A sawtooth horizontal sweeping voltage and phase control are provided for the oscilloscope.

The coils are ready assembled and precision adjusted to exact frequency. As in all Heathkits, the best of parts are supplied, Mallory filter condenser, zero coef. ceramic condensers, all punched and formed parts, grey crackle cabinet, 5 tubes, test leads, etc. Better get it built now and be ready for the FM and TV business. Shipping wt. 6 lbs.

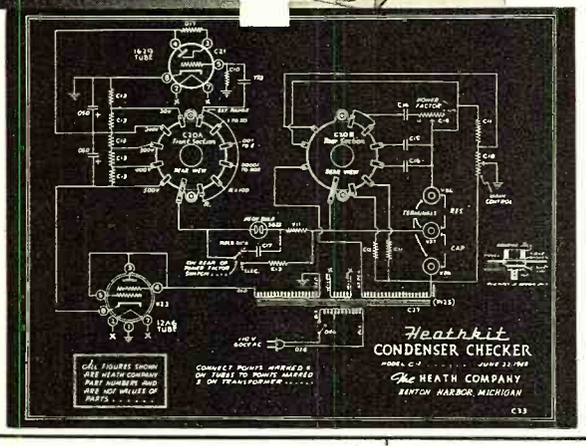
$24.50
Nothing
ELSE TO BUY





SHIPPING WEIGHT 6 POUNDS

$19.50
Nothing
ELSE TO BUY



HEATHKIT
CONDENSER CHECKER KIT

Features

- ★ Bridge type circuit.
- ★ Magic eye indicator.
- ★ 110V transformer operated.
- ★ All scales on panel.
- ★ Power factor scale.
- ★ Measures resistance.
- ★ Measures leakage.
- ★ Checks paper-mica-electrolytics.

Checks all types of condensers, paper-mica-electrolytic-ceramic over a range of .00001 MFD to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage for 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110V 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill. Shipping weight 7 lbs.

Why BUILD YOUR OWN TEST EQUIPMENT

1. You save two-thirds in cost. With increasing prices of most everything, labor costs are an important factor. Eliminating assembly labor costs, we can offer the Heathkit Oscilloscope, VTVM and Signal Generator at a total of only $83.50—about the cost of a factory-built VTVM alone.

2. You have all the fun and learn while you save. The thrill of assembling these beautiful instruments makes them seem more your own to be used with justifiable pride. Through knowledge of construction gained in assembly, better use can be made of the instruments and you can keep them in better repair if need arises.

ORDER DIRECT FROM THIS AD.
WE WILL SHIP C.O.D.
Add Postage for Weight Shown

ORDER BLANK
HEATH COMPANY
BENTON HARBOR,
MICHIGAN

FROM_____

SHIP VIA
__Parcel Post
__Express
__Freight
__Best Way

Quan.	DESCRIPTION	Price	Total

ENCLOSED FIND ☐ CHECK . . . ☐ MONEY ORDER FOR_____
PLEASE SHIP C.O.D. . . . POSTAGE ENCLOSED FOR____POUNDS

NOTE: 25% DEPOSIT REQUIRED ON ALL ORDERS WEST OF DENVER, COLORADO

The HEATH COMPANY
. . . BENTON HARBOR 15, MICHIGAN

Buy HEATH SURPLUS Now!

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

APN/1 RADIO ALTIMETERS

NO. 200. The last chance to get a complete new 14 tube radio altimeter. Contains 420 Mc. transmitter and receiver, power supply, range switches, two antennas, meter indicator, all plugs and instruction manual. This unit makes excellent amateur station as it is right in the band. Shipped in original export crate. Weight 87 lbs.

$34.50

BC 645 GENERAL ELECTRIC TRANSCEIVER

NO. 201. Complete 15 tube transmitter-receiver. Ideal for new citizens band 460 Mc. for communication between office and car, home, boat, etc. Conversion article in August ELECTRONICS Magazine. Brand new in original G.E. cartons with tubes. Add postage for 25 lbs.

$19.50 . . . 2 for $35.00

ACCESSORIES FOR BC 645

PE101C Dynamotor for car use ..... $ 3.95

110V 60 Cycle Power Supply for home or office use....$14.50

RCA NAVY COMMUNICATION RECEIVER

NO. 202. The last of these beautiful RCA sets. Covers 195 Kc. to 9.1 Mc. continuously. Supplied complete with tubes, control box, tuning unit, 24 Volt dynamotor, band change motor, plugs and circuit diagram. Superheterodyne circuit covers aircraft, broadcast, short wave, marine, foreign broadcasts. Has sharp or broad I.F.'s B.F.O., etc. Shpg. Wt. 30 lbs.

$29.50

G.E. BC 375 TUNING UNIT

NO. 203. Model TU10B covers 10 Mc. to 12.5 Mc. New complete with aluminum cabinet. The best buy of surplus. Over $30.00 worth of new variable condensers, coil, dials, switches, etc. Add postage for 20 lbs.

$2.49

G.E. 50 AMP CIRCUIT BREAKER

$2.95 EACH— 3 FOR $7.50

NO. 204. New General Electric 50 Amp 220 Volt AC circuit breakers. 100 Amp when used on 110V. Add postage for 4 lbs.

BC 347 AIRCRAFT INTERPHONE AMPLIFIER

NO. 205. Interphone amplifier contains 6F8 tube, Ouncer transformers, diagrams, etc. in aluminum cabinet. Add postage for 4 lbs.....

$2.95

T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs.

$2.95

MINIATURE ELECTRIC MOTOR

NO. 211. Tiny Delco motor only 1" x 1¼"x2" 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb.

$2.95

P. E. 103 6 VOLT DYNAMOTOR

NO. 212. Dynamotor only from PE 103 power supply. Input 6 or 12 Volts, output 500 Volts at 160 MA. Brand new original cartons. Shipping Weight 29 lbs.

$5.95

G. E. 1,000 VOLT 350 MA DYNAMOTOR

NO. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs.

$5.95

DM-36 DYNAMOTOR

NO. 215. Western Electric 24 Volt input, 220V. at 60 MA out. With filter assembly. Shipping Weight 6 lbs.....

$2.95

PE 125 TRANSMITTER POWER SUPPLY

NO. 223. Operates from 12 to 24 Volts and supplies 500 Volts at 160 MA. Extremely rugged construction used in Army tanks. Complete with fuses — relays — filters, etc. Ideal for boats. Shipping Weight 73 lbs.

$12.95

FM PUSH BUTTON TUNER

NO. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs.

$2.50 EACH

RG 8/U FLEXIBLE COAXIAL CABLE

4¢ PER FOOT

NO. 225. Standard television lead in 52 ohm. Any length up to 1,000 ft. Add for postage.

POWER TRANSFORMER *Specials*

NO. 226. Primary 117V. 60 cycle. Secondaries supply 746 V.CT at 220 MA, 6.3V. at 4.5 A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping Weight 11 lbs. each.

$3.95 . . 3 for $9.95

OUTPUT TRANSFORMER

NO. 227. Push pull 6V6's to 6 - 8 ohm voice coil excellent characteristics,.....

3 for $1.95

TRANSMITTER TRANSFORMER

NO. 228. The transformer for Transmitter Power Supply, 600 Volt at 200 MA and 4 Amp. filaments of 3 to 24 Volts. Also 5 Volts at 4 amperes for rectifier. Shipping Weight 12 lbs.....

$9.50

MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA, 5V. at 2A. and 24V. at ½ A. "B" type supplies 500 VCT at 50 MA, 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. Shipping Weight 4 lbs.....

$2.95

274N COMMAND SET ACCESSORIES

NO. 238. 5" PM Speaker with output transformer matching headphone output.....$2.80

NO. 239. Dual receiver rack FT277A with connecting plugs.....$1.00

NO. 240. Single transmitter rack FT234A $1.00

NO. 241. Spline shaft for tuning command receivers. Allows use of regular tuning knob on BC 453-4-5 receivers .....$ .39

BC 451 CONTROL BOX

NO. 236. Control box for 274N transmitters. Contains proper cw-voice switch, 4 channel switch, power switch, mike jack and telegraph key.

Add postage for 2 lbs.....$1.95

METER SPECIAL

NO. 237. Brand new DeJur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb.....

$2.95

G.E. BC 306 ANTENNA TUNING UNIT

NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs.....

$2.95

W.E. BC456 MODULATOR

NO. 217. Modulator from 274N command transmitters contains 3 husky relays, 3 tubes, VR150, 12J5 and 1625. Brand new. Add postage for 11 lbs.

$3.95

A-62 ARMY PHANTOM ANTENNA

NO. 206. Contains tuning condenser, coil, resistors, tuning dial, tuning indicator, binding posts, steel case, useful for building amateur transmitter. Add postage for 8 lbs.....

$1.95

BE 77 TELETYPE TEST SET

NO. 218. Contains zero center volt-milliammeter, switches, relays, voltage divider resistors, neon indicator, etc. Excellent foundation for radio tester. Shipping Weight 10 lbs.

$7.95

BENDIX MR9C COMPASS CONTROL UNIT

NO. 207. Tuning and control unit for Bendix MN 26 radio compasses contains tuning dial, band switch, crystal switch, AVC switch, volume control, fuses, phone jacks, etc. Shipping Weight 5 lbs.

$9.50

BENDIX MN 20E DIRECTION FINDER LOOP

NO. 219. Ring type loop excellent for use on boat or aircraft. Extremely rugged construction. Low impedance manual type. Add postage for 8 lbs.

$9.95 EACH

LP 18C DIRECTION FINDER LOOP

NO. 220. Motor driven streamline pod type loop used on automatic direction finders. Has Selsyn transmitter and motor, fits most military direction finders. Add postage for 20 lbs.....

$14.50 EACH

BC731 CONTROL BOX

with Weston Model 476 AC Voltmeter

NO. 208. Excellent buy in motor control box. Size 8"x10"x5½". Contains Weston 0-150V. AC 3½" voltmeter, motor starting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs.....

$7.95

KIT SPECIALS

POTENTIOMETERS

NO. 232. Kit of 10 excellent shaft type potentiometers good variety

$1.95

SOCKETS

NO. 233. Kit of 20 high quality sockets several different types.....

$1.00

HOME WORKSHOP GRINDER KIT

NO. 230. Easily assembled 110V AC or DC ball bearing fully enclosed motor from Army surplus dynamotor. Purchaser to make simple changes and shaft extensions, detailed instructions and all parts supplied. Motor approximately 5,000 R.P.M. Ideal for tool-post grinder, flexible shaft tool, model drill press, saw. Shipping Weight 6 lbs.

$3.95

HEARING AID HEADPHONES

NO. 216. The Army's best — eliminate flat ears and outside noise. Complete with transformer for conversion from low to high impedance. With cord and plug complete.

Add postage for 1 lb.....

$1.00

TELEVISION CONDENSERS

NO. 221. Tobe triple .2 MFD 4000 V.D.C. Filter used on Army radar. Ideal filter for H.V. television set. Add postage for 3 lbs.....

$3.95

NO. 222. G.E. Pyranol capacitor .25 MFD 6000 V.D.C. Porcelain insulated, an outstanding buy for high voltage filters. Add postage for 3 lbs.....

$3.95

HOW TO ORDER • • • GIVE PART NUMBER AND DESCRIPTION . . ADD POSTAGE FOR WEIGHT SHOWN. NO ORDERS UNDER $2.00 . . WE WILL SHIP C.O.D.

The HEATH COMPANY

. . . BENTON HARBOR 15, MICHIGAN

ELECTRONIC BARGAINS for EXPERIMENTERS and HOBBYISTS

ALL QUANTITIES LIMITED SUBJECT TO PRIOR SALES

STANCOR FILAMENT TRANSFORMER

NO. 242. Heavy duty Stancor No. ST355 supplies 5V at 6 Amps, 5V at 3 Amps and 5V at 3 Amps from 220V 60 Cy. primary or ½ above from 110V. Cased type. Ship. Wgt. 7 lbs. Each **$1.50**

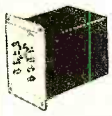
G.E. THYRATRON TRANSFORMER

NO. 243. New G.E. Transformer supplies 2.5V at .100 KVA, has 3KV insulation 100V 60 cy. primary. Shipping Wgt. 13 lbs. Each **$9.50**

RCA SATURABLE REACTOR TRANSFORMER

NO. 246. New RCA No. CRV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping wgt. 4 lbs. Each **$1.00**

12.6V POWER TRANSFORMER

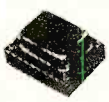


NO. 247. New cased 110 V 60 cy. Power Transformer. Supplies 440V Ct. at 60 MA, 6.3V at 2A. and 12.6V at 1 Amp. Excellent for military sets. Shipping Wght. 6 lbs. Each **$1.95**

RCA INPUT TRANSFORMER

NO. 248. Heavy duty RCA No CRV-30529. Input has primaries 600 to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each **$1.00**

REPLACEMENT POWER TRANSFORMER



NO. 251. Excellent value transformers made by one of largest transformer companies. 110V 60 cy. Primary supplies 746 V Ct. at 150 MA. 5V at 4A and 6.3V at 4.5 Amps. Shipping Wgt. 7 lbs. Each **$2.95**

FEDERAL POWER TRANSFORMER

NO. 252. New cased 110V 60 cy. Power Transformer. Supplies 480V CT at 50 MA and 6.3 V at 2.1 Amps. A beautiful transformer. Shipping Wgt. 4 lbs. Each **$1.50**

HEAVY DUTY 6-12-24 VOLT VIBRATOR

NO. 253. A husky vibrator used on army transmitter. Rated 30 amperes at 6 Volts 220 cycle with contacts for 12 and 24 Volts, Synchronous type, has many industriol applications. Ship. Wgt. 3 lbs.

4 CHANNEL PUSH BUTTON TUNER

NO. 254. Permeability tuner from BC 728 containing RF, first detector, and oscillator coils. Covers 2 to 5 MC. Complete circuit diagram furnished. Shipping Wgt. 2 lbs. Each **$2.50**

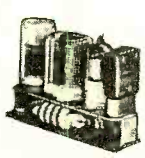
CONDENSER SPECIAL

NO. 255. An ideal oil filled power supply filter used in army 16 tube unit, has 2.5, 2.5 and 5 MFD all at 600V D.C. rating. Shipping Wgt. 3 lbs. Each **$1.50**

AEROVOX TELEVISION CONDENSER

NO. 256. Aerovox Hyvol .05 MFD at 7500V. rating. Excellent television coupling condenser with mounting bracket. Shipping Wgt. 3 lbs. Each **$3.50**

BC 746 TUNING UNIT



NO. 257. Plug in transmitter tuning unit from army Walkie Talkie. Contains antenna and tank coils, tuning condenser, transmitting and receiving crystals. Ideal transmitter foundation. Shipping Wgt. 1 lb. Each **$1.00**

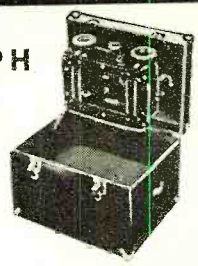
(Same as above except transmitter crystal in 80 meter amateur band.....$2.50 each)

T30 THROAT MICROPHONE

NO. 258. Makes excellent contact microphone for musical instrument or vibration pick-up. Shipping Wgt. 1 lb.....$1.00 each

Extension cord with switch for above .....$ .50 each

BRAND NEW ARMY AIR FORCE ASTROGRAPH



NO. 259. The case of this unit makes the finest tool and service kit ever designed. Plywood construction, 14 x 11 x 10" 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 for a foundation for enlarger, strip map holder, etc. The case alone worth twice the give-away price of **$3.95**

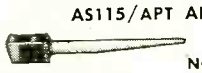
AN27/ARN5 ANTENNA

NO. 260. Standard blind landing antenna system. Brand new in original crate. Ship. Wgt. 14 lbs. **$9.50**

AS114/APT ANTENNA SYSTEM

NO. 261. New blade type antenna complete with case assembly, in original carton. Shipping Wgt. 9 lbs. **$7.50**

AS115/APT ANTENNA SYSTEM



NO. 262. New blade type antenna complete with case assembly, in original carton. Ship. Wgt. 11 lbs. **$7.50**

AT38A/APT RADAR ANTENNA

NO. 263. New radar dome type antenna with mounting base and connections, in original carton. Ship. Wgt. 11 lbs... **$14.50**

AN104A BLADE ANTENNA

NO. 264. Standard blade antenna used on many military fighting planes with coaxial connection at base. Shipping Wgt. 3 lbs. **$1.50**

BENDIX MT51C TRANSMITTER CONTROL BOX

NO. 235. Contains channel switch, emission switch, send receive switch, power switch and indicators for Bendix aircraft transmitters. Ship. Wgt. 3 lbs. **$5.50**

BC 670B REMOTE CONTROL BOX

NO. 265. Motor starting control box has starting and stopping switch, indicator, cable and plug. Wooden case. Ship. Wgt. 6 lbs. Each **$1.95**

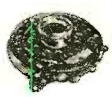
BK 22 RELAY ASSEMBLY

NO. 266. Used on SCR 269 Radio Compasses. Contains stepping and control relays — junction box of aluminum. Brand new. Ship. Wgt. 7 lbs. Each.... **$3.95**

HEINEMANN CIRCUIT BREAKER

NO. 267. Heavy duty type 7 Amp. 24 Volt D.C. Many uses around shop. Shipping Wgt. 2 lbs. Each..... **$1.00**

CUTLER HAMMER MOTOR FIELD CONTROL



NO. 285. Rated 10 ohms. 3.2 Amps. Maximum. 6½" diameter with knob and mounting feet, can be used to regulate generator output voltage. Shipping. Wgt. 5 lbs. Each **$2.50**

PENN THERMO RELAY

NO. 268. Thermo Relay with a range of 45° to 100° complete with 5 Ft. flexible cable to immersion bulb. Shipping Wgt. 6 lbs..... **$3.50**

B & W 11 to 14 MC TANK COIL

NO. 281. Plug in type used on BC 610 Transmitter. New, original cartons. Shipping Wgt. 2 lbs. Each..... **$1.50**

DM 64A 12 VOLT DYNAMOTOR

NO. 269. Input 12V at 5 Amps. Output 275 Volt 150 MA. New. Shipping Wgt. 7 lbs. Each..... **$5.50**

DM 32A COMMAND SET DYNAMOTOR

NO. 270. Part of 274N Command Receivers. Input 28 Volts, output 250V at 60 MA. Shipping Wgt. 4 lbs. Each..... **$5.50**

DM 21 12 VOLT DYNAMOTOR

NO. 271. Used in Army BC 312 Communication Receiver. Input 12 Volts at 3.3 Amps. Output 235 Volts at 90 MA. New, original cartons. Shipping Wgt. 8 lbs. Each..... **$5.50**

PE94C SCR 522 POWER SUPPLY

NO. 272. Complete dynamotor power supply for the SCR 522, operates from 28 Volts. Complete with controls, filters, etc. Original carton. Shipping Wgt. 34 lbs. Each..... **$8.75**

PE101C BC645 POWER SUPPLY

NO. 273. Complete power supply for BC 645. Operates from 12 or 24 Volts. Supplies both AC and DC required. Shipping Wgt. 13 lbs. Each..... **$3.95**

DM 35 12 VOLT DYNAMOTOR

NO. 274. New input 12 Volt at 18.7 Amperes. Supplies 675V at 275 MA or ½ above voltage from 6 volts. Excellent for auto use. Shipping Wgt. 11 lbs. Each..... **$7.50**

PE 86 DYNAMOTOR

NO. 214. A popular 28 Volt receiver dynamotor used on present military equipment. Supplies 250V at 60 MA. Shipping Wgt. 4 lbs. Each..... **$5.50**

GN 58 HAND GENERATOR

NO. 275. Makes excellent home lighting plant, operated by wind propeller, waterfall, gas engine, or hand crank. Reduction gear allows full output at slow speed; supplies 6 volts at 2.45 amp., 425 volts at .115 amp. New. Add postage for 28 lbs. Each **$7.95**

Handles for GN 58..... $ .50 each

Connecting cord for GN 58 with plugs CD1086..... $1.50 each

COLLINS AUTOTUNE CONTROL HEAD

NO. 278. Brand new controls used on the ART/13, 100 Watt, Transmitter. Types 7, 8, 10, and 11 available. Get a spare while available as new cost is over $22.00 each. Shipping Wgt. 3 lbs. Price any type (mention when ordering). Each..... **$4.50**

MC 432 VHF ANTENNA LOADING UNIT

NO. 279. Contains 2 pole, 5 position rotary switch with silver ceramic variable condensers, and coils for matching VHF Transmitter to AN109 antenna with 50 ohm line. Many useful parts. Shipping Wgt. 2 lbs. Each..... **$1.50**

148 OUTDOOR TELEGRAPH KEY

NO. 280. Rugged enclosed type for outdoor use, built for army to withstand hard useage. Complete with cord and PL55 plug. Shipping Wgt. 2 lbs. Each..... **$2.00**

ONE KILOWATT ADJUSTABLE ANTENNA LOADING COIL

NO. 282. Huge porcelain coil 4" diameter 8¼" long, has 5 sliders for adjustments. Shipping Wgt. 5 lbs. **$3.50**

300 MA SELENIUM RECTIFIERS

NO. 209. Rated 300 MA at 36 Volts, complete with mounting brackets. Shipping Wgt. 1 lb. ..... 3 FOR $1.00

DUAL SELENIUM RECTIFIER

NO. 283. Two units mounted on single bracket, each section rated 15V. at ½ Amp. Shipping Wgt. 1 lb. 2 FOR $1.00

HOW TO ORDER • • • GIVE PART NUMBER AND DESCRIPTION . . . ADD POSTAGE FOR WEIGHT SHOWN. NO ORDERS UNDER $2.00 . . . WE WILL SHIP C.O.D.

The HEATH COMPANY

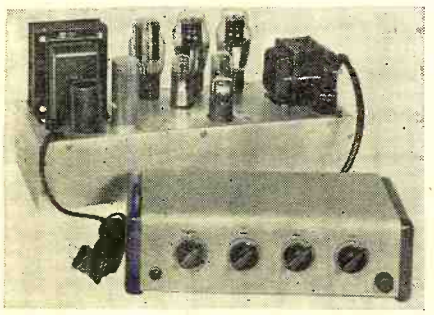
. . . BENTON HARBOR 15, MICHIGAN

What's New in Radio

ALL-TRIODE AMPLIFIER

A new 10-watt model of the *Brook* amplifier which provides the advantages of all-triode audio performance in the moderate price field, has recently been announced by *Brook Electronics, Inc.* of Elizabeth, New Jersey.

A new circuit development, known as the "transient peak" circuit, permits the amplifier to handle power



peaks considerably higher than its 10-watt rating, at the same time holding distortion within the figures published by the manufacturer as applying to constant power output. Intermodulation and harmonic distortion are virtually eliminated and frequency response is practically flat from 20 to 20,000 cycles.

Both bass and treble controls provide attenuation as well as boost and consist of two-stage resistance-capacitance networks in which equalizing curves for various types of recordings are obtained through use of eight-step selector switches. Two high-impedance inputs provide high gain with equalization for magnetic-type pickups and medium gain for crystal pickups and tuners. Output impedances range from 2 to 500 ohms.

Distortion analysis and complete technical specifications will be supplied by *Brook Electronics, Inc.*, 34 DeHart Place, Elizabeth 2, New Jersey, without charge or obligation.

TV TEST PROBES

A new series of television test probes has been announced by *Precision Apparatus Co., Inc.* of Elmhurst, Long Island.

Known as the Series TV High Volt-

age Safety Test Probes, the new units afford direct measurement facilities up to 30,000 volts d.c. with complete safety to the operator.

These probes provide direct kilovoltmeter facilities with present high sensitivity test sets and vacuum tube voltmeters. They can be used with most popular high sensitivity test sets due to the availability of stock value and special value multiplier cartridges. Convenient, tool-less interchange of the special tubular multiplier permits a single *Precision* TV probe to be used with various test sets, provided the proper cartridge is used.

The functional safety of these probes is provided via extended high dielectric anti-leakage paths; a multi-channeled guard barrier; full handle length internal arc-back shield directly grounded; external arc-back barrier directly grounded; fully shielded instrument connecting cable; all critical high potential and ground connections within the probe are positively accomplished by means of high compression contact springs; and the probe head constructed of custom-molded polystyrene while the handle and barrier are of bakelite and the internal components of lucite.

For additional information contact *Precision Apparatus Company, Inc.* directly at 92-27 Horace Harding Blvd., Elmhurst, L. I., New York.

TONE GENERATOR

A small, portable tone generator, designed primarily for use in broadcast studios, is currently in production by the *RCA Engineering Products Department.*

The new instrument, the Type WA-26A, combines a high quality audio oscillator and sensitive meter to supply a suitable tone for use in equalizing remote telephone lines.

The tone generator circuit is an *RC* type, allowing selection of ten frequencies from 50 to 15,000 c.p.s. The output is metered and calibrated in dbm. An output of either 150 ohms or 600 ohms may be selected by means of a switch mounted on the front panel.

The unit is supplied with a black leatherette carrying case and weighs 9 pounds, 4 ounces including batteries.

For full details on the Type WA-26A write to Engineering Products Department, *Radio Corporation of America, RCA Victor Division*, Camden, N. J.

"NOISERASER"

Development of a new instrument in the audio electronics field has been announced by *The Minnesota Electronics Corporation* of St. Paul.

Known as the *"Goodell* Magnetic Noiseraser," the instrument is designed to eliminate all signals and background noise from entire reels of magnetic tape in a few seconds. It removes saturation signals and completely reconditions old tape, according to the manufacturer. It can also be used to condition new tape before recording to reduce inherent noise level thus permitting an increased dynamic range of from 4 to 6 db. to minimize the probability of peak signals producing distortion.

Power supply requirements are 110 to 120 volts, 60 cycle a.c., with current drain approximately 8 amperes for the Model N-7 (7" reel size) and 16 amperes for the Model N-14 (14" reel size).

Complete details on the new instrument are available from *The Minnesota Electronics Corporation,* 6th and Minnesota Streets, St. Paul 1, Minnesota.

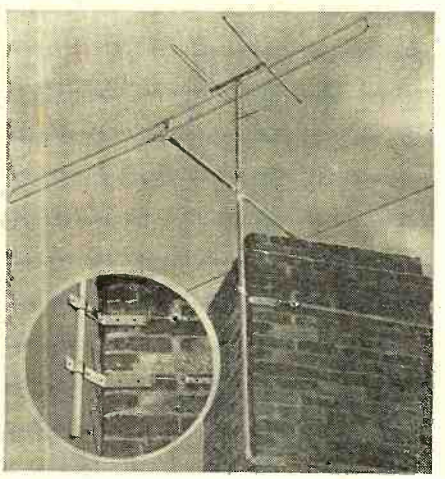
ADJUSTABLE ANTENNA MOUNT

The *JFD Manufacturing Co., Inc.* is now manufacturing an adjustable chimney antenna mount which has been especially designed for television antenna installations.

According to the company, the new unit may be erected in 5 minutes using only a pair of pliers and a screwdriver. There are no holes to be drilled or other adjustments to be made.

The unit mounts on any chimney, pipe or other rectangular-shaped extension and is securely held with two 12 foot lengths of heavy-duty galvanized steel bands.

Constructed in two separate sections, the mount permits unlimited spacing between brackets. This



achieves maximum support of antenna masts even though they are over 6 feet in height. No secondary mounts, guy wires, or additional supports are necessary when installing unusually high antenna masts.

The brackets hold any size mast from ½" to 1½" o.d. and do not require spacers or shims. All parts are made from galvanized steel and are corrosion-proof.

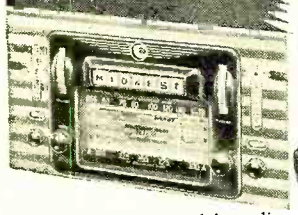
For further information on the new adjustable chimney antenna mount

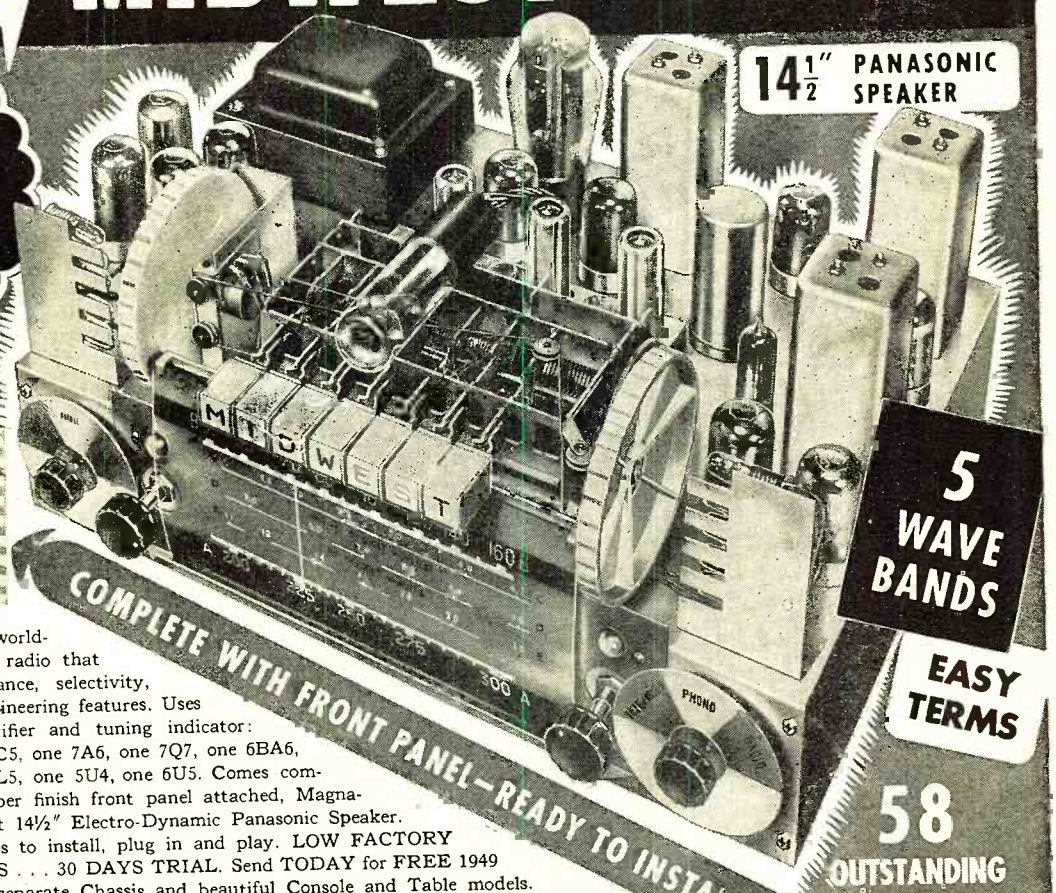
LOW FACTORY PRICES!

...on the Sensationally NEW 1949 MIDWEST RADIOS

NEW SERIES 16 SUPER DE LUXE AM-FM CHASSIS

30 DAYS TRIAL





14½" PANASONIC SPEAKER

5 WAVE BANDS

EASY TERMS

COMPLETE WITH FRONT PANEL—READY TO INSTALL!

Here is the last word in radio engineering . . . a powerful, world-ranging, magnificently-toned radio that is unsurpassed for performance, selectivity, sensitivity, and advanced engineering features. Uses these latest-type tubes, rectifier and tuning indicator: three 7A7, three 7A4, two 7C5, one 7A6, one 7Q7, one 6BA6, one 6BE6, one 6C4, one 6AL5, one 5U4, one 6U5. Comes complete with satin stripe copper finish front panel attached, Magna-Tenna Loop Aerial and giant 14½" Electro-Dynamic Panasonic Speaker. Requires only a few minutes to install, plug in and play. LOW FACTORY PRICES . . . EASY TERMS . . . 30 DAYS TRIAL. Send TODAY for FREE 1949 Midwest Radio Catalog of separate Chassis and beautiful Console and Table models.

A Complete Line of FINE RADIOS and RADIO-PHONOGRAPHS . . . Available in SEPARATE CHASSIS Like the POWERFUL SERIES 16 AM-FM Model above or in COMPLETE CONSOLES like this...

58 OUTSTANDING FEATURES

Including the Exclusive Midwest

FLASH-O-MATIC Volume and Band Indication

TELEVISION Audio Switch-Over

FIDEL-A-STAT Color-Ray Tone Selection

TRI-MAGNADYNE Coil System

...Plus NO-DRIFT FM and many other features

Beautiful SYMPHONY GRAND

AM-FM Radio-Phonograph with TELEVISION Audio Switch-Over and NEW Intermix AUTOMATIC RECORD CHANGER

A Magnificent musical instrument and a masterpiece of cabinet design—the finest Midwest Radio in 29 years of manufacture. Offers world-ranging radio reception and newest automatic Intermix Record Changing Phonograph. Uses Series 16 Super DeLuxe AM-FM Chassis. Giant 14½" Panasonic Speaker; Tri-Magnadyne Coil System; Built-In Loop Antenna. Other luxurious console and table model cabinets available with Series 16, 12, and 8 chassis—on Easy Terms and 30 Days Free Trial.

Rush for Free Catalog!

FILL IN COUPON AND MAIL TODAY OR JUST SEND NAME AND ADDRESS ON 1¢ POSTCARD

MIDWEST RADIO & TELEVISION CORP.
Dept. 376, 909 Broadway, Cincinnati 2, Ohio

Please send me your new FREE 1949 Catalog.

NAME .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

BUY DIRECT FROM FACTORY and SAVE!

MIDWEST RADIO & TELEVISION CORP.

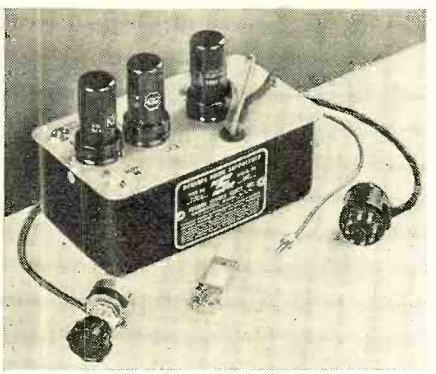
Dept. 376 909 Broadway, CINCINNATI 2, OHIO

write to *JFD Manufacturing Co., Inc.*, 4120 Fort Hamilton Parkway, Brooklyn 19, New York.

LOW-COST D.N.S.

Low cost, remote control, and easy installation are features being claimed for the new Type 10-A Dynamic Noise Suppressor being manufactured by *Hermon Hosmer Scott, Inc.* of Cambridge, Massachusetts.

This unit may be added to most existing a.c. phonograph or radio-phonograph systems. Designed primarily to minimize the background noise on records which proves so annoying to the



discriminating music lover, the unit may be used for both AM and FM reception.

Further simplifying the dynamic bandpass principle of suppression, the Type 110-A covers a frequency range equal to or greater than most records on the market. A specially matched pickup is included for wide range performance and low needle-talk; and a single control connected with a two-wire cable enables great flexibility in mounting and operation.

Only one connection is necessary to install the Dynamic Noise Suppressor 110-A in its position between the pickup and the amplifier. Small and compact, it can be located in any convenient spot within the phonograph cabinet.

Hermon Hosmer Scott, Inc., Dept. RN, 385 Putnam Avenue, Cambridge, Massachusetts will supply additional details and prices on request.

TV TRANSFORMERS

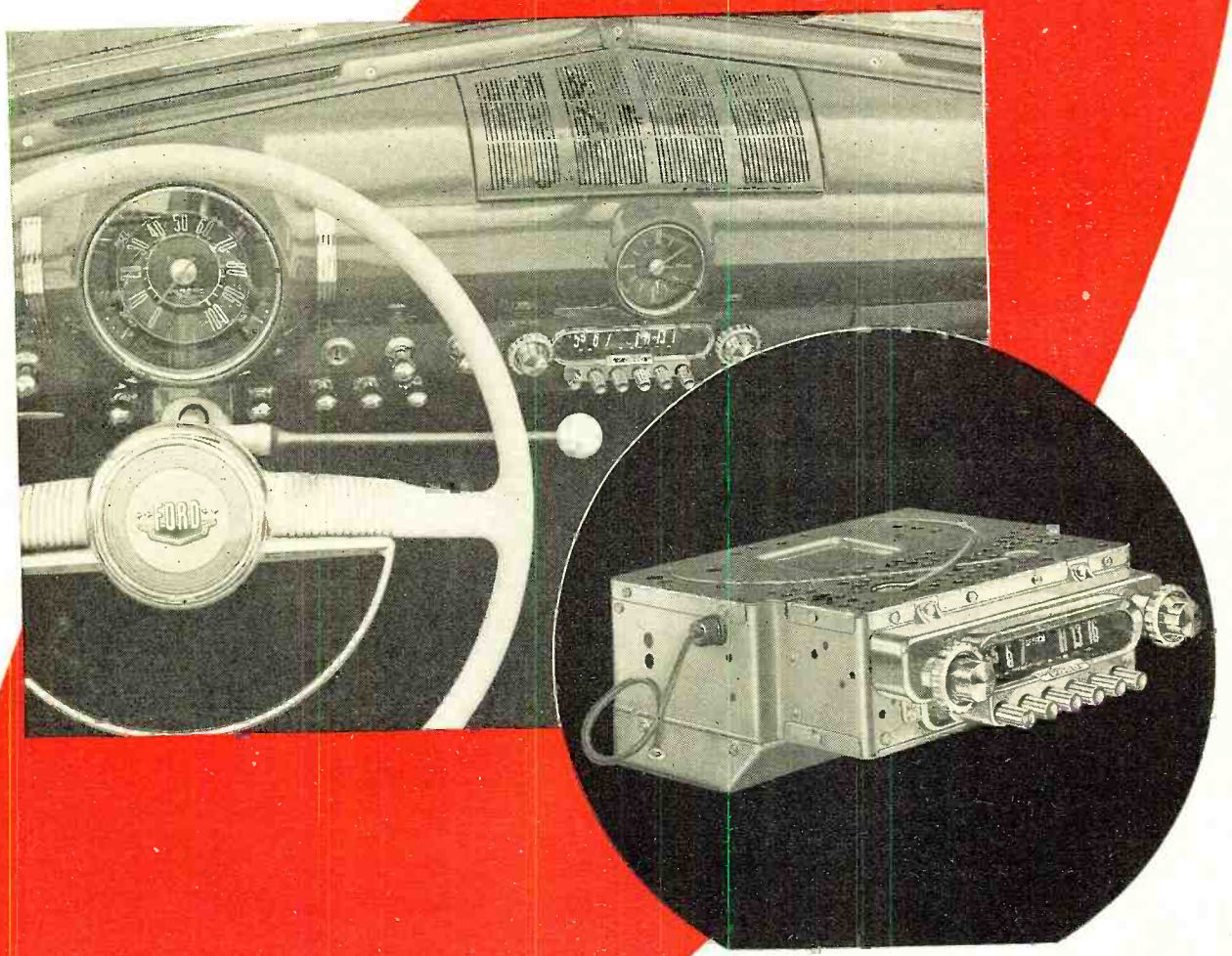
A high-voltage, corona shielded, tuned transformer assembly which includes octal socket for use with 1B3-8016 type tubes has been developed by *Spellman Television Co., Inc.* of New York.

The filament voltage is easily adjustable through a small access hole in the bottom of the spun copper cup, allowing the tube to be used for voltages from 1 kv. to 20 kv.

This unit is designed to operate in conjunction with r.f. step-up coils of approximately 200 kc. frequency, solving the problem of research workers and experimenters in the construction of corona-free high voltage r.f. power supplies. To obtain 20, 30, 40 kv. or high voltages it is merely necessary to use doubler, tripler, or quadrupler cir-

(*Continued on page* 151)

AUTO RADIO and HYTRON go together



"A Ford in your future?" There will probably be a fine new Ford radio receiver on the dash. Chances are good this receiver will be equipped with tubes by Hytron. For Hytron is a major supplier of Ford auto radio tubes. That is only natural. Hytron *specializes* in auto radio tubes --both GT and miniature. Close engineering co-operation with leaders like Ford help make Hytron auto radio tubes leaders, too. 'Nuff said. Hytron and auto radio go together.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921.

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

★ ★ ★ BRAND NEW GENERAL ELECTRIC TEST EQUIPMENT AT HALF PRICE ★ ★ ★

AUDIO OSCILLATOR
$29.95

General Electric YGA-4 Audio Oscillator. Variable from 25 to 16,000 cycles. Brand new. Weight 31 lbs. Regular price $49.50. Sale price $29.95.

SINE OR SQUARE WAVE GENERATOR
SALE PRICE $59.95

General Electric YGA-2 Sine or Square Wave Generator. Variable from 20 to 20,000 cycles. Accurate to one cycle below 33 cycles. Weight 43 lbs. Regular price $150.00. Brand new Sale price $59.95.

CAPACITANCE AND RESISTANCE BRIDGE
SALE PRICE $29.95

General Electric YCW-1 Capacitance and resistance Bridge. .000005 to 200 mfd. Resistance scales 5 ohms to 20 megohm. 2" meter. Weight 20 lbs. Regular price $59.50. Brand new Sale price $29.95.

FM/AM SIGNAL GENERATOR
SALE PRICE $99.50

General Electric YGS-3 AM/FM Signal Generator and Audio Oscillator. Up to 200 megacycles. Weight 43 lbs. Regular price $195.00. Sale price, brand new $99.50.

3-INCH OSCILLOSCOPE
SALE PRICE $49.95

General Electric CRO-3A 3 inch Oscilloscope with vertical and horizontal amplifiers. Weight 35 lbs. Regular price $98.50. Sale price, brand new $49.95.

SILVER VOMAX
SALE PRICE $42.95

The ever famous Silver Vomax Model 900. Vacuum tube volt ohmmeter. Made to sell for $59.95. Brand new now only $42.95.

If the above information on each piece of General Electric test equipment is not enough to convince you, read our last month's advertisement in Radio News, or write for our General Electric test equipment catalog. However, don't wait too long to order. Only a few hundred pieces of each type are available.

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 2-35B5, 12SJ7 and 35Z5 tubes. Priced with tubes and connecting instructions. Works on 110 volts AC-DC. Crystal mike and desk stand $4.95 extra. Model DE-5 truly a de-luxe mike-phono oscillator.

3-TUBE PHONO. OSC. ONLY $4.95

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.....$4.95

SUPERHET BROADCAST TUNER $7.95

Broadcast superhet tuner for connection to any phono amplifier or P. A. system. Built on a small compact chassis with dial plate and tuning knob furnished. Requires only three connections to amplifier. Uses three miniature tubes. Loop antenna and instructions are included. Specify when ordering, whether tuner is to be used on AC-DC or AC type amplifier. If you don't specify we will ship tuner for AC type amplifier. Stock No. PAT-3 Net Price $7.95.

8-WATT AMPLIFIER WITH P.P. 50B5 $9.95

4 tube, plus rectifier, AC-DC amplifier. Push-pull 50B5 output tubes, with 12SJ7 (Gain for mike or G.E. variable reluctance pick-up), 12SL7 (Gain for conventional crystal pick-up) and phase inverter. This is a nice small audio amplifier, with tone and fader control, plus inverse feedback. Furnished wired and tested, complete with tubes. 8 watts output. Ready to play. Weight 6 lbs. Model TM-5. Net price $9.95.

Crystal mike and desk stand $4.95 extra. 8" PM speaker $2.95 extra. G.E. variable reluctance pick-up cartridge $4.69 extra.

COMPLETE WIRE RECORDER $69.95

Portable Wire Recorder Model GN-11

Has ready wired and tested 5 tube AC type amplifier with push-pull 6V6 tubes. Built-in eraser circuit. Input for crystal mike or phono pick-up. Diagrams show how you can record from any radio receiver. 3 position switch enables you to quickly change from record to playback or conventional P. A. system. This amp delivers 12 watts of good clean audio. Here is what you get: Webster 79 recording mechanism, with 15 minute spool of wire, attractive leatherette covered case. 6" heavy duty PM speaker and wired and tested 12 watt AC wire recording amplifier. All you do is mount the amp, recording mechanism and speaker. Simple instructions furnished. Portable Recorder Model GN-11 Net $69.95. Crystal mike $4.95 extra.

Deluxe Portable Wire Recorder Model GN-12. Has same features as the model GN-11, as well as a larger split type leatherette covered case and a heavy duty 10 inch PM speaker. Deluxe Portable Wire Recorder Model GN-12. Net $79.95, Crystal Mike $4.95, extra.

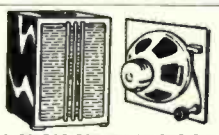
Recording Wire. 15 minute spool $1.30, 30 minute spool $1.95, 1 hour spool $3.25.

Either the GN-11 or the GN-12 wire recorder listed above may be had with the Webster wire recording mechanism or the AIR KING type wire recording mechanism which will record from a phono record. Specify when ordering which mechanism you want.

RECORD PLAYER $14.95

Complete record player. Component parts shipped separately. Amplifier is ready wired and tested. Amplifier has four tubes, 12SQ7, 2—117Z3, 50L6. All parts are included, self-starting phono motor, crystal pickup, 5" heavy duty PM speaker and amplifier, with tone and volume control. Deluxe heavy wooden case is covered with brown leatherette and has chrome fittings and speaker grill. Stock No. CC-8. Net Price $14.95.

Super deluxe record player with push pull 7C5 AC type amplifier and 6 inch speaker. All you do is mount amp. in the case. Case is of the accepted type. This player should sell for $35.00. Stock No. DL-3. Net $19.95. Offered with Stewart Warner automatic changer. Stock No. ARO-4. Net $27.95.



L-25 $19.95 BW-3L $29.95

15" THEATRE TWIN SPEAKER $29.95

Our sound laboratory has assembled this fine speaker combination. A super heavy duty 15" cinaudagraph Alnico V PM and a University Lab. trumpet type high frequency tweeter. Ready-cut plywood baffle and cut to fit grill cloth. All you do is bolt speakers to the baffle and connect in the 1 mfd. high pass filter. This combination will take 35 watts of audio and reproduce 40 to 10,000 cps. A speaker combination of theatre quality. Stock No. BW-3L. Net $29.95. If a baffle cabinet is desired, order the L-25 below.

University Lab. high frequency tweeter trumpet with connecting instruction. Same tweeter as used on the above theatre combination. Net $11.76.

Walnut floor type speaker baffle. Size 12x22x26". Will accommodate either 12" or 15" speakers. Air relief cutouts in corner of grill. Weight 30 lbs. A $25.00 value for only $19.95. Stock No. L-25. Net $19.95.

SCOOP SALE ON MAGNAVOX

A red hot McGee special. Latest 1948 production Magnavox auto radio replacement speakers. Same as used in original equipment. 4 ohm field and standard voice coils. Every speaker is guaranteed. They will take the wallop of any car radio.

6" square 4 ohm field	$2.49
7" 4 ohm field	2.98
8" 4 ohm field	2.98
6x9" 4 ohm field	2.98

5000 Famous Magnavox permanent magnet Alnico 3 speakers. We are offering these first quality speakers to you, practically at manufacturers prices. There are latest 1948 production. All are guaranteed to be perfect: no rubbing cones.

5"	8 oz. Alnico 3 magnet speaker, net	$1.79
8"	12 oz. Alnico 3 magnet speaker, net	2.98
10"	20 oz. Alnico 3 magnet speaker, net	4.95
12"	20 oz. Alnico 3 magnet speaker, net	5.95

COAXIAL 12 Inch P. M. Speaker NET $12.95

NATIONALLY FAMOUS MAKE

Made by a nationally known builder of fine speakers, to sell for $27.50 list. Offered by McGee for only $12.95. Has a frequency response of 50 to 10,000 cycles. Alnico V PM magnet, 3" high frequency tweeter, built-in high pass filter. Only 2 wires to connect to any 8 ohm output. Will take 18 watts peak audio. Used on radios selling for up to $400.00. A real McGee super value. Shipping weight 8 lbs. Stock No. 4-12X. Net Price $12.95, two for $25.00.

15" "KING COAX" SCOOP PRICE $25.00

The King Coax. A 21.5 oz. 15 inch Alnico V. PM speaker with a built-in high frequency tweeter. Will respond to from 50 to 12,000 cycles. This is a ruggedly built speaker with a curvienter one piece molded cone. Built-in high pass filter. Just hook to any 8 ohm output. Built by the maker of our ever popular 12 inch coax model 4-12X. This speaker has a retail list of over $60.00. We offer you our 5-15X 15 inch coax for only $25.00. Weight 20 lbs.

OUR LEADER 12 INCH COAXIAL P.M. $9.95

Model 12-RN—Our leader 12" coaxial PM speaker, with 3" tweeter. Equal to above model 4-12X except tweeter will not respond to as high a frequency. Matching network is built-in; hook to any 8 ohm output. Will take 15 watts. Weight 12 lbs. Net $9.95, 2 for $19.00.

Brand New 1948 Production

15-INCH PERMANENT MAGNET SPEAKER SCOOP OF ALL TIMES

SCOOP PRICE $9.95

Pre-War or Post-War, you never bought a speaker like this, for such a scoop price. Made by a nationally known builder of fine speakers. A full 15" 12½ oz. Alnico V magnet speaker of juke box quality. Has standard 8 ohm voice coil. Will take up to 18 watts average or 25 watts peak. Here is a speaker that will bring out those low notes. Latest 1948 production; not line through-outs. Every speaker is guaranteed new and perfect. We may not be able to continue this offer for long, so place your order now. Stock No. 15-KR. INCLUDE POSTAGE. Weight 11 lbs. A $35.00 value for only $9.95.

15 INCH 35-WATT P.M. SPEAKER $19.95

Model 15-LS. 15" 21½ oz. Alnico V Magnet PM Speaker. Will take 35 watts with ease. Thousands of dollars were spent in building the fine tools to produce this speaker. The 8 ohm voice coil is 1½" in diameter and has been heat treated and plastic coated. Constructed to eliminate loose voice coils, wires and wrapping. Made by a renowned builder of fine speakers. Truly the King of juke box speakers. Weight 15 lbs. Net Price $19.95, 2 for $38.00.

Children's Player Kit $7.95

New, children's electronic player. Offered in kit form. Includes all material necessary. Attractive red plywood cabinet, self-starting phono motor and crystal pick-up, 4x6" PM speaker and parts to build 70L7 amplifier. Diagram included. Stock No. LJ-1. Net Price $7.95.

Portable Player Kit Scoop $9.95

Deluxe portable electronic record player kit. Includes all parts and easy to wire diagram. Comes complete with grey leatherette portable carrying case self-starting phono motor, pickup, 5" PM speaker and all necessary parts to build 70L7 amplifier. Stock No. CK-1. Net Price $9.95.

12" 15 WATT P.M. SPEAKER 5 for $22.50

Nationally known 12" 6.8 oz. Alnico V PM, with 1" 8 ohm voice coil. Will take 15 watts. Grey finish. Our leading 12" speaker. Stock No. CH-12. Net. $4.95. 5 for $22.50.

12" 12 Oz. Mag. Will Take 20 Watts $8.95

Super heavy duty 12" 12½ oz. Alnico V magnet PM with 1¼" with 8 ohm voice coil. This speaker is equal to 60 oz. of old type magnet. Will take 25 watt peak. Stock No. CH-13—$8.95; two for $17.00.

POPULAR FIELD AND P.M. TYPES

6" 1.5 oz. Alnico V PM speaker	$1.49
6" 2.15 oz. Alnico V PM speaker	1.98
4x6" 1.5 oz. Alnico V PM speaker	1.49
6x9" 3.16 oz. Alnico V PM speaker	2.98
10" 4 oz. Alnico V magnet PM speaker	3.95
10" 7 oz. Alnico V magnet PM speaker	4.45
12" 7 oz. Alnico V magnet PM speaker	4.95
For radio set and amplifier use. 12" 15 watt, 8 ohm voice coil Alnico V PM. A scoop for $4.95, 5 for	22.50
4" 450 ohm field speaker	1.89
5" 450 ohm field speaker	1.89
4" 4 ohm field speaker for auto sets	1.89
5" 4 ohm field speaker for auto sets	1.89
5" 450 ohm field speaker, with output transformer to match single 50L6 tube Utah	1.98
8" 450 ohm field speaker, with output transformer to match single 6V6 tube	2.25
8" 1000 ohm field speaker	2.95
6" square 1000 ohm field speaker, with 7000 ohm output transformer	1.95
12" RCA 450 ohm field speaker, ideal for console radio replacements	4.95

Either 1000 ohm or 2500 ohm 12" Cinaudagraph Speaker, $4.95.

P.M.'s—WITH OUTPUTS ATTACHED

6½" 1.47 oz. Alnico V PM with PP 50L6 output	$1.95
5" 1.47 oz. Alnico V PM speaker with 50L6 output	1.49
5½" Utah, 2.15 oz. Alnico V PM speaker with output transformer to match 3Q5 tube	1.95
4"x6" Alnico V PM with 50L6 trans.	1.69
4" 1.47 oz. Alnico V PM with 50L6 trans.	1.49

P.M.'s—WITH ADJUSTABLE CONES

The voice coils on these speakers are mounted to an adjustable metal rim, that can be shifted several thousandths of an inch. The cream of the speaker production. Nationally famous maker. More output per watt.

5"	1½ oz. Alnico V magnet PM	$1.49
5½"	2.15 oz. Alnico V magnet PM	1.98
6"	2.15 oz. Alnico V magnet PM	2.49
6"	3.16 oz. Alnico V magnet PM	2.98
8"	2.15 oz. Alnico V magnet PM	2.98
8"	3.16 oz. Alnico V magnet PM	3.98
12"	7 oz. Alnico V magnet PM	6.95

EASY TO FIT IN—P.M. SPEAKERS

McGee offers the answer to your replacement speaker problems. All fully guaranteed first line run (not odds and ends), with Alnico V magnet and standard RMA 3.2 ohm voice coils. Cadmium plated with dust cover. The small size pots make them adaptable to tight places. All have the same size magnet width and depth. 2¼" pot size only 1¼" by 1¾". Packed 24 to the case.

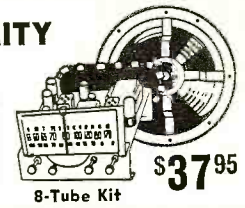
4"	square frame	1 oz.	magnet speaker	$0.99
5"	round frame	1 oz.	magnet speaker	.99
5"	round frame	1½ oz.	magnet speaker	1.19

McGEE RADIO COMPANY ORDER FROM THIS AD PRICES F.O.B. K. C. SEND 25% DEPOSIT—BALANCE C.O.D. 1225 McGEE ST., KANSAS CITY, MISSOURI

McGee Offers Complete Radio and Amplifier Kits for the Student and Engineer

BUILD THIS

8-TUBE HI FIDELITY RADIO AND AMPLIFIER



8-Tube Kit

$37.95

- 8-INCH SLIDE RULE DIAL
- RECEIVES BROADCAST and 19 to 49 METERS
- PUSH PULL OUTPUT TUBES
- BASS BOOST TONE CONTROL
- EVERYTHING FURNISHED
- CHASSIS SIZE 9½ x 11 x 8" HIGH
- BEST RADIO KIT VALUE IN THE WORLD

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. **$29.95**

PRK-24. Radio-Amp. Kit with 12" P.M. speaker. With tubes....Net

CPR-15. Exactly the same kit as the PRK-24 kit, except it is furnished with a 12" Cinaudagraph wide range speaker. (Has built-in high frequency tweeter.) **$37.95**

This is our finest kit.....Net

12-WATT AMP. KIT, $10.95

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.

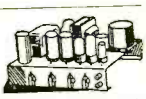
The above AC-12 amplifier wired and tested ready to operate net $14.95. Specify Stock No. AC-1125. 12-inch Alnico V PM speaker $5.95 extra. Crystal mike and desk stand $4.95.

WALNUT ARM CHAIR CABINET, $29.95

WILL HOUSE CRP-15 KIT

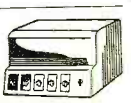
Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16½" deep and 27" wide. Ample room for radio receiver 14" long, 9" high, and 10" deep. Will hold a changer up to 14" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AR-15. Net price **$29.95.** General Instrument changer $14.95, extra. Armchair cabinet in blonde finish. Net price $34.95.

20-WATT AMP. KIT, $17.95



Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched 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 control. Designed for use with PM speakers; has 8-16 ohm output transformer. All parts and easy-to-follow diagram furnished, including tubes: 2—6SN7, 6J5, 2—6L6GA, 5Z3. Kit Model 20-LX. Net **$17.95.**

DELUXE 30-WATT AMP. KIT, $29.95



Kit model RA-30. A complete 30 watt high fidelity Push pull 6L6 amplifier. Ready punched chassis with cover to match. Beautiful opalescent finish. Input for two mikes and crystal pick up. Perfect for the new GE VR Cartridge. Twin tone controls bass and treble. Inverse feed back. Heavy duty output trans for 4, 8, 16 and 500 ohm. Everything furnished including diagram and tubes 2—6SJ7, 2—6C5, 2—6L6, 5V4. Worth twice our price. Build an amp you will be proud of. Kit model RA-30. Net **$29.95.** Furnished with a merit impregnated and shielded wide range output transformer with 4, 8, 16, 250 and 500 ohm secondary **$5.00** extra.

JUKE BOX AMP. KIT, $24.95

Juke Box amplifier kit. Model KV 7. All the necessary parts and tubes to build a juke box type amplifier. Has push pull 6L6 tubes in the output. Proper tone control circuits. Super heavy duty power trans, choke and output trans. Everything furnished including tubes, diagram and photo, inputs for mike variable reluctance pick or crystal pickup. Gives 25 watts of power. Scoop price **$24.95.**

6-110 VOLT POWER SUPPLY KIT, $14.95

New utility power supply kit, works on either a 6 volt storage battery or 110 volts AC. Furnishes power for a 25 watt amplifier and will run a turntable from a storage battery. Kit 6-110 KH complete with diagram **$14.95.** 6-110 volt 60 cycle vibrator only **$1.98.** Thermador 6-110 power transformer **$5.95.**

Complete Intercom SCOOP PRICE $14.95

The nicest Inter-com you have ever seen. Made by a top quality manufacturer. A complete two-station unit with 50 feet of connecting wire. Sub-station and Master are black plastic case size 8 x 6 x 5 inches. Made to sell for **$25.00.** Stock No. DG-29. Sale Price **$14.95.**

$59.50 Value

Musical Amp., $24.95

8 watt musical amplifier, 4 tube AC type. Inputs for crystal or dynamic mike and phono or instrument pickup. 2 gain controls and tone control. Has heavy duty built-in 8" speaker. Attractive leatherette covered case. Made by a large manufacturer to sell at $59.95. Brand new, fully guaranteed. For 110 volt AC operation. Our scoop price, **$24.95.** Stock No. XR-3. Contact instrument pick-up, $6.95 extra. Deluxe instrument pick-up with volume control, **$8.95** extra. Crystal mike and desk stand **$4.95.** Shipping weight, 20 lbs.

PHONO-MOTORS, $1.98

ALLIANCE

Standard 78 RPM phono motor with turntable **$1.98.** Deluxe 78 RPM phono motor with turntable **$2.95.** General Industries RM 4 regular **$15.00.** 1st motor with weighted turntable 78 rpm, net **$5.95** Dual speed rim drive for reg. and LP records **$4.95.** Replacement phono motor for automatic changers **$1.49.**

3-TUBE MUSICAL AMP., $19.95

In same deluxe case as the model XR-3 shown above. Has same features except it is designed for instrument pickup only. No input for mike. Stock No. XR-22. Net **$19.95.**

GAROD PERSONAL RADIO KIT, $14.95

Size 8½ x 3¼ x 4⅛—Weight 3½ Lbs.
Simple Assembly and Wiring Instructions

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 X-45. Price **$14.95.** Include Postage for 6 lbs.
Scoop Model X-45 Personal Portable Kit Wired and Tested With Batteries. Net $17.95

4-TUBE T.R.F. KIT

BARGAIN SPECIAL $6.95

4 tube AC-DC, TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagram and photos. Has Alnico V PM speaker and tubes 12SK7, 12SJ7, 50B5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This in the easiest type of radio to build. Kit Model TF-4. Weight 6 lbs. Net **$6.95.**

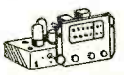
DELUXE 5-TUBE AC-DC KIT

OUR LEADER $9.95

Made from Detrola Components

A full size 5 tube superhet radio kit housed in a 13 inch wood cabinet with full plastic front. Lighted slide rule dial. Incorporates a standard 2 gang superhet circuit. Loop antenna, ready punched chassis, etc. This is another one of our line production radio kits. Every part is furnished including tubes, 14Q7, 14B6, 14A7, 50B5 and 35Y4. Diagrams, photos and instructions are included. 5" dynamic speaker. Receives broadcast 550 to 1650 kc. Weight 9 lbs. Kit model **TF-6B.** Net **$9.95.** Model **TF-68** wired and tested. Net **$14.95.**

8-TUBE, 2-BAND Basic Parts Kit $6.95



Detrola basic parts kit. We furnish pieces listed, you furnish tubes and small parts. You get cadmium plated ready punched chassis; for up to eight tube receiver, size 14 x 5½ x 2½ inches, 6" slide rule dial, a pair of 456 kc I.F. transformers, 3 gang tuning condenser, band switch and coils with trimmers, for broadcast band and 6 to 18 mc band, loop antenna and a diagram to build an eight tube radio with RF stage. Scoop price. Stock No. DBK-8. Wt. 10 lbs. Net **$6.95.**

GAROD DELUXE 5-Tube Kit $12.95

This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full length illuminated slide rule dial. Choice of Ivory or Walnut plastic cabinet. Full high efficiency 2 gang superhet circuit, with loop antenna. Ready punched chassis, full 5" PM speaker. Every part fits. Everything furnished, including tubes. 12SA7, 12SK7, 12SQ7, 35Z5 and 50L6. This kit will go together just like it would on the production line. Diagram, photos and instructions are furnished. Shipping weight 9 lbs. Kit model XA-49. Net **$12.95.**

100 CARTONED AND GUARANTEED RADIO TUBES for only $35.00

Popular GT tubes. All individually cartoned and branded Hy-Vac. Guaranteed best quality. Full replacement. These tubes meet the ever-growing need for low-cost service replacement and counter sales. Over 800,000 sold. A scoop item for the service dealer.

39c EACH IN SMALLER QUANTITIES

117P7 GT	3V4	5Y3 GT	25L6 GT	1T4	12SF7	6X4	6C4
32L7 GT	6C5	6K6 GT	7017 GT	1L4	6F5	6BJ6	6AU7
12A8 GT		6Q7 GT	117L7 GT	1U4	6J5	6AK5	6AG6
12K7GT	12SK7 GT	6V6 GT	117Z3	1R5	6SJ7	6BH6	
25Z6 GT	12SQ7 GT	6X5 GT	12AT6	1S5	12SJ7	80	12AU6
6A7		6SA7 GT	12BA6	3Q4	6AJ5		12AU7
47	35Z5 GT	6SD7 GT	12BE6	3S4	6SF5	19T8	12AT7
12F5 GT		6SK7 GT	35W4	1B4	6BA6		12SN7
6S8 GT	6K7 GT	6SN7 GT	35B5	12K8	6BE6	12S8	6SL7
6P5 GT	6A8 GT	6SQ7 GT	50B5	12A6	6AT6	6AL5	

75% OF THE TUBE YOU USE, 49c EACH, GUARANTEED NAME BRANDS CARTONED AND UNCARTONED

12AH7	6C5	6SC7	6SR7	12SG7	6R7	35Z5 GT	6K5 GT
27	6H6	6SF7	6V6 GT	12SH7	6L7	35W4	6A3
26	6J5	6SQ7	6X5 GT	12SJ7	7Z4	50B5	483
78	6K7	6SH7	6AB7	12SA7	12SQ7	2525	2051
76	9001	6SJ7	12AT6	12SL7	12SR7	2526	2525
3S4	9002	6SK7	12BA6	12SC7	50L6	6D6	6B4
5U4G	9003	6SL7	12BE6	1T4	12SK7	6C6	6C4
5Y3G	1625	6SG7	12H6	1R5	25L6 GT	6J7	
6AC7	6SA7	6SN7	12J5 GT	1S5	35L6 GT	77	
35Y4	14Q7	7E5	7H7	7B6	7F7	7C5	7Y4
14A7	14B6	7E7	7C7	7A7	7N7	7Z4	

Sylvania or Equal. 1LN5, 1LD5. 1LH4, 1LC6, 1LA6, 1LB4, 1LC5, 3LE4. @ **59c.** 10 for $5.50.

Name Brand, 1st Line. 1A7, 1H5, 1A5, 1N5, 8Q5, @ **59c.** 50A5 or 35A5 or 0Z4, 69c.
New Metal WAA 6L6 (Rusty). Each, **49c.** 10 for $4.50.
6L6G or Metal. Reg. stock, @ $1.09.

AERO $12.95 | DETROLA $12.95 | G. I. $14.95 | FARNSWORTH $19.95 | VM-400 $19.95 | SEEBURG $29.95

Get in on McGee's big January sale of automatic record changers. A good supply of every one advertised at unbeatable values.

Latest Aero changer, made for Stewart-Warner. Equipped with the popular Webster high list bouncing pickup cartridge. Plays 10 12" or 12 10" records automatically. Base size 12x13". Scoop price **$12.95.** 2 for $25.00.

Ever popular Detrola changer. Base size 11½x12". Plays 10 12" or 12 10" records autoniatically. A scoop price **$12.95.** 2 for $25.00.

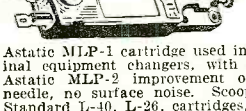
General Instrument automatic changer. Base size 10½x12". Plays 10 12" or 12 10" records automatically. A real value at only **$14.95** each.

Farnsworth, 2 post automatic changer; complete with new variable reluctance cartridge. Net price, each **$19.95.**

V-M 400. twin post automatic record changer, will intermix 10" and 12" records. Scoop price, each **$19.95.**

Famous Triple Post Seeburg intermix automatic changer, will play 10" and 12" records together. Net price, each **$29.95.**

Leatherette covered bases designed to fit any of the above changers **$1.95** extra. Specify type of changer when ordering base.



SAVE ON PICK-UPS CARTRIDGES AND V.R. AT McGEE

Astatic MLP-1 cartridge used in Webster Chicago and many other original equipment changers, with needles **$1.49.**

Astatic MLP-2 improvement over the MLP-1. Has quiet type QT needle, no surface noise. Scoop price **$1.95.**

Standard L-40, L-26, cartridges, old standbys, thousands in use. Complete with rest clip. Each, **$1.49.**

Astatic L-70, L-75, cartridges or Shure Equal. Each, **$1.49.**

Astatic L-72A 3½ volt output, used in one lung record players, etc. Also where tone networks are used. **$1.69.**

NJ-1 Nylon cartridge with permanent, but changeable needle. **$3.29.**

RCA magic-tone cell, with permanent sapphire needle. Modernization kit replaces 95% of old cartridges in RCA radio phonographs, built during 1938 and later. 4 page instruction book included. A scoop at only **$1.95.**

Astatic QT 3-M cartridge with silent needle response to 10,000 CPS. Reg. $8.40 List. Scoop price, **$3.29.**

COMPLETE PICK-UPS—NAME BRANDS, $1.95

Complete arm with cartridge of normal output and weight. Shure Astatic or Webster. Our pick as available. Net **$1.95.**

Complete extra lite weight arm with cartridge of normal output. Shure or equal. Net **$1.95.**

McGEE RADIO COMPANY

ORDER FROM THIS AD PRICES F.O.B. K. C.

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

A Common Cause of Erratic Picture Tube Operation

By ROBERT L. DONALDSON

The horizontal kick-back high voltage rectifier circuit is often the cause of unsatisfactory CR tube operation.

THE one megohm resistor shown in the diagram (Fig. 1) of the widely used horizontal kick-back high voltage rectifier is more often responsible for erratic or unsatisfactory picture tube operation in a television set than is commonly realized.

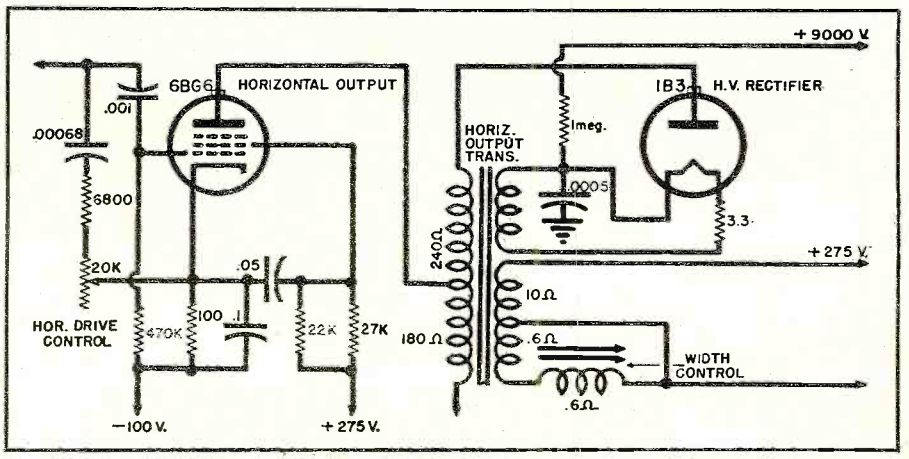
This resistor is required as a current limiting resistor in case the lead to the second anode of the picture tube should become shorted to ground, or in case of accidental bodily contact with the lead or anode cap then the resistor would limit the current through the body so as to make the fatal result of such contact more unlikely.

However, this resistor also serves in conjunction with the picture tube's anode to ground capacity to form a simple *R-C* filter network which removes the high frequency ripple from the output of the rectifier. It is necessary to filter this ripple since it is 15,750 cycles-per-second, the same as the horizontal scanning frequency, and if not effectively filtered out would cause bright and dark vertical lines or bands in the picture. That the filtering action can be so complete can be appreciated from a consideration of the relative reactances involved. The one megohm resistor is, for a.c., in series with the picture tube's anode to ground capacity, which for a 10BP4 averages about 2000 $\mu\mu$fd. This capacity has a reactance at 15,750 cycles of only 5000 ohms. Thus it can be seen that the ripple from the rectifier tube output is reduced to only 1/200 of its original value, and an essentially pure d.c. voltage of 9000 volts is applied across the picture tube.

An important point to consider is the fact that the ripple content of the rectifier tube output runs in excess of 1500 volts peak, due to the steep waveform of the applied voltage pulse. Since practically all of the ripple must be attenuated across the one megohm resistor, terrific voltage gradients are set up within the resistor body. This may cause internal sparking and radical change of resistance. This, in turn, causes the high voltage applied to the picture tube to vary erratically and exhibit symptoms of poor high voltage regulation, i.e., difficulty in maintaining focus when changing brightness, impossibility of attaining normal screen brightness, or sporadic changes in picture size, brightness, focus, and color.

Since the ordinary type of small carbon resistor used by most manufacturers cannot stand such high voltage gradients, it is advisable when such troubles are experienced to replace the single one megohm resistor with three 330,000 ohm, 1 watt resistors wired in series. This will reduce the a.c. voltage gradient across each resistor to ⅓ of the total and so bring it down to a value that the ordinary insulated carbon resistor can handle more easily. When soldering the resistors in place it is not advis-

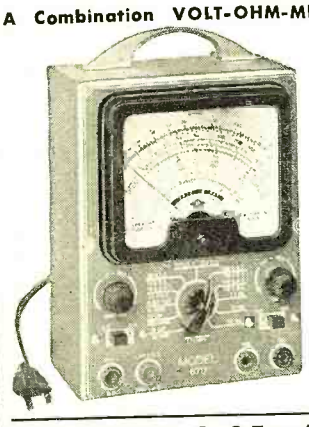
Fig. 1. A typical high voltage rectifier circuit as found in the RCA Model 630 TS receiver.



MONEY BACK GUARANTEE — We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check on the design, calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.

THE NEW MODEL 670
SUPER METER

A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS



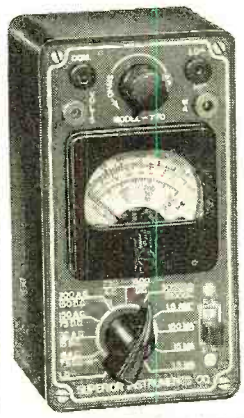
D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. A.C. VOLTS: 0 to 15/30/150 / 300 / 1500 / 3000 Volts. OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000. D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps. RESISTANCE: 0 to 500/100,000 ohms, 0 to 10 Megohms. CAPACITY: .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for 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

THE NEW MODEL 770—AN ACCURATE POCKET-SIZE
VOLT OHM MILLIAMMETER



(Sensitivity: 1000 ohms per volt)

FEATURES:

Compact—measures 3⅛" x 5⅞" x 2¼". Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use. Specifications: 6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 volts.
6 D.C. VOLTAGE RANGES: 0-7½/15/75/150/750/1500 volts.
4 D.C. CURRENT RANGES: 0-1½/15/150 Ma., 0-1½ Amps.
2 RESISTANCE RANGES: 0-500 ohms. 0-1 Megohm.

The Model 770 comes complete with self contained batteries, test leads and all operating instructions

13.90 net

THE MODEL S-35—A POWERFUL
REFLEX PROJECTOR

COMPLETE WITH BUILT-IN DRIVER UNIT CONSERVATIVELY RATED AT 35 WATTS—HANDLES UP TO 55 WATTS WITHOUT BLASTING.

DRIVER UNIT MFG. BY WESTERN ELECTRIC

Heavy gauge aluminum in the main trumpet section completely eliminotes blasting and blaring. New plastic diophragm overcomes the resonont peoks of the old type; also it is absolutely impervious to atmospheric changes whereas the old type was subject to atmospheric corrosion. Complete unit unconditionally guaranteed for one year.

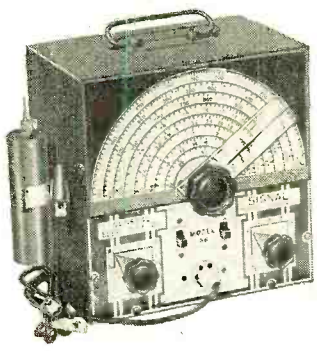
SPECIFICATIONS:

POWER (CONSERVATIVE)—35 WATTS; AIR COLUMN—3½ FT.; DISPERSION—80°; POWER (PEAK)—55 WATTS; BELL DIAMETER—15"; IMPEDANCE—8 ohms; FREQUENCY RANGE—130 to 5000 C.P.S. PROJECTION—½ mile; FINISH—Attractive two tone crystalline.

The Model S-35 Comes Complete with Built-in Driver Unit, ONLY

28.50 net

THE MODEL 88—*A COMBINATION*
SIGNAL GENERATOR and SIGNAL TRACER



SIGNAL GENERATOR SPECIFICATIONS:

• Frequency Range: 150 Kilocycles to 50 Megacycles. • The R.F. Signal Frequency is kept completely constant at all out-put levels. • Modulation is accomplished by Grid-blocking action which is equally effective for alignment of amplitude and frequency modulation as well as for television receivers. • R.F. obtainable separately or modulated by Audio Frequency.

SIGNAL TRACER SPECIFICATIONS:

• Uses the new Sylvania 1N34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megocycles. The Model 88 comes complete with all test leads and operating instructions. ONLY

28.85 net

THE NEW MODEL 247
TUBE TESTER

Check octals, loctals, bantam jr. peanuts, television miniatures, magic eye, hearing aids, thyratrons, the new type H.F. miniatures, etc.

Features:

★ A newly designed element selector switch reduces the possibility of obsolescence to an absolute minimum.

★ When checking Diode, Triode and Pentode sections of multi-purpose tubes, sections can be tested individually. A 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.

★ 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 indicated for outside use. Size: 10¾"x8¾" x5¾". ONLY.....

ONLY $29.90 NET

20% DEPOSIT REQUIRED ON ALL C.O.D. ORDERS

GENERAL ELECTRONIC DISTRIBUTING CO.

Dept. RN-1, 98 PARK PLACE NEW YORK 7, N. Y.

able to mount them on anything at all, merely make neat connections, smoothly soldered, to guard against possible corona discharge effects, and slip a piece of large diameter spaghetti over the whole assembly. Be sure the assembly does not lie closer than ½ inch to any other object, otherwise arcing through the spaghetti to ground might occur.

It is urgently advised that when any work is done on a television set, particularly the high voltage supply circuit, that a ground lead be clipped onto the chassis and to the anode cap and lead. Since there is no bleeder in this circuit the filter condenser and picture tube capacity can hold a hefty charge for an hour or more, and contact with any part of the high voltage circuit may shock or startle the serviceman enough to cause damage, either to himself or to the picture tube. Merely shorting the high voltage line to ground with a screwdriver momentarily is not sufficient, since there is also energy stored in the supply transformer stray capacity to ground, and this will leak through to the d.c. side of the rectifier and cause another charge to appear there even after the high voltage line has been once discharged. Thus the necessity for leaving the grounding connection on all the time one may have contact with any exposed high voltage point.

—30—

Sweep Generator

(*Continued from page* 53)

consideration need be given this. The first receiver circuit is in itself selective enough to pass only the desired frequency, and most certainly reject a frequency removed by some 90 mc. There is one other aspect that has to be considered. The selection of 55 mc. was the lowest practical frequency for the f.f.o. that would not throw a second harmonic in the FM band of 88 to 108 mc. If for instance the f.f.o. center frequency was 52 mc. the second harmonic would land at 104 mc. We would have a frequency modulated signal in the FM band whether we liked it or not, as there is no shielding provided in the unit. The user must be cautioned about one thing in the final application of this instrument for FM r.f. alignment. This is that the v.f.o. is operating throughout the range of 32 to 54.7 and is capable of generating an unmodulated harmonic in the FM band. As we previously pointed out the frequencies have been carefully chosen, and any variation would involve computing all the variables discussed above. To illustrate the unmodulated harmonic consider the case where the frequency swept sum of 100 mc. was being used for r.f. alignment. To produce this the

AN EASILY-BUILT CAPACITY DETECTOR

BY ANDRE BOURGET, VE2VP

A FEW months ago the author built a capacity detector which has proven to be so satisfactory that the circuit is being described in the hope that it may be of use to other readers.

The principle involved in this circuit is as follows: A standard oscillator feeds a sharp-tuned circuit which is tuned to the same frequency. The r.f. is then detected and sent as a d.c. control voltage to the grid of a second tube. The tube being controlled then operates a relay in its plate circuit. When the oscillator changes frequency because of a change in capacity between its control wire and the ground, the voltage developed by the rectifier drops and the relay operates.

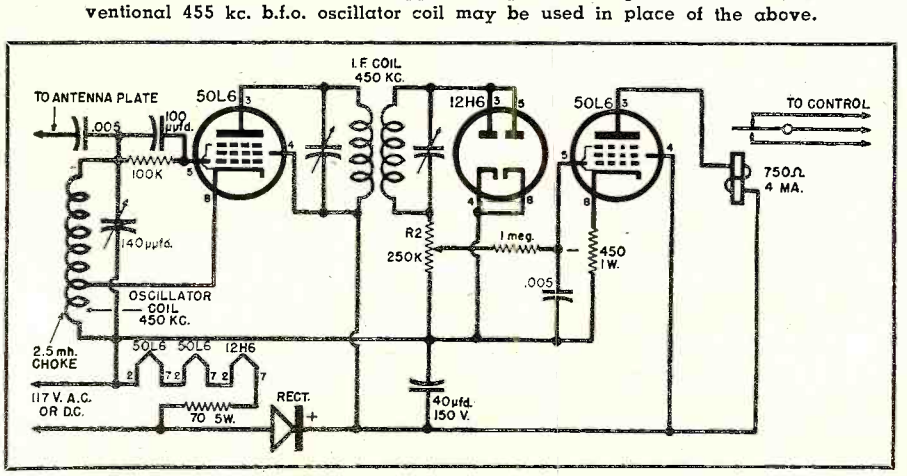
By adjusting R_2 at the critical point, it was found that the apparatus was sensitive enough to detect the passage of a person as far away as three feet from the plate (four inches square) connected to the control wire.

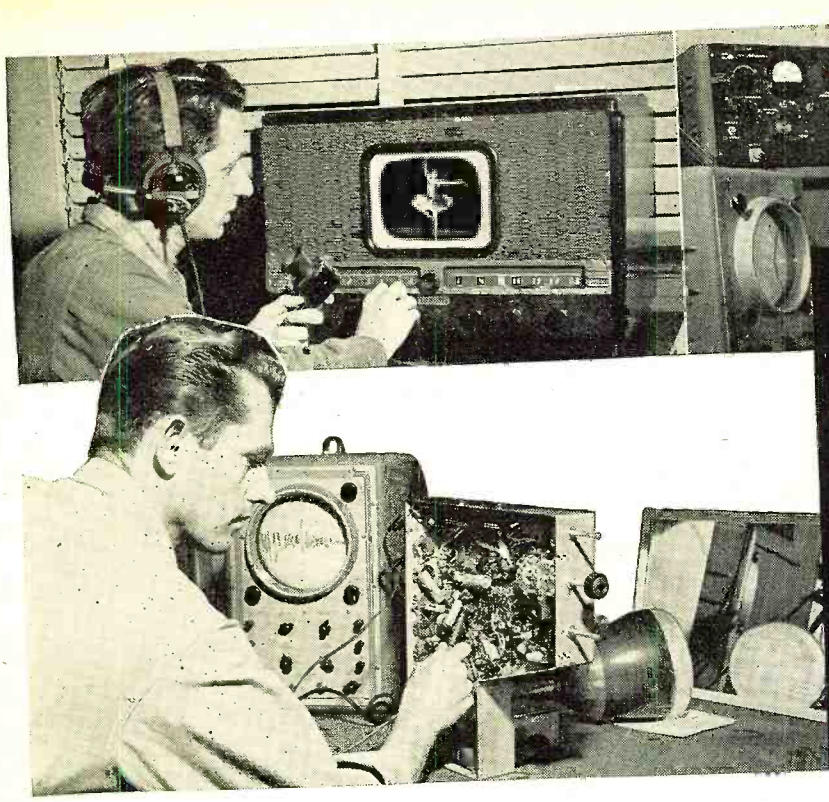
The principle is simple and the circuit uses standard parts which can be purchased in any radio shop. The complete apparatus costs less than $5.00 to build.

This circuit can be made to operate at other frequencies than the ones indicated if it is found that the operation of the circuit interferes with broadcast reception in any way.

—30—

Circuit diagram of the capacity detector. If a 2.5 mh. r.f. choke is used for the oscillator coil, it should be tapped at 1 pi from the ground end. A conventional 455 kc. b.f.o. oscillator coil may be used in place of the above.





MR. SERVICEMAN: This is for YOU

CREI Presents Just the Course You Need and Want to Safeguard Your Future-Earn More Money

"Television and FM Servicing"

Practical On-the-Job Training Program for the Better Serviceman Who Wants Greater Earnings and Security In This Expanding Field

THIS basic CREI Servicing Course paves the way to greater earnings for you. Since 1927 thousands of professional radiomen have enrolled for our home study courses in Practical Radio Engineering. Now, CREI supplies the answer to the need for a Practical Servicing Course. You do not have to be, or want to be, an engineer to benefit from this course. It is written for *you*—the average *good* serviceman! It's not too elementary for the experienced. It's not "over the head" of those who have limited experience—if they have real ambition and natural ability.

CREI developed this course at the request of several large industrial organizations. The urgent need of capable, trained servicemen is one of the big problems of the industry. Hundreds of thousands of Television Receivers will be marketed in 1949. By 1951 two million TV units are expected to be flowing into American homes. With Television comes FM receivers and circuits. This new field demands a tremendous increase in the number of properly trained television and FM technicians to install and service this equipment.

CREI EQUIPS YOU TO INSTALL AND SERVICE ALL TYPES OF TELEVISION AND FM RECEIVERS

Now . . . with the help of this new CREI streamlined Service course you can move ahead to unlimited opportunities in your chosen field. CREI has again taken the lead by offering a course so entirely new that for the first time in our twenty-one year history we can offer a down-to-earth course of training for servicemen. In offering this course at a popular price, CREI is enabling thousands of the "top third" now engaged in service work to enter the ultimate profitable field of television and FM installation and service.

This can be your big year! Don't waste another day. CREI has the answer to your future security in this new servicing course. Write today for complete information. The cost is *popular*. The terms are *easy*. The information is *free*. Write today.

Radio Service Division of

CAPITOL RADIO ENGINEERING INSTITUTE

An Accredited Technical Institute

Dept. 121-A, 16th & Park Rd., N. W., Wash. 10, D. C.

Branch Offices: New York (7) 170 Broadway • San Francisco (2) 760 Market St.

MAIL TODAY

CAPITOL RADIO ENGINEERING INSTITUTE
16th & Park Road, N. W., Dept. 121-A, Washington 10, D. C.

Gentlemen:
Please send me complete details of your new home study course in Television and FM Servicing. I am attaching a brief resume of my experience, education and present position.

NAME_____

STREET_____

CITY_____ ZONE____ STATE_____

☐ I AM ENTITLED TO TRAINING UNDER G. I. BILL

v.f.o. must be operating at 45 mc. The unmodulated second harmonic of the v.f.o. is of course 90 mc. and this will appear 10 mc. away (lower) than the desired frequency swept signal. This is not detrimental from an application standpoint, but is simply mentioned so that the user will be aware of the nature of this response if the receiver is tuned through the r.f. range while the sweep generator is left fixed.

Oscillator Calibration

The calibration of the two oscillators requires the use of an accurate signal generator, a signal tracer, and a short-wave receiver of some sort. These are more or less common pieces of equipment in any service shop. The authors had laboratory equipment available which made life much simpler, but the system to be described was developed and proved equally accurate. When the unit is finally constructed the output is fed into the signal tracer in parallel with the accurate signal generator. The slug in the f.f.o coil (L_1) is first adjusted with the calibrating generator set at 55 mc. When the proper frequency is set a squeal will be heard in the signal tracer speaker indicating that the f.f.o. and the calibrating oscillator are within audio beat of each other. This oscillator is set to zero beat and lacquer or coil dope applied to the f.f.o. slug screw to hold the set. The v.f.o. is next set in similar manner. First set the 32 mc. point by the above process, and the 54.7 mc. point by bending the back plate of C_6 slightly. After these have been accurately set the dial may be calibrated. The first 15 mc. or so may be set in terms of listening to the actual beat difference in the short-wave receiver as C_6 is tuned throughout its range. The receiver calibration may be rechecked against the serviceman's own standard signal generator at all points required. All required points may be lightly indicated in pencil, and most used points such as 4300, 5250, 10,700 penciled carefully. Two other frequencies namely 455 kc. and 21.9 mc. should be noted, as one is used for broad-band broadcast i.f. and the other is a standard television sound i.f. The television i.f. is nothing more than an FM receiver section, and may be aligned by conventional FM visual technique. The calibration of the oscillators is now done, and the r.f. range may be laid in in terms of the i.f. calibration, as one range is a function of the other. For example if the difference frequency of 10 mc. is considered this means that v.f.o. is 10 mc. away from the f.f.o. or 45 and 55 mc. respectively. The sum of r.f. points would of course be 100 mc. All other r.f. points may be laid in on an adjacent scale by the same simple computation.

Sweep Width Calibration

As previously mentioned the amount of carrier shift or swing obtained from the f.f.o. is determined by the amount of voltage applied to the re-

OUTSTANDING VALUES NOW AVAILABLE

SUPER SIGNAL TRACER

Presenting the NEW MODEL 201 SUPER TRACER by Precision Electronics for faster, easier servicing. Frequency range from 30 cps. to 300 MC. Quickly shoots trouble in FM, TELEVISION, all radios and amplifiers. Vacuum tube polystyrene tip probe of low 3mmf. input capacity will not disturb oscillators. Audio input jack, output meter jack, 5" P.M. speaker for hum checking are plus features for added versatility.

COMPLETE FOR ONLY

$29.95 with probe.

SUPER 25 WATT HI-FI AMPLIFIER KIT

Including all parts, schematic and layout diagrams, enabling you to easily build this fine, deluxe amplifier.

FEATURES:

- **Ready punched chassis**
- **Multi-impedance output transformer 2-4-8-16-500 ohms for use with any PM speaker**
- **2 mike inputs, 1 phono input**
- **Push pull phase inverter driver for low hum and distortion**
- **Separate bass and treble control**
- **110-120 volt AC operation, on fuse UL approved line cord**
- **6 tubes: 2—6SJ7, 6SC7, 2—6L6G, 5Y3**
- **Attractive, well-constructed steel chassis and cover. Baked hammerloid finish**
- **Indirect lighted panel**

Nowhere can an amplifier of comparable features be had for twice the price. This amplifier, designed from the famous Clark Amplifier, will fill 90% of all sound uses.

$22.95 COMPLETE WITH TUBES

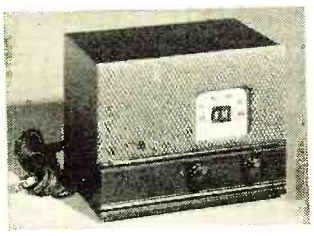
BEST SPEAKER VALUES IN THE COUNTRY

2" PM Alnico V	**89c**
3" PM Alnico V	**89c**
4" PM Alnico V	**99c**
5" PM Alnico V	**99c**
6" PM Alnico V	**$1.49**
8" PM Alnico V	**2.99**
10" PM 4.65-oz. Alnico V	**3.95**
12" PM 4.65-oz. Alnico V	**4.95**

WITH 50L6 OUTPUT TRANSFORMER

3" PM Alnico V	**$1.25**
4" PM Alnico V	**1.35**
5" PM Alnico V	**1.35**
6" PM Alnico V	**1.75**

REGENCY FM TUNER



- Attractively styled Mahogany cabinet
- Compact
- Of Highest Quality
- Easily attached to any radio or amplifier
- AC operation
- 88 to 108 megacycles operation
- Tube line up 6BE6, 6AL5, 2-6BA6; Ratia Detector type.

PRICE **$20.59**

BATTERY ELIMINATORS

Don't put that portable away for the winter! Use your set on AC throughout the cold weather by installing this reasonably priced unit. Can be used for all 4, 5 and 6 tube 1 ½ volt and 90 volt battery sets.

$4.95

AMPLIFIER FOUNDATION CHASSIS

Amplifier Foundation Chassis and Covers presented again BY POPULAR DEMAND. AMPLIFIER MEN and BUILDERS—constructed of high-grade steel, hammerloid finish, sloping panel. Used by top manufacturers. Size 15"x9"x3".

PRICE NOW ONLY **$2.75** Each

IN LOTS OF THREE **$2.49** Each

PARTS SPECIALS

CHECK THIS LIST FOR OUTSTANDING VALUES

6 ft. AC cord, molded rubber plug, tinned and hanked. **22c** each. 10 for **$1.89.**

AC plug, with rubber plug cap, screw or terminal type. 10 for **65c.** 100 for **$5.49.**

40x20 mfd 150V—20 mfd 25V Electrolytic. Standard Brand. **32c** each. 10 for **$2.95.**

0.1 mfd 1500 V. **16c** each 10 for **$1.29.**

100 ma 6 plate Selenium Rectifier. **69c** each. 10 for **$5.90.**

75 ma Selenium Rectifier. **49c** each. 10 for **$3.98.**

3CP1 tube with screen. **$1.69** each. 3 for **$4.47.**

Midget IF transformers, 456 KC, dimensions ¾" x 2". **99c** per pair. 6 pairs **$5.29.**

3-tube phone amplifier, built of highest quality parts, using 50L6, 35Z5, and 12SQ7. **$4.95** with tubes.

Pick-Up Arm, Standard Crystal Cartridge, Hi-Gain, complete with hardware. **$2.29.**

WRITE FOR OUR LATEST CATALOG

HEAVY-DUTY POWER TRANSFORMER

Ideal for heavy duty amplifier or small transmitter. Primary 115 volts, Secondary 6.3 V 10 amps, 6.3 V 6 amps, 5V CT 3 amps, 850V CT 142 ma, Bias 65V 142 ma. Terminal board type connections, upright mounting.

PRICE NOW..... **$3.95**

ANOTHER AMPLIFIER SPECIAL!

RA18 12 watt peak amplifier. An amplifier designed especially for home, or small audience use.

- **3 separate controls — mike, phono, treble and bass**
- **Output transformer for use with 4 to 8 ohm PM speakers**
- **Frequency response 2db from 50 to 10,000 cycles**

This fine amplifier is small in size, light in weight, attractive, and operates superbly—making it adaptable to many uses.

ONLY **$21.50**

VULCAN SOLDERING IRON

100 watt 110-120 Volt. Complete with stand. ⅜" replaceable tip, 14" overall length. This is just the iron for general radio and electrical work.

NOW..... **$1.49** Each

FINEST QUALITY CRYSTAL MICROPHONE

Made by a well-known manufacturer. Comes complete with **100 feet of mike cable.** This is just the mike for general sound use!

$5.95

Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.

actance modulator grid (within the limits of the straight portion of the tube characteristic). To accurately determine the amount of swing some means must be provided to give voltage steps to this grid, and a means employed to vernier each voltage value. This is accomplished by the four-step switch S_1 in conjunction with the potentiometer R_3. It is seen that S_1 adds resistance to the series voltage dividing circuit of which R_3 is an element. As each series resistance is added less voltage is available across R_3, and consequently less swing is obtained. The reactance modulator is not a linear device vs. grid voltage as evinced by the values of resistance in the switch sections. With S_1 connected to the transformer secondary 1200 kc. of swing is obtained as R_4 is rotated to its extreme limit. The next step provides 600 kc.; the next 300 kc.; and the last 70 kc. This swing is practically a linear function of R_3, and if R_3 is calibrated from 0 to 10 it is simple to determine the exact swing. The simplest way to calibrate the full swing of each step is again to listen to the beat difference in the short-wave receiver, and as the sweep is expanded on each step to check the end limits of the sweep with the standard signal generator. This provides an accurate calibration method, and bandwidth measurements may be relied upon once this calibration is done.

Synchronizing Circuit

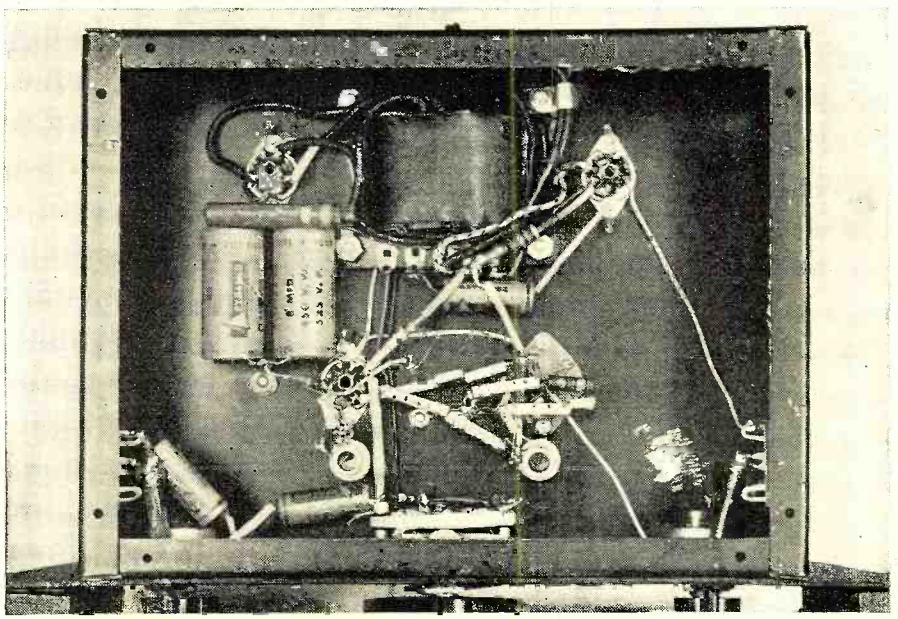
The isolating condenser C_{11} provides a 120 cycle saw-tooth wave that may be used for synchronizing purposes of the oscilloscope. If this is attached to the external binding post (external lead from C_{11}) of the scope it will stabilize the pattern observed on the scope screen. If the scope time base is turned off this may be connected to the high side of the scope horizontal amplifier and used for direct control. In this case the "mirror image" pattern described in current articles covering visual alignment will be observed. This voltage is of the proper form and in exact phase with the reactance modulator voltage so that proper synchronizing or "locking" of the pattern will be realized.

Mechanical

As illustrated by the accompanying photographs the unit was conventionally mounted on a small chassis. There is no critical wiring with the exception of the oscillator grid and plate leads. Mechanical layout is not included, as it seemed improbable that this exact conformation would be duplicated, nor need it be. The *National* dial was selected because of its excellent vernier and reset characteristics. The *National* dial or a comparable unit should be used as the accuracy of calibration is dependent on this.

The unit described was built and calibrated in two evenings. We will not attempt to give data on the frequency accuracy of this device. We were frankly amazed at the stability of the unit, and feel that whoever builds this instrument has a pleasant surprise in store in terms of an accurate FM source. Space does not permit dealing with the alignment application of FM receivers. Several excellent articles have recently appeared dealing with this phase, and the reader is referred to issues of various trade magazines for representative information. It is felt that there is a definite place in the service shop for this generator. The advantages of calibrated sweep, and a hand calibrated dial have never been available to the serviceman except at prohibitive cost. If component values are carefully followed, and the calibration procedure painstakingly done the time involved will be well spent in the realization of an extremely worthwhile instrument. —30—

Under chassis view of home-built sweep generator showing simplicity of wiring.



RADIO TUBES

LARGEST TUBE STOCK IN THE COUNTRY AT ROCK BOTTOM PRICES!

100 CARTONED and GUARANTEED TUBES ONLY ... $32.50

37c ea. in smaller quantities

Popular GT Miniature and Loctal Tubes. All individually cartoned and branded. Guaranteed best quality. Available at this low price and may be assorted. THE FIRST REAL SCOOP FOR THE SERVICE DEALER.

FREE! $20.00 worth of condensers—(list value), ten 20-20 @ 150V—free with each 100 tubes ordered.

7Y4, 7Z4, 7B6, 7E6, 7E5, 7C4, 14X7, 1A5GT, 1A7GT, 1B4, 1C4, 1H5GT, 1L4, 1N5GT, 1P5, 1Q5, 1R4, 1R5, 1S4, 1S5, 1T4, 1U4, 1V, 2A3, 2A5, 2A7, 2B7, 3A4, 3Q4, 3S4

5U4G, 5V4, 5X4G, 5Y3GT, 5Y4G, 5Z3, 6A7, 6B6, 6B7, 6C8G, 6AC5GT, 6A3, 6A8GT, 6AK5, 6AQ5, 6AQ6, 6AT6, 6AU6, 6BA6, 6BE6, 6BH6, 6BJ6, 6C5GT, 6C6, 6AG5, 6AJ5, 6AK5, 6AL5, 6C4, 6C8G

6D6, 6F5G, 6F6GT, 6F8G, 6G6, 6H6GT, 6J5GT, 6J6, 6J7GT, 6K6GT, 6K7GT, 6L6G, 6P5GT, 6Q7, 6Q6GT, 6R7, 6S8GT, 6SA7GT, 6SC7GT, 6SD7GT, 6SF5GT, 6SF7, 6SG7GT, 6SH7, 6SJ7GT, 6SK7GT, 6SL7GT, 6SN7GT, 6SQ7GT, 6SR7GT

6U7GT, 6V6GT, 6X4, 6X5GT, 6Y6G, 9T8, 10, 12A8GT, 12A6, 12A7, 12AT6, 12AU6, 12C8, 12BA6, 12BE6, 12F5, 12H6, 12J5, 12J7GT, 12K7GT, 12K8G, 12Q7GT, 12SA7GT, 12SH7GT, 12SG7, 12SJ7GT, 12SK7GT, 12SN7GT, 12SQ7GT, 12SR7

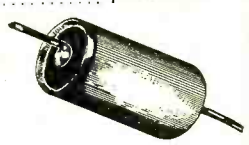
12SR7GT, 19T8, 20, 2050, 2051, 24A, 25L6GT, 25Z5, 25Z6GT, 26, 27, 30, 31, 32L7GT, 35, 35/51, 37, 38, 35B5, 35L6GT, 35W4, 35Z5GT, 37A, 38, 39, 39/44, 40, 41, 42

43, 44, 45, 46, 47, 50, 50B5, 50L6GT, 56, 57, 58, 70L7GT, 71A, 75, 76, 78, 80, 81, 83, 84/6Z4, 85, 112A, 89, 117L7GT, 117P7GT, 117Z3, 182B, 183, 482B, 483

BY-PASS CONDENSERS

6c each—Lots of 100 (assorted) $4.95

.001 mfd, 600V.—ea. 6c
.002 ..... ea. 6c
.005 ..... ea. 6c
.01 ..... ea. 6c
.02 ..... ea. 6c
.05 ..... ea. 7c
.1 ..... ea. 8c



IF TRANSFORMERS

Standard replacement Each 45c
Standard replacement Midget 45c

VOLUME CONTROLS

500,000 ohms with switch and long shaft—best brands ..... ea. 35c
250,000 ohms with long shaft ..... ea. 12c

PM SPEAKERS

Nationally advertised brands—GUARANTEED—best quality

5" Alnico 5 Magnet Lots of 10, ea. 95c
4" ..... " " " ea. 95c
3" ..... " " " ea. 95c
2" ..... " " " ea. 95c
Individual price ..... ea. 99c
6" ..... Lots of 10, ea. $1.39
Individual price ..... ea. 1.49
8" ..... ea. 3.65
10" ..... ea. 4.25
12" ..... ea. 4.95
12" (with 32-oz. magnet) ..... ea. 6.95

FILTER CONDENSERS

Highest Quality Standard Brands, All Fresh Stock Electrolytic.

20-20 mfd, 150V ..... ea. 39c
30-30 mfd, 150V ..... ea. 47c
40-40 mfd, 150V ..... ea. 49c
50-50 mfd, 150V ..... ea. 49c

STOCK UP AT THESE PRICES

60-60 mfd, 150V ..... ea. 39c
(Small size, low price, use in place of 60-40, 50-30, 50-50, 40-40, 30-30, etc.).
20 mfd, 150V ..... ea. 25c
40 mfd, 150V ..... ea. 29c
8 mfd, 450V ..... ea. 21c
8-8 mfd, 450V ..... ea. 43c
10-10 mfd, 450V ..... ea. 43c
20-20 mfd, 450V ..... ea. 39c
25 mfd. 25V ..... ea. 17c

OUTPUT TRANSFORMERS

For: 50L6, 50B5, 50A5, 50C6, 32L7, 70L7, 26A7, 6W6, 28D7, 70A7, 1276, 6A5, 6B4, 25C6, 7C5, 2A3, 6A3, 6Y6, 25B6, 25L6 ..... each 39c

For: 6V6, 6F6, 3Q5, 42, 41, 43, 45, 50, 71A, 12A5, 25A6, 25A7, 6N7, 6A6, 25N6, 25B5, 117L7, 117M7, 117N7, 117P7, 35A5, 6L6, 6AH5, 6AL6 ..... each 49c

MISCELLANEOUS BUYS!

Crystal Cartridge
L-72A ..... ea. $1.49
L-82 ..... ea. 1.39
Push-Back Wire
100-ft. rolls ..... per roll 49c
Vibrators
4-Prong Vibrators ..... ea. 99c

ALL MERCHANDISE IS BRAND NEW and nationally advertised brands.
Minimum order $5.00; all shipments F.O.B. Chicago ... ORDER TODAY!

CLEAR-VAC CO.

5036 RAVENSWOOD AVE.
CHICAGO 40, ILLINOIS

"Clear heads order from CLEAR-VAC"

PRECISION TEST EQUIPMENT

(Government Surplus Equipment)

Low Voltage CIRCUIT TESTER Model I-42

★ Here is an instrument that any mechanic that works on automobiles, boats, or airplanes would be proud to own and we offer it at a fraction of its original cost.

★ The low voltage circuit tester is a self-contained trouble-shooting device for making a complete and rapid check of the generator—battery circuit, including any current and voltage regulators which may be used. Battery voltage, regulator and cut-out settings, and generator performance can all be easily determined.

★ This tester is enclosed in a gray heavy-gauge metal box with a strong hinged top that, when opened, is supported by a slide rod and when closed, is latched by clamps. There is a carrying strap attached to the box.

★ This instrument was manufactured for the Quartermaster's Corps, United States Government Ordnance Department under the most rigid specifications. It is comparable in beauty and dependability to instruments made today that sell for many many more dollars than our price. Electric Heat Control Company, Cleveland, Ohio, or the Heyer Products Company, Inc., Belleville, New Jersey manufactured these for the Army. Although the unit you receive may be made by either of these companies, it will be practically identical to the unit made by the other company and all are made under Heyer Products Company's design and according to Government specifications.

★ This low voltage circuit tester is 11 3/16" wide x 9 9/16" deep x 7½" high and can be used on either a 6 volt or 12 volt system. There is a metal chart attached to the lid of each unit which is easily readable while using the instrument. This chart shows settings of all controls and gives operation instructions to be used in conjunction with the operating manual which is included with the tester. One can quickly determine and correct trouble with this instrument. There are two battery leads with drive-in connectors (with spikes—lead coated) 8' long; ammeter lead (3-wire) complete with calibrated shunt, 6' long; voltmeter leads with alligator clip connectors and rubber insulators 8' long, and field rheostat leads with alligator type connectors and rubber insulators 5' long. The direct reading meter scale 4" in diameter with color-coded scales, along with the push-button switch, voltage selector (3-circuit toggle switch), meter polarity switch, utility switch, volt-ammeter scale selector switch, field rheostat, regulator test selector switch, multisection load resistor, is used to control all operations and functions of this instrument. The master meter reads 0-60 volts and 0-60 amperes. One switch box indicator has following ranges: 0-9 volts and amperes, scale deviation—0-9 range in 1/10th of a volt, 0-18 in 2/10th's of a volt, 0-60 in 1 volt and ampere division, 0-9 in .05th of a volt and ampere.

★ They are brand new. Each weighs approximately 14 pounds. The price that we quote is only made possible because of the fact that they are Government surplus and this company bought them at a "steal." Remember, this is truly the finest of instruments and we cannot over-emphasize that we believe it is the best bargain ever offered.

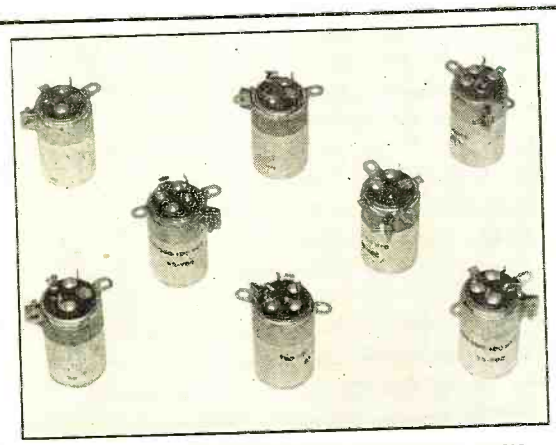
PRICE $29.95 **TERMS: Cash with Order**

ESSE Radio Co
130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

CABLE CONNECTORS AND PLUGS
All Brand New

Manufacturer	Type	Price Ea.
Amphenol	AN3101-16-10P	$0.50
Amphenol	AN3101-18-1S	.70
Amphenol	AN3101-22-6S	.60
Amphenol	AN3102-22-15P	.60
Amphenol	AN3102-28-10P	.60
Amphenol	AN3102-32-5P	.60
Amphenol	AN3106-18-11S	.65
Amphenol	AN3106-18-18P	.65
Amphenol	AN3106-24-6S	.80
Amphenol	AN3106-24-7P	.90
Amphenol	AN3106-32-5S	.90
Amphenol	AN3108-14S-*	.65
Harwood	AN3108-14S-2S	.65
Aero	AN3108-14S-2S	.65
Cannon	AN3108-14S-2S	.65
Amphenol	AN3108-18-12P	.80
Amphenol	AN3108-22-5S	.80
Amphenol	AN3108-22-5S	.80
Cannon	AN3108-24-6P	.90
Amphenol	AN3108-24-16S	.80
Amphenol	AN3108-24-16S	.80
Cannon	AN3108-32-5P	.90
Amphenol	AN3108-28-10P	.90
Amphenol		.90

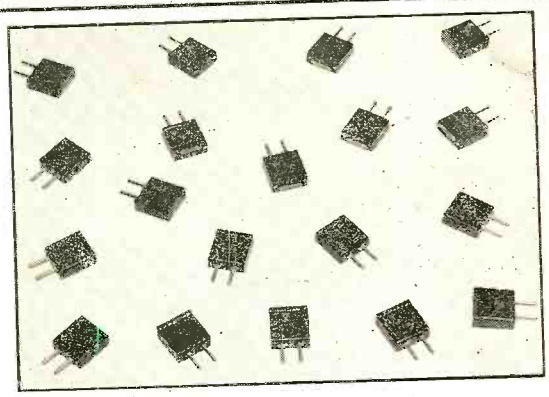


ELECTROLYTIC CONDENSERS, ALUMINUM CANS

30 Mfd.	450 volts	$0.60
20 Mfd.	450 volts	.50
40 Mfd.	450 volts	.75
50 Mfd.	350 volts	.50
2500 Mfd.	3 volts	.25
1000 Mfd.	25 volts	.50
50 Mfd.	10 volts	.45
1000 Mfd.	15 volts	.45
30 Mfd.	150 volts	.35
.14 Mfd.	50 volts	.15
100 Mfd.	300 volts	.75
100-100-100 Mfd.	35 volts	.65
20-20-20 Mfd.	25 volts	.35
2000 Mfd.	50 volts	1.50

HIGH VOLTAGE CONDENSERS

1 Mfd. 10,000 volts Aerovox	$15.00
.25 Mfd. 20,000 volts Aerovox	4.95



CRYSTALS
IN STANDARD 5-PRONG SOCKET HOLDERS

10 Meter Ham Band

7120	$0.55
7130	.55
7140	.55
7160	.55
7180	.50
7210	.50
7220	.50
7240	.50
7250	.50
7260	.50
7270	.50
7280	.50
7290	.50
7300	.50
7310	.45
7320	.45
7330	.45
7340	.45

6 Meter Ham Band

8351	$0.75
8356	.75
8357	.75
8360	.75
8361	.75
8362	.75
8367	.75
8400	.75
8450	.75
8451	.75
8452	.75
8476	.75
8477	.75
8480	.75
8486	$0.75
8488	.75
8520	.75
8530	.75
8540	.75
8541	.75
8542	.75
8547	.75

20 Meter Ham Band

7120	$0.55
7130	.55
7140	.55
7160	.55
7180	.50

40 Meter Ham Band

7120	$0.55
7130	.55
7140	.55
7160	.55
7180	.50
7210	.50
7220	.50
7240	.50
7250	.50
7260	.50
7270	.50
7280	.50
7290	.50
7300	.50

!Odd Frequencies

5450	$0.50
5560	$0.50
5810	.50
7660	.50
7670	.50
7680	.50
7690	.50
7700	.50
7710	.50
7920	.50
7940	.50
7950	.50
7970	.50
7990	.50
8245	.50
8248	.50
8250	.50
8251	.50
8252	.50

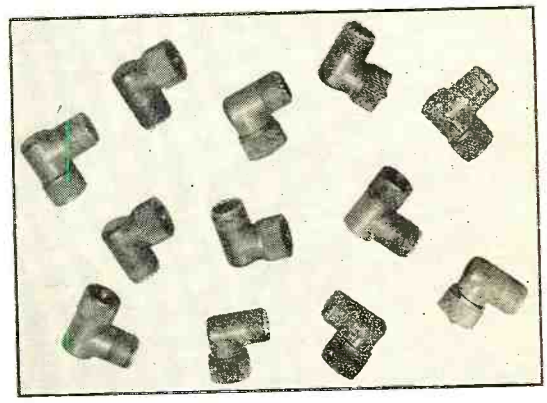
2 Meter Ham Band

8085	$0.75
8092	.75
8100	.75
8103	.75
8104	.75
8105	.75
8110	.75
8114	.75
8115	.75
8120	.75
8124	.75
8126	.75
8130	.75
8194	.75

A tremendous bargain—quartz crystals without holders

Get an assortment of these and grind to your own frequencies or use them as they are. .5X.6" B-cut lapped on faces and squared on edges (Ready to use). We will give you an assortment of these from approximately 13 thousandths of an inch to 24 thousandths of an inch whereby you can grind to frequencies desired.

An Assortment of 20 Different Thicknesses $2.50



AMPHENOL LOW-LOSS UHF CONNECTOR for RG type cable. Rugged construction, heavily silver plated, provides easy assembly and positive connection. Type 83-1AP Angle Plug Adapter polystyrene insert, pin and socket—very special—20c each.
Type 83-1R Receptacle, chassis type, low-loss Mica filled insert, very special, 30c each.

ESSE Radio Co

130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

RCA "Ultrafax" System

A new "million words a minute" communications system demonstrated recently in Washington, D. C.

THE Library of Congress in Washington, D. C. was recently the scene of a unique demonstration of a new system of television communications which is capable of transmitting and receiving written or printed messages and documents at the rate of a million words a minute.

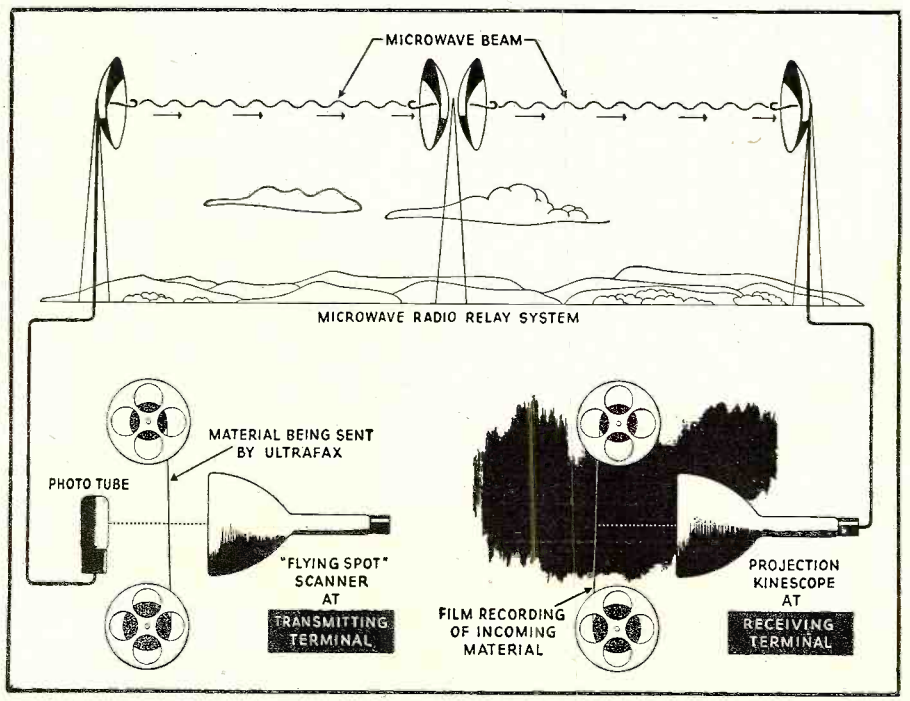
The demonstration of "Ultrafax" was conducted by *Radio Corporation of America,* developers of the new system. David Sarnoff, president of *RCA,* explained that the development presents several new and interesting communications possibilities among which are the exchange of international television programs; combined television and "Ultrafax" service for the home which would permit various types of publications to be transmitted directly to the viewer without interrupting the program being viewed; the transmission of a full-length motion picture from a single negative in the production studio to the screens of thousands of motion picture theaters throughout the country; and the possibility of a radio-mail system with vast pickup and delivery services of the Post Office Department.

The first message to be publicly transmitted was a handwritten letter by Mr. Sarnoff. Letters from Secretary of Defense Forrestal and Wayne Coy, Chairman of the FCC, were also transmitted over the "Ultrafax" system.

—30—

Donald S. Bond, research engineer for RCA, demonstrates "Ultrafax" at the Library of Congress while Jean Montgomery looks at a copy of the 1047-page novel "Gone with the Wind" which was transmitted word-for-word in its entirety in about two minutes. Documents beamed through the air are received and reproduced as exact duplicates of the original. ("Ultrafax" is an RCA development.

Operating details covering the new RCA "Ultrafax" system of high speed communication.



SPECIAL SURPLUS BROADCAST OF OUR SUPER SPECIALS!!!

"TRANSTATS"

Amertran Voltage Regulator 11.5 KVA 50/60 cy. Commutator range 0-115 V. Max. Amps. 100. Reconnection diagram available for 230 V 50 A operation. BRAND NEW. In original Factory Cases. GUARANTEED. **$75.00**

TRANSTAT—115 VAC 60 CY. .25 KVA @ 2.17 A 103-126 V by AMERTRAN. **$9.45**

TRANSTAT—115 VAC 400 CY. .5 KVA 5.5 A 92-115 V by AMERTRAN. **$2.50**

COMMAND SET EQUIVALENT—BC 430. Excellent VFO using 2 Type 45's and 2 Type 10 tubes. 40 WATTS CW with one coil. (COIL RANGES: 2 - 2.5, 2.5 - 3.2, 3 - 3.6, 3.6 - 4.5, 4 - 4.8, 6 - 7.3, and 7.3 - 9 MC. **$7.95**

COMMAND TRANSMITTERS—2 - 3 MC, LN **$4.95**, 3 - 4 MC, LN **$12.95**, 4 - 5.3 MC, LN $5.95. 5.3 - 7 MC, LN **$5.95**

SALVAGE COMMAND TRANSMITTERS @ **$2.95**. NO CHOICE OF FREQUENCIES.

COMPASS RECEIVER—BC 433 G. FREQUENCY 850-1750 KCS 15 TUBES. **$14.95**

SCR 178—TRANSMITTER - RECEIVER. 2400 - 3700 KCS 10 W OUTPUT. W/SPARE PARTS. PHONE AND CW OPN. . . **$45.00**

RA-50A WESTERN ELECTRIC RADAR HIGH VOLTAGE POWER SUPPLY—Consists of trans. 20,000 Volts C.T. @ 750 VA. FILTERING BY .05 MFD @ 12,500 VOLTS with two 705 'A' S Tubes. Fil. trans. supplies 5 Volts 10 AMPS @ 15,000 VOLTS TEST. 21½ x 17 x 11½ @ **$49.95**

RCA AUDIO FREQUENCY METER MODEL 306A. Measures unknown frequencies from 0-50,000 cycles. LN. **$75.00**

LAB METERS—4 - 1/8" scale desk type vertical 50-0-50 MA; 150-0-150 MA. your choice LN. **$2.50**

TRANSMITTER AND RELAY RACK CABINETS—Chrome decorated, hinged door on top w/catch and hinged door on back. Amateur or W.E. notched. Black crackled, 28½" high, 18" deep. Panel space 26¼" LN **$15** ea.; 2 for. **$27**

TUNING UNITS P/GP7 AIRCRAFT EQUIPT. Pick Freq. wanted. 350 - 800 KC; 800 - 1500 KC; 4525 - 6500 KC; 6200 - 9050 KC. Parts alone worth the money. Each. **$3.00**

PE204 VIBRATOR POWER SUPPLY—Input 12 VDC Output Two 4.3 VDC @ 50 MA; Two 45 VDC @ 0.5 MA; Two 85 VDC @ 5MA. Loaded with parts. **$1**

BATTERY CHARGERS—Input 115 V 60 cy.. Output 7.5 Volts @ 6 A. Portable. Insulated leads. Each. **$8.25**

WILLARD STORAGE BATTERIES—Used in GE Portables Model LB530—2 V @ 20 AH. 4" x 3½" x 5½" @ **$2.50** each, 10 for **$20.00**, case lots of 36. ea. **$1.50**

INTERCOM SETS—Two way system for YR shack and home. Battery operated. Complete w/wire, per set. **$9.95**

"FLASHLITES" BY KWIKLITE—2 cell metal case—**60c**; PLASTIC—**75c**; 3 CELL METAL CASE—**80c**; PENLITES. **35c**

GARAGE/MECHANIC'S EXTENSION LIGHT—25' heavy duty cord. Switch on handle. Metal bulb protector. **$2.50** ea. 10 for. **$22.00**

BATTERY CLIP ASSEMBLY—Eight foot - two conductor cord with 2 prong Hubbell male and female connector, heavy-duty Alligator battery clips on two ends. ea. . . **69c**

EXTENSION CORDS—2 cond. 7' lengths PL55 and JK26 on ends. Ea. **35c**

CRYSTAL CONTROLLED MV SIGNAL GENERATOR—MM-144 Hickok. 15 KC - 30 MC. Crystal controlled @ 100 and 1000 KC. battery operated. Portable. Completely shielded, with instruction book. LN **$45.00**

B AND W 300 WATT TANK COILS—4.5 - 5.7 MC @ **75c**; 20 METER W/LINK @ 95c; 40 METER W/LINK @ **95c**; Budd 160 METERS 50 W Socket type **55c**, 4 for. **$1.50**

WESTERN ELECTRIC PRECISION CRYSTALS—40 Meter Band 7270 KC 95c ea. 2 for. **$1.75**

INVERTERS—ATR, 6 VDC to 110 VAC 60 cy. 85W **$17**; 12 VDC to 110 VAC 60 cy. 125W **$14.50**; **ELEC. LAB** 12 VDC to 110 VAC 60 cy. 150 W. **$16**; 110 VDC to 110 VAC 60 cy. 250W. **$26.50**

HELIPOTS—Model A. 20,000 OHMS 5W. 10 turns 3600° Rotation. 0.5 Guar. Linearity **$4.50**; W/Stop. **$5.00**

DAVEN SOUND ATTENUATORS. Compact constant impedance attenuators that will dissipate 10 Watts in any position. Type 350E. Ladder network. 250/250 OHMS IMPEDANCE, ATTENUATION 2 DB. Type 350A 30/30 OHMS IMPEDANCE. Linear attenuation. Your choice. . . **$2.50**

"TELEVISION" GUY WIRE—1/16" Dia. Galv. Perf. Steel. Excellent elasticity. Rust proof. Ideal for television antenna installations. 1000 ft. rolls. **$3.00/M**

HEAVY DUTY PLATE TRANSFORMER—AMERTRAN. INPUT 115/230 V 60 CY OUTPUT 4730/2365 volts @ 1.66 KVA. 11 x 11 x 9. WGT 150 lbs. **$27.50**

RL-42B ANTENNA REEL—W/MOTOR AND GEAR BOX—Perfect Beam rotators. Wt. 4 lbs. Easily mounted, magnetic clutch. Reversible with SPDT switch. Many other uses. **$4.95**

"BEAM INDICATOR" SELSYNS—GE model 2J1G1. Operates from 57.5/57.5 volts 400 cycles w/wiring diagram for 110 V 60 CY operation. **$2.50** per pair. Also available GE Model 2J1F1 115/57.5 Volts 400 CY. Per pair. **$3.00**

SELSYNS—DIEHL/BENDIX SYNCHRO TRANSMITTERS. 115 V 60 cy. 3" Dia. Each **$4.35**. Pr. **$7.95**

ANTENNA CHANGE OVER SWITCH—SPDT. knife operated. Heavy duty. Isolantite insulation. Each. **25c**

HEINEMAN CIRCUIT BREAKERS—24 VDC @ .220 AMPS. SPST 95c ea.; 0311M-10. 24 VDC @ 10 A, SPST. **$1.45**. 0322M-10. 24 VDC @ 15 AMPS. DPDT. . . . **$2.25**

WESTON PORT. VOLTAMMETER

Model 280. Two ranges 3-15-150 Volts and 3-15-30 Amperes. Accuracy 1%. Complete with black leather carrying case. BRAND NEW. SPECIAL **$21.00**

24 VOLT RELAYS—Leach. 180 OHMS, DPDT. 10 AMPS. 65c (Have thousands of others. Write for list.)

"S" METER—MFG by M.B., 0-1 MA 1¼" dia. Pilot lite mounting. **$3.50**

PHONES—HS-30, 600 OHM IMPD., rubber ear inserts. LN 35c ea. **65c** new. HS-23, 8,000 OHM IMPD., LN **$1.00**. New **$2.00**

extension cords. **35c**

"MIKES"—T-17 Hand mike, carbon. **95c**

T-32 Carbon. Desk mount. LN. **$3.25**

KEYS—J-38 Hand keys. Each. **95c**

CHEST UNITS—T-26 Earphone and mike for chest use. **$1.75**

SOLDERING IRONS—JACKSON "STANDARD" No. 323. Removable tip 150 Watt 115 VAC/DC **$2.95**. General Electric Model **1-79** 115 VAC/DC 250 Watt. Removable tip. Heavy duty. **$7.50**

FRACTIONAL HORSE POWER MOTORS—OSTER 27.5 VDC 1/20 HP 3600 RPM. SHUNT Wound. **$7.55**

UNIVERSAL ELECTRIC 115 VDC. .12 AMPS .003 HP 5000 RPM. **$4.50**

OSTER 6 VDC 1.8 AMPS 5000 RPM. 6 oz./in. torque W/BLOWER Size 1½ AND IMPELLER. **$4.50**

EMC 110 VAC 60 cy. 1/40 HP 1725 RPM LN. **$4.50**

OSTER 27.5 VDC1/100 HP. Series wound. 7000 RPM. **$2.50**

UNIVERSAL ELECTRIC 28 VDC. 0.6 AMPS 5000 RPM. 1/100 HP. **$2.50**

GEAR REDUCTION MOTORS—

EMC 110 VAC/DC 1/20 HP 200 RPM @. **$8.50**

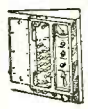
EMERSON—24 VDC 24 AMPS. Series wound. 100 RPM 160 OZ/FT torque. **$7.95**

EMC 28 VDC .6 AMPS 1 RPM. . . **$4.85**

G.E. 27 VDC .5 AMPS 250 RPM 8 OZ/IN torque. LN. **$2.50**

All items new except items notated LN (meaning like new). If not rated, 25% with order, balance C.O.D., F.O.B. Boston. Let us quote on your requirements. Write for our Catalog. Minimum order **$3.00**.

B.C.-604 F.M. TRANSMITTER



Wide or narrow-band FM. 30 watt power output. Excellent possibility for ten or eleven meter exciter. Range 20-27.9 MC. Working space permits modification. Complete with tubes but less power supply and xtls. LN. **$11.50**

DYNAMOTORS—

PE103. BALLENTINE 6V-21A/12V-11A; 500 VDC @ 160 MA W/O Filter. . . **$8.95**

GE. 28 VDC @ 5 AMPS; 575 VDC @ 160 MA. **$3.95**

DM21A, 14V @ 3.3A; 235V @ .090A **$3.50**

PE94C. SCR522. 24VDC W/Filter. . . . **$3.25**

BD-AR83. PIONEER 14 VDC @ 6.5 AMPS; 375 VDC @ 150 MA. **$2.95**

DM410. 14V @ 2.6A; 240 Volts @ 80 MA W/Filter. **$2.00**

PE-86D, 28 VDC @ 1.25 AMPS; 250 VDC @ 60 MA. **$2.00**

EICOR, 13 VDC @ 3.3 AMPS; 220 VDC @ 100 MA. **$2.50**

WINCO, 18 V.; 450 VDC @ 150 MA. **$1.95**

DM36-D, 28 VDC @ 1.4A; 220V @ 80 MA. **$1.05**

COPPER OXIDE RECTIFIERS—110 VAC—28 VDC @ 10 AMPS **$7.50**; 55 VAC—28 VDC @ .1-8 AMPS. **$4.50**

CHOKES—2.5 HENRIES @ 700 MILS, 14 OHMS. **$5.95**

20 HENRIES @ 45 MILS, 500 OHMS. **60c**

40 HENRIES @ 20 MILS. **80c**

Audio, 150 HENRIES @ 1 MIL, 7,000 OHMS. **45c**

TRANSFORMERS—

THORDASON (70R62) 115 V 60 cy; 350-0-350 @ 145 MILS; 5 V @ 3 A; 6.3 VCT @ 4.5 A. **$4.25**

JEFFERSON FIL—115 V 60 cy; 20 Volts @ 10 A. **$3.95**

POWER, Thordason (92R21) Pri 115 V 60 cy.; Sec. 389-0-389 Volts @ 200 MA; 5 V @ 3 A; 6.3 VCT @ 5 A. . . . . Each **$4.95**

POWER, 115 V 60 cy; 650 VCT @ 150 MA; 5 V @ 3 A; 6.3 V @ 5 A. . . . **$4.00**

POWER, 115 V 60 Cy; 430 VCT @ 145 MA; 6.3 V @ 5 A; 5 V @ 3 A. . . . **$3.50**

OPEN CORE POWER, 115 V 60 cy; 18 V @ 6 A. **$2.95**

POWER, 115 V 60 cy; 600 VCT @ 70 MA; 5 V @ 2 A; 6.3 V @ 2 A. **$2.50**

Audio-Output—Pri 5000 OHMS Sec 16 OHMS. HERM. SEALED. **95c**

MIKE TRANS—PRI 150 OHMS Sec. S. Grid. Ratio 20:1. "UTC". **85c**

MIKE TRANS—PRI 35 OHMS Sec. 600/200 OHMS. **75c**

INPUT—Ratio 1:2. Freq. Resp. 500-15,000 within 3 DB. **60c**

AUDIO—FEDERAL "OUNCER" Pri 8000 OHMS SEC 600 OHMS. **60c**

MIKE TRANS—"OUNCER" PRI 300 OHMS. Sec. .25 MEG. **50c**

OUTPUT TRANSF for BC 221, 125 OHMS. **35c**

FUSE HOLDERS—3 AG BUSS TYPE HCM. **15c**

NEON TESTER—Indicates 60-500 VAC/DC. Useful for determining open or short CKTS. **39c**

CORDS, Three Conductor Rubber Insulated, 7' length W/PL-68. **22c**

PANEL LAMPS—#44 and #47 @ **55c** per carton 10; #51 @ **45c** per carton 10.

NEON LAMPS—NE 45 @ **20c** each; NE 48 @ **15c** ea.; NE 32 @ 25c ea.; NE 2 @ **8c** ea.; cartons of 10 only.

110 VOLT PILOT BULBS 686, D.C. BAY. **16c** ea.; **95c** carton 10.

CATHODE RAY TUBES—5BP1 @ **$3.00**; 5 BP4 @ **$4.95**; 5 CP1 @ **$3.50**; 3 EP1 @ **$2.95**.

ROYAL PLUG FUSES—15 or 25 Ampere—23c box of five.

FRICTION TAPE—½ lb.. ¾" wide, fresh stock **17c** ea.; **10/$1.50**.

CARBON PILE VOLTAGE REGULATORS—BENDIX/ECLIPSE TYPE 956 Model 1 Style A. 13 Volts. **$1.25**

ECLIPSE TYPE 1339-4-B, 115 AC W/Rectifier/Transformer Unit. **$2.95**

ECLIPSE TYPE 1339-1-A, Set at 115 AC. **$2.95**

LELAND Set at 18 Volts. **$1.25**

PHONO MOTORS—HEAVY DUTY, GENERAL INDUSTRIES. 115 V 60 cy; .5 AMPS 80 RPM Minus turntable. . . . **$3.75**

Same as above but 115/230 Volts AC. **$4.00**

ESCO ELECTRO Sales Co.

110 Pearl Street, Boston, Mass. • • **Phone LIberty 2-5589 or HAncock 6-5069**

LARGEST WAR SURPLUS STOCK

PREAMPLIFIER BUY

External source of power supplies this compact aluminum case only 5¾"x4"x2½", containing dual triode power tube 6F8G, inside the case, not standing out from it, and all brand new, in original packing, for only..... **$1.29**

RADAR ANTENNA

AS-69: fish-hook type radar antenna assembly; can be used with APT-2, APT-3 and APT-5. NEW. F.O.B. Chicago, only..... **$2.95**

MICROPHONE BUY

T-24: Hand-held mike, carbon, with push-to-talk switch, brand new, far superior to older styles. SPECIAL. F.O.B. Los Angeles, only **79c**

24,000 OHM HEADSET

P-16: Has long cord, needs no extension, ends in standard plug PL-55. Very high impedance. Brand new. SPECIAL..... **95c**

HS-16: Brand new $1.49

ALTIMETER TRANSCEIVER RT-7/APN-1

Frequency 418-462 Mc FM, with 14 tubes: 3—12SJ7; 4—12SH7; 2—12H6; 1—VR150; 2—955; 2—9004; 27 V. Dynamotor, used in working condition **$7.95**

SELSYN INDICATORS

For use with beam rotators for indication of direction of beam. Operate from 15-24V. 60 cycle AC supply. Small model, 3 inch diameter, only **$2.45**

3" SELSYN INDICATOR

With direction selector dial. BRAND NEW. F.O.B. Chicago, only..... **$1.49**

Large model. 5 inch diameter, only..... $4.95

400 CYCLE AUTOSYN MOTOR

Ideal for indicating direction of antenna systems—BRAND NEW .....Each **$2.95**

RADIO PARTS

Assorted Bypass Condensers, 400-600WV.....	100 for	$4.29
100 Resistors ⅛ to 1 watt.....		95c
Electrolytic condensers 50-30, 150 Volt	10 for	$2.89
½ and 2 Meg. Volume Controls 1" shaft with switch, each 39c..	10 for	3.00
½ Meg. Volume Controls 1" shaft without switch	10 for	1.95
Crystal Pick-up, new light wt...	each	1.79
Heavy Duty 12" PM Speaker...	each	5.95

OUTPUT TRANSFORMER

Hi-Fi; used is Scott-made Navy receiver. Fully potted. Pri. 5000 ohms, output secondary 600 ohms CT, inverse-feedback secondary 60 ohms CT. ONLY **$1.49**

DYNAMOTORS AND INVERTERS

BD-77—Dynamotor Unit 14v in. 100v 350ma out, with relay fuse box and filters. F.O.B. Chicago only $5.75

DM-21—Dynamotor: Part of BC-312 and BC-314 14v in. 235v 100 ma out..... $2.47

PE-101-C—Dynamotor Unit: 12 or 24v in. outputs 800v, 20 ma. 400v, 135ma, 9v, 1.1A..... $2.75

PE-55—Dynamotor Unit: 12v in. 16 amp. 500v out, 200 ma F.O.B. Chicago only..... $3.75

PE-206—Inverter Unit: rotary converted, 28v in. 80v at 500 VA, 800 cy. out. F.O.B. Chicago only $3.95

DM-32A—Each 95c. 3 for..... $2.00

DM-25—12v input, 250v @ 50ma output, ideal for command receivers. New..... $3.95

IA53—12v-24v input, output 500v @ 50ma, ideal for 6 volt installation, lightweight, new.. $2.95

DM-35—12v input, 625v output @ 285ma, used, good condition $4.95

EICOR TYPE—14v in, 400v, 200ma out, with mtg. rack, brand new $14.95

DM-34—12v in, 220v, 80ma out, as used on the tank receivers BC-603 and BC-683..... $2.95

SCR-178

Portable two-way radio, 2.4 mc, 3.7 mc, battery operated, complete with carrying case, excellent condition, F.O.B. Chicago, only **$14.95**

BC-122

Westinghouse transmitter, V or CW, 325 Kc to 800 Kc, in handy portable field case, 3 panel meters plus many parts, less tubes, excellent condition, F.O.B. Chicago, only..... **$9.95**

T-26/APT-2

Radar jamming transmitter, 450-710 mc. Heising amp.-mod. by noise from 931A photo-tube. Output 3 to 7 watts. All controls on front panel. 2—6AC7 and 1—6AG7 video circuit supply random noise, with pass band of 20 kc. to 4 mc. to the 807 mod. 2—368AS tubes in a push-pull ¼-wave transmission-line osc. circuit supply the RF. Power furnished by 2—5R4GY and 1—2X2 tube. Contains 27vdc blower. Input 27vdc and 75-85v or 105-125v, 400 to 2600 cy. Brand new in original export case, with all tubes and handbook. Don't let this get away from you—Order today! F.O.B. Chicago, only. At only... **$9.95**

AN/APT5 ULTRA HIGH-FREQUENCY TRANSMITTER Brand New

400-1500 Megacycle Transmitter, made for U.S. Govt., complete with the following tubes: 2—6AC7, 1—6L6, 2—829, 1—931A, 1—6AG7, 1—522 Ultra high freq. tube. Complete with high freq. cavity, 1 blower to cool the 522, 1 time delay relay, 2 filament trans. cond. and many other component parts for ultra high frequency work. It has a frequency checker, complete Lecher wires, with slider and sensitive bulb for checking the wave length. Contains instruction book. Wt. 118 lbs. F.O.B. Chicago, only **$49.95**

It's Here!

Our NEW, 8-page catalog featuring many excellent surplus values! Write for your copy today!

IT'S FREE!

COMMAND SET SCR-274 MEDIUM FREQUENCY

Excellent condition. F.O.B. Chicago, only **$29.95**

Complete installation with 2 transmitters, 3 receivers, racks, tubes, crystals control box and plugs.

COMMAND RECEIVERS and TRANSMITTERS (274N Series)—Complete with Tubes

T-20/ARC-5 same Freq. **$5.95**

BC-457. NEW .....

BC-456 MODULATOR. Brand New..... $2.95

BC-1206-C BEACON RADIO RECEIVER

Designed to receive A-N beam signals. 24-28 VDC 21.6 watts. Tube complement: 14H7 or 14A7, RF amplifier; 14H7 or 14J7, mixer; 14A7 or 14H7, IF amplifier; 14R7, detector and 1st audio amplifier. 28D7, output amplifier, 195 to 420 kc, 4" high x 4" wide x 6⅝" long—wt. 3 lbs., 4 oz. BRAND NEW in original carton..... **$5.95**

ANTENNA THERMO-COUPLE METER

BC-442; 0-10 amps, with extra relay and 50 MMFD 5000 Volt condenser . . . used with command transmitters. BRAND NEW. **$1.95**

SELSYN METER TO INDICATE POSITION C-71A/APQ-13

Contains 2" meter, FS-100uA, Weston 506, 0-300 V, 0-30 MA, with 6 precision resistors, as external multipliers and shunts; toggle switches, push switches, rotary switch, pots, knobs, etc. GOOD CONDITION. F.O.B. Chicago, only **$4.95**

SCR-522 CONTROL UNIT

BC-602-B, brand new, export packed, 1 "off" push-button switch, 4 channel-selecting push-button switches, 5 pilot lamp assemblies with pilot bulbs and film dimmer and lever switch with locking control. With Schematic..... **98c**

RECEIVER-TRANSMITTER BC-620

FM Mobile Transmitter-Receiver operates from 6 volt vibrapack, 20.0 to 27.9 Mc; easily converted to 10-meter freq. 28-29.7 MC.

New. F.O.B. Chicago, only **$14.95**

Used. F.O.B. Chicago, only..... $9.95

2-METER TRANSMITTER SCOOP!

The famous AN/ARC-5 VHF Transmitter (T-23/ARC-5), brand new 100-156 mc but less tubes, crystals, and the holders for the 832A tubes. Furnished with complete schematic, 4 Xtal-controlled channels selected by 3 motor-driven turrets. Motor can be spun by hand for manual band switching or driven by low-power rectifier power pack. Tubes required are 2—1625 and 2—832A. Don't pass this up at ONLY..... **$4.95**

R-89/ARN-5A

Glide Path receiver. Crystal control of local oscillator. 332-335 mc, complete with relays, 7—6AJ5, 1—12SR7, 2—12SN7, 1—28D7, and 3 crystals: 6497 kc, 6522 kc, 6547 kc. 90-cycle band-pass and 150-cycle band-pass filters, excellent for making an intermodulation checker. Beautiful cabinet and chassis as foundation for many interesting experimental and construction projects. Broad pass band on 20.7 mc IF's ideal for television. Schematic furnished.

Used, excellent. Only..... **$6.45**

New $12.95

BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. 108.3 to 110.3 mc, by relay selection of crystals in the local oscillator. Wide pass-band on 6.9 mc IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100 volt DC bias. With relays, crystals, and 10 tubes: 3—717A, 2—12SG7, 1—12SQ7, 1—12A6, 1—12AH7, 2—12SR7. Schematic furnished! Condition: Used, excellent, F.O.B. Chicago, only, **$3.95**

New F.O.B. Chicago, only..... $9.95

VEEDER-ROOT METER AND CASE

Counts up to 1000.

F.O.B. Chicago, only. Each..... **59c**

HAND-TYPE MICROPHONE RS-38

Carbon type, with PL-68 plug. **$1.95**

BRAND NEW .....

Used $1.00

PE-117 UNIVERSAL POWER SUPPLY

6 or 12 volt input; output 145 volts and 90 volts; less vibrator, voltage regulator and rectifier tube; ideal mobile power supply unit; excellent condition. F.O.B. Chicago, only, ea. **$2.95**

Complete $6.95

MD-7 modulator for above transmitter, with push-pull tube, brand new with dynamotor $4.95

MISCELLANEOUS BARGAINS

Command Transmitter BC-457, brand new, 4 to 5.3 mc $7.95

RA-87: Rectifier, selenium, input 95—125V or 190-250V, 50/60 cy. Output 115 V dc, 400 ma and 115V ac, 4.35 A. Used, excellent..... $14.95

CD-307: Extension cord, 6 to 8 feet long, for headsets HS-23, HS-33, etc. PL-55 on one end, JK-46 on other end. Brand new.. **69c**

ANB Receiver: Low-impedance, magnetic type, use as under-pillow speaker.

New, each **39c**

All shipments F.O.B. Chicago or Los Angeles unless specified. 20% Deposit required on all orders. Minimum order accepted $5.00.

California and Illinois residents, please add regular state sales tax to your remittance.

ARROW SALES, INC.

Main Office
1712-14 South Michigan Avenue
Chicago 5, Illinois

North Side Branch
1802 North Humboldt Blvd.
Chicago

West Coast Branch: 1260 South Alvarado, Los Angeles, Calif.

OFFERED AT LOWEST PRICES!

BRAND NEW TUBE

304TL.....ea. 90c
four for $3.00

BLOWER MOTOR

24V AC or DC, small portable with fan, ideal for defroster or ventilator unit, 17,000 RPM. BRAND NEW..... **$1.95**

THE LAZIEST Q-5'er

FL-30. used when flying radio range. RANGE-VOICE-BOTH switch selects 1020 cps pass ONLY, or voice freq. minus 1020 cps. or by-passes filter completely. Put in series with low-impedance head-set when listening to 1 kc MCW or use with adapter for high-impedance output to low impedance phones. BRAND NEW..... **95c**
FL-8 ..... **$1.95**

FILTER CHOKES—All Fully Enclosed

8.7 H. @ 145 MA. DC., 125 ohms DC. Res. 4 MTG. Studs, each..... **59c**
100 mi 10H..... **59c**

APN-1 RADIO ALTIMETER

Complete 420 MC transmitter-receiver unit, complete with all plugs, indicators. BRAND NEW. F.O.B. Chicago, only **$34.50**

BC-929-A

Contains power supply 110 V. 400 cycles, has 7 tubes such as 3CP1 brand new, complete with tubes. Each $17.95; Used. F.O.B. Chicago, only, each..... **$14.95**

R-78/APS-15

Has 45 tubes, one 5" scope tube, one 2" scope tube, has 3 meters, 4 power supply units 110V 400 cycles, complete with tubes. F.O.B. Chicago, only, Each..... **$39.50**

COMPASS RECEIVER MN-26

Remote control commercial type navigational receiver. Indicates direction of any desired transmitting station 3 bands—frequency range: 150 Kc to 1500 Kc. has 12—6 V. type tubes. Brand new, original cost $600. Now **$24.95**

Accessories for Above:

Loop MN-20	$9.25
MN-28 Control Box	7.25
MN-52 Loop Control Unit	4.45
Loop Transmission cable—168" long	9.95
MC-124 Flexible Shaft	2.45
IN-4D Left-right Indicator	9.95
Set of 3 plugs	4.60
MN-40 Navigators Indicator	12.95
AS/138 streamlined loop antenna	10.95

PLUGS YOU NEED

PL-103: For your BC-348 receiver. Fits all models ..... ea. **69c**
PL-59, 60, 61, 62: For BC-375-E or BC-191 ea. **50c**

REMOTE POSITION INDICATING SET

6-12 V. 60 cycles. 5 inch indicator with 0-360° dial. Heavy duty transmitter.

Indicator ..... each	$4.95
Transmitter ..... each	2.95
Set	7.95

HS-33

(Red plug) Low impedance. Used, almost like new. With rubber cushions. 8000 ohms or 200 ohms..... **95c**

POWER YOUR RIG FROM AC

RA-34 RECTIFIER. Makes a ground xmtr of BC-191, the 12V version of BC-375-E. Convert BC-375-E to 12V by changing heater link switches and relay connections, power it with RA-34. Input 105-125 or 210-250V, 60 cy. Outputs: For plates, 1000V filtered dc at 350 ma; for relay and mike, 12V filtered dc at 2.4 A; for heaters, 12V ac at 14.25 A. With tech. manual. Used, excellent condition. F.O.B. Los Angeles, only **$59.75**
With meters and adjustable hi-voltage output **$85.00**

SURPRISE PACKAGE

20 lbs. assorted radio parts—$25.00 Value—only..... **$1.95**

ARB RECEIVER

Famous Navy ARB (CRV46151) receiver, 195-9050 kc. in four bands, 6-tube, 3 microvolt sensitivity, CW or MCW, MVC or AVC, Sharp or Broad selectivity. With 28V dynamotor. A NATURAL FOR MARINE USE or for adaptation to AC power supply. Used, excellent condition. Each **$19.95**
Remote control boxes .....Each **$2.95**

SOCKET FOR 5BP1 OR 5BP4

2Z8681.2 For magnal-based CR tubes. With leads attached. New. Each **95c**

BD-71 ARMY TELEPHONE SWITCHBOARD

Magneto monocord, the simplest type, 6 trunks (loops). Each loop has a cord, a jack, a drop, and a 2-way lever key. Has built-in ringer and head and chest set for operator. Ringing from distant end of a loop operates the drop. Ideal for camps, motels, oil-field or timber operation, etc. Condition; used, good. Price is ridiculously low. F.O.B. Los Angeles, only **$12.95**

BD-72 ARMY TELEPHONE SWITCHBOARD

Same as BD-71 described above, except larger; for 12 trunks. Condition; used, good. F.O.B. Los Angeles, only..... **$19.75**

SCR-625 MINE DETECTOR

Portable, in sturdy suitcase container. Detects metallic objects (ferrous or non-ferrous) to a depth of approx. 6 ft. Find outboard motors on the bottom of resort lakes, locate under-ground piping, etc. Complete with instruction manual. New, in original packing... **$39.95**
Used, excellent condition..... **$29.95**

EE-8 ARMY FIELD TELEPHONE

Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition, used. Each..... **$7.95**

A CATHODE-RAY HONEY

AN/APN-4 Indicator: Uses 5CP1. Loran, convert to test scope, panadapter, etc. Contains extremely accurate 100 kc xtal to time sweeps and marker pips at 2, 20, and 100 kc. Two parallel horizontal sweeps, obtain time differences between signals, between half-power points on pass-band curves, and numerous other scope uses. Experimenters' delight! Use the counter circuits to try the new system of FM demodulation (July Proc. IRE), or to time camera shutters, 25 tubes. Condition; used, excellent. With schematic **$39.95**

ANTENNA MASTS

Each section 38" long, screw together as follows: MS-49 (tip section) into MS-50. MS-50 into MS-51, MS-51 into MS-53 into another MS-53 or into the mounting base. Make as long as you please by adding MS-53's. BRAND NEW, per section..... **35c**
MP-48 vehicular base, ceramic insulator, spring flexing section, fits MS-53..... **$2.45**

AN-23-A ANTENNA

35' 12-strand, all-weather ins. wire, with snap-hook and connector on each end. Hook together for various all-wave hi-gain combinations. F.O.B. Chicago, only **49c**

AN-21 ANTENNA WIRE

100' roll 12-strand all-weather ins. wire. F.O.B. Chicago, only..... **49c**

PIONEER GEN-E-MOTOR

Self-excited, delivers 450 vdc, 100 MA, driven by 18v dc or ac. Long shaft, gear. New, less dust covers on ends. F.O.B. Chicago, only **$1.89**

OIL-FILLED CONDENSERS

Condenser, Pyranol, 2 MFD, 4000 v..... **$2.95**
4x8 with mounting bracket 4" x 2" x 3"..**$1.95**

OIL-FILLED CONDENSERS

.25 MFD at 1500 VDC	59c
2 MFD 220 VAC	29c
.5 MFD at 750V AC	29c
2 X .25 at 2000V DC	29c
3000 MFD at 3V DC (electrolytic)	19c

BEST SURPLUS BUY OF THE YEAR

Receiver, converts to 2, 6, 10 and 11 meters, plus 88-108 mc AM/FM, plus xtal-controlled freq. meter! Independent front-panel dial control for each of 4 rf & osc tuning sections working into a single 2.85 mc IF strip. Self-contained xtal calibrator/heterodyne freq. meter gives choice of 1000 or 100 kc check points incorporating a locked-in multivibrator exceptionally rich in harmonics. used both for transmitter and receiver calibration. For home or mobile or for new aviation VHF channels. Complete with 4" panel speaker, 12v dynamotor and lab-standard 1000 kc xtal. Used, excellent condition, with schematic and complete conversion instructions, only **$34.95**

HEADSET SPECIAL
HIGH-IMPEDANCE UNIT R14

Convert your low-impedance headset to high-impedance. HS-23 by switching to R14 receiver units. New, per pair, F.O.B. Los Angeles, only..... **49c**

A SWEET OSCILLOSCOPE DEAL

ASB-7 Radar Indicator Unit: For conversion to test scope or for use as modulation monitor. Has standard test-scope CR tube, H Cent, V Cent, Bril, Foc, Gain, and range selection switch. External power source was used. Tubes: 4-6AC7, 3-6H6, 1-5BP1. Condition: used, excellent. LOOK AT THIS PRICE; F.O.B. Los Angeles, only..... **$9.95**

RADIO SCHOOL SPECIAL

BD-57-A code practice switchboard. Has built-in motor alternator supplying 400 cycle tone for up to twenty student positions. All cords and plugs supplied. F.O.B. Chicago, only..... **$12.50**

RADAR TRANSMITTER

ASB-7: Airborne search unit, 0-70 miles, 515 mc. External power supply was used. Condition: used, excellent. F.O.B. Los Angeles, only **$12.95**

AS-97

Whip type, solid steel antenna with RF matching transformer, ideal for mobile 10-meter job. BRAND NEW ..... $1.49 ea.
3 for **$4.00**

GEARED TUNING DIAL

5 Band vernier, brand new, ideal for many applications, an exceptional buy.. **$1.39**

It's Here!

Our NEW 8-page catalog featuring many excellent surplus values! Write for your copy today!

IT'S FREE!

All shipments F.O.B. Chicago or Los Angeles unless specified. 20% Deposit required on all orders. Minimum order accepted $5.00. California and Illinois residents, please add regular state sales tax to your remittance.

ARROW SALES, INC.

Main Office
1712-14 South Michigan Avenue
Chicago 5, Illinois

North Side Branch
1802 North Humboldt Blvd.
Chicago

West Coast Branch: 1260 South Alvarado, Los Angeles, Calif.

DO YOU KNOW?

By DAVID SCOTT

16. What is meant by linear displacement?

A. *Linear displacement occurs when a whole line in the image is displaced bodily with respect to the rest of the pattern. Linear displacement may be controlled by proper design and adjustment of circuits used in the deflection beams of transmitter and receiver. The amplitude, duration, and timing of each cycle must be the same as those preceding it. This brings in the need for sync signal.*

17. What is meant by non-linearity of scanning?

A. *Non-linearity of scanning arises from an inconstant speed of the scanning spot as it moves across the line. If the transmitter scanning spot moves faster than the receiver's scanning spot, then the received picture elements will be bunched. If the received spot is faster, the received elements will be spread. This defect is controlled through the design and adjustment of the deflecting current or voltage generators.*

18. What is the result of non-linearity in the vertical displacement circuit?

A. *Non-linearity of the downward motion of the scanning spot causes some lines to be spread further apart than other lines.*

19. What is the effect of power supply ripple voltage on vertical deflection?

A. *120 cycle power supply ripple voltage superimposed on the vertical deflection voltage causes alternate bunching and spreading of the lines.*

20. What is the effect of power supply ripple voltage on horizontal deflection?

A. *120 cycle ripple voltage superimposed on the horizontal scanning voltage causes a displacement of lines so that they do not square evenly.*

21. What is the result of changes in the horizontal scanning amplitude?

A. *Changes in the horizontal scanning amplitude cause distortion.*

22. What is meant by pairing?

A. *Pairing is caused by one field not fitting accurately into the spaces left it by preceding field. Pairing may be partial or complete. Pairing is the result of inaccurate timing in the vertical displacement circuit.*

23. What is meant by rotary disc scanning?

A. *Rotary disc scanning is the process of scanning an object through a rotating disc with concentrically punched holes so that different portions of the image are focused on a photoelectric tube at a time.*

24. What are the drawbacks of rotary disc scanning?

A. *Drawbacks are: 1. Moving mechanical parts; 2. High illumination is necessary; 3. Low definition; 4. Low output.*

25. What are the efficiency reducing factors of the iconoscope?

A. *Efficiency reducing factors of the iconoscope are: 1. Not all of the stored charge is passed on to the amplifier; 2. The photoelectrical emission of the charge is limited by the low value of the electric field at the surface of the mosaic.*

26. Define the power density of a scanning beam.

A. *Power density is the factor concerning the number and energy of electrons in the scanning beam. Power density is equal to the number of microamperes per square centimeter of cross sectional area in the beam multiplied by the voltage drop through which the beam passes. Power density is measured in watts per square centimeter.*

27. What is gamma?

A. *Gamma is the figure of merit comparing the over-all tonal contrast of the picture elements existing in the received picture as compared to the original scene.*

(To be continued)

SCR 610 11-10 METER PORTABLE/MOBILE RIG

SCR 610 portable transmitter-receiver, 27 to 38.9 mc. crystal controlled, using FM for efficient operation. Unit consists of Xmtr-revr BC 659 and power supply PE 97 . . . operating from 6 to 12 vdc. Slightly used, excellent condition. Less Xtals, Antenna **$25.00**

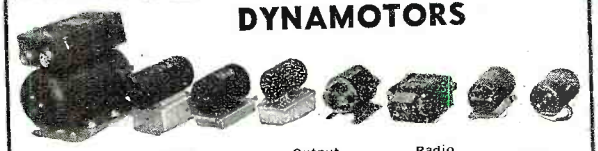
MINE DETECTOR

Model AN/PRS-1 Detector will detect buried Metallic and Non-metallic objects, such as: rocks, pipes, water pockets, etc. Ideal for home owners, campers, prospectors. Uses meter and phones for visual and aural indication. Price: New, including detector, amplifier, phones, resonator, and all cables..... **$12.75**
With Batteries 21.65

AUTOMATIC CODE EQUIPMENT

TAPE PULLERS (McElroy): TP 890, 110-120 v. AC-DC..... **$12.50** ea.
TAPE BRIDGES (McElroy): TG 815, complete **$3.50**
TAPE LOOPS:
For TG-8 and TG-9..... **1.00**
BLANK CODE TAPE: 4" rolls, ¼" wide. Per roll..... **$.15**

DYNAMOTORS



Type	Input Volts	Input Amps	Output Volts	Output Amps	Radio Set	Price
BD 77KM	14	40	1000	.350	BC 191	$20.00N
						14.00LN
PE 73	28	19	1000	.350	BC 375	24.50N
DM 21	14	3.3	235	.090	BC 312	3.45N
DM 21CX	28	1.6	235	.090	BC 312	3.45N
DM 25	12	2.3	250	.050	BC 367	2.49LN
DM 28R	28	1.25	275	.070	BC 348	8.75N
DM 33	28	7	540	.250	BC 456	5.50
DM 42	14	46	515	.110	SCR 506	6.50LN
			1030	.050		
			2 28			14.95N
D 104	12		225	.100		
			440	.200	SCR 522	8.95N
DA 3A*	28	10	300	.260		
			150	.010		
			14.5 5		APN 1	3.95N
#5053	28	1.4	250	.060	TA 21	25.00N
DA 7A	26.5		1100	.400	SCR 245	5.25LN
PE 55	12	25	500	.400	RC 36	3.95N
PE 86	28	1.25	250	.060	SCR 515	5.25N
PE 101C	13/26	12.6/ 6.3	400	.135		
			800	.020		
			9 AC	1.12		4.95N
BD AR 93	28	3.25	375	.150	APN-1	3.50N
23350	27	1.75	285	.075		3.50N
35X045B	28	1.2	250	.060		3.95N
ZA .0515	12/24	1/2	500	.050	Mark II	
B-19 pack	12	9.4	275	.110		9.95N
			500	.050		

* N—New
LN—Like New
#Part of PE 94, less Filter Box, Relays.

30' U.S. ARMY SIGNAL CORPS RADIO MASTS

Complete set for the erection of a full flat top antenna. Of rugged plymold construction telescoping into 3 ten-foot sections for easy stowage and transportation. A perfect set-up for getting out. Supplied complete: 2 complete masts, hardware, shipping crate. Shipping wt. approx. 300 lbs. Sig Corps #2A289-223-A. New ..... Per set **$39.50**

INSTRUCTION MANUALS

BC 312, BC 342..... **$1.25**
SCR 281 ..... $1.25
BC 460 ..... 1.00
Mark II 1.00
SCR 508 ..... 1.50
SX-32 ..... 1.00

XMTR TUNING UNITS

For BC 610; TU-47 (2-2.5 mc.); TU-48 (2.5-3 mc); TU-53 (812 mc). Each..... **$1.75**
For BC 223AX; TU-17 (2-3 mc); TU-18 (3-4.5 mc). Each **$1.95**
BC 306-A, Antenna Loading unit for BC 375 & BC 191 ..... **$2.75**
6-section ceramic capacitor, 10 -460 mmf, 400 vdc originally used for collins ART-13 xmtr. ..... **$.69**

HEADSETS

Dynamic mike and headset combination. A high quality, efficient unit, used in B-19 tank Xmtrs. Mike and phones complete, new **$2.75**
R-15 headsets: 8000 ohms impedance, rubber cushions. Comes with 5' cord and plug PL 55. New..... **$2.95**

MICROWAVE GENERATORS

AN/APS-15A "X" Band compl. RF head and modulator, incl. 725-A magnetron and magnet, two 723A/B klystrons (local osc. & beacon), 1B24 TR, revr-ampl., duplexer, HV supply, blower, pulse xmtr. Peak Pwr Out: 45 KW apx. Input: 115v. 400 cy. Modulator pulse duration .5 to 2 microsec. apx. 13 KV Pk Pulse. Compl with all tubes incl. 715-B, 829B, RKR 73, two 72's. Compl pkg, new **$210.00**
APS-15B. Complete pkg. as above, less modulator **$150.00**
"S" BAND AN/APS-2. Complete RF head and modulator, including magnetron and magnet, 417-A mixer, TR, receiver, duplexer, blower, etc., and complete pulser. With tubes, used, fair condition **$75.00**
10 CM, RF Package. Consists of: SO Xmtr.-receiver using 2J27 magnetron oscillator, 250 KW peak input. 707-B receiver-mixer..... **$150.00**
Modulator-motor-alternator unit for above.. 75.00
Receiver-rectifier power unit for above..... 25.00
Rotating antenna with parabolic reflector for above. New... 75.00

MAGNETRONS

2J41 magnetron-magnet-stabilizer pkg. 9290-9330 mc. 1.25 KW Pk Pulse Output Power. 100 mc tuning range possible. Refer Rad. Lab. Series Vol. 6, pg. 766...**$75.00** (As shown)

TUBE	FRQ. RANGE	PK. PWR. OUT.	PRICE
2J31	2820-2860 mc.	265 KW.	$25.00
2J21-A	9345-9405 mc.	50 KW.	25.00
2J22	3267-3333 mc.	265 KW.	25.00
2J26	2992-3019 mc.	275 KW.	25.00
2J27	2965-2992 mc.	275 KW.	25.00
2J32	2780-2820 mc.	285 KW.	25.00
2J38 Pkg.	3249-3263 mc.	5 KW.	25.00
2J39 Pkg.	3267-3333 mc.	87 KW.	25.00
2J55 Pkg.	9345-9405 mc.	50 KW.	65.00
2J61	3000-3100 mc.	35 KW.	65.00
2J62	2914-3010 mc.	35 KW.	55.00
3J31	24,000 mc.	50 KW.	39.50
5J30			25.00
714AY			50.00
720BY	2800 mc.	1000 KW.	50.00
720CY			25.00
725-A	9345-9405 mc.	50 KW.	25.00
730-A	9345-9405 mc.	50 KW.	20.00

Klystrons: 723A/B, $12.50; 707B W/Cavity

MAGNETRON MAGNETS

GAUSS	POLE DIAM.	SPACING	PRICE
4850	¾ in.	⅝ in.	$12.50
2500	1⅝ in.	1 11/16 in.	12.50
1500	1⅝ in.	1½ in.	12.50

TUNABLE PKG'D "CW" MAGNETRONS

QK61.....2975-3200 Mcs QK62.....3150-3375 Mcs
QK60.....2800-3026 Mcs QK59.....2675-2900 Mcs
Now ..... **$65.00** Each

RADAR SETS

RC 145 IFF SET. Consists of BC 1267 xmtr-revr, remote antenna controller and indicator I-221, power supply RA 105-A. 1 kw. pulse oscillator operates on 154-186 mc. Operates from 117 v., 60 cy. New.....**$190.00**

SN RADAR-GE, low power, 5 and 25 miles ranges. Uses GL446 as pulsed oscillator. 5" "A" scope. "S" band. Extremely compact, ideal for demonstration and laboratory work. 115V 60 cy. operation.
Used. Excel. cond. **$600.00**

SE 10 CM. SURFACE SEARCH RADAR, W.E., 20,000 to 80,000 yds. range. 250 KW. pk. power input to 706 magnetron. Thyratron modulator, variable pulse rate. Complete set including spare parts, tubes, waveguide and fittings. Send for price and additional information.

RBSTPL-1 RADAR RCVR. Sperry.....**$85.00**

TBK-19 500 Watt Navy Transmitters, 2-18 mc. Available: 10 New Transmitters, 5 Motor Generator Sets, 220/440 VAC.; 3 Modulator Units for Phone Operation; 50 Spare Oscillator Units. *Send for Information.*

GREAT TUBE VALUES!

01-A	$ .45	7E5	$ 1.00	836	$ 1.15
1B24	4.85	7E6	.72	837	1.95
1H5	.55	10Y	.60	843	.59
1N5	.69	12A6	.35	860	15.00
1T4	.69	12GF7	14.95	861	40.00
2C21	.69	12K8Y	.65	874	1.95
2C22	.69	12SF7	.49	876	4.95
2J21-A	25.00	12SR7	.72	1005	.35
2J22	25.00	15R	1.40	1613	.15
2J26	25.00	28D7	.75	1619	.21
2J27	25.00	30 (Spec.)	.70	1624	.85
2J31	25.00	45 (Spec.)	.59	1629	.35
2J32	25.00	39/44	.49	1961	5.00
2J38	25.00	35/51	.72	8012	3.95
2J39	25.00	227A	3.85	9002	.65
2J55	25.00	225	8.80	9004	.47
3J31	55.00	268-A	20.00	CEQ 72	1.95
2X2/879	.69	355-A	19.50	EF 50	.79
3BP1	2.25	417A	22.50	F-127	20.00
3C24	.50	530	90.00	FC 258A	165.00
3C30	.70	531	45.00	FC 271	40.00
3D6	.79	532	3.95	GL 562	75.00
3CP1/S1	3.50	559	4.00	GL 623	75.00
3D21-A	1.50	562	90.00	GL 697	75.00
3DP1	2.25	615	.89	ML 100	60.00
3EP1	2.95	703-A	7.00	QK 59	65.00
3FP7	1.20	704-A	.75	QK 60	65.00
3GP1	3.50	705-A	2.85	QK 61	65.00
3Q5	.79	†707-B	20.00	QK 62	65.00
5BP1	1.20	714AY	25.00	*RCA 932	.65
5BP4	4.95	715-B	12.00	VR 91	1.00
5CP1	3.75	720BY	50.00	VR 130	1.25
5FP7	3.50	720CY	50.00	VR 135	1.25
5JP2	8.00	721-A	3.50	VR 137	1.25
5J30	39.50	723-A/B	12.50	VU 120	1.00
6AC7	1.00	724B	1.75	VU 134	1.00
6C4	.58	725-A	25.00	WL 532	4.75
6G	2.00	726-A	15.00	WN 150	3.00
6K7	.55	800	2.25	WT 260	5.00
6L6GA	1.00	801-A	1.10	†with cavity:	
6SC7	.70	804	9.95	Cavity only	5.00
6SL7	1.00	815	2.50	*Photocell	
6V6	.79				
7C4	1.00				

1619 1619 1619

TYPICAL OPERATION CHARACTERISTICS

Filament.....2.5 v. at 2 Amps. Octal Base

	CLASS C RF AMP (TELEG.)	CLASS AB2 AUDIO (2 TUBES PP)
PLATE VOLTS	400	400
SCREEN VOLTAGE	300	300
PLATE CURRENT	75 ma	75/150 ma
SCREEN CURRENT	10.5 ma	6.5/11.5 ma
GRID VOLTAGE	−55	−16.5
GRID CURRENT	5 ma	.4 W
GRID DRIVE	.36 W	36 W
POWER OUTPUT	19.5 W	

While they last.....**$.21 ea. or 5 for $1.00**

MICROWAVE TEST EQUIPMENT

TS-238 GP. 10 cm. Echo box with resonance indicator and micrometer adjust cavity. 2700 to 2900 Mcs calibrated..**$85.00**
TS 108-AP dummy load.... 65.00
"X" Band calibrated attenuator **$85.00**
Shielded klystron tube mounts with rough attenuator outputs **$90.00**
W. E. I 138. Signal generator, 2700 to 2900 Mc range. Lighthouse tube oscillator with attenuator & output meter. 115 VAC input. reg. Pwr. supply. With circuit diagram....**$50.00**
3 cm. wavemeter: 9200 to 11,000 mc transmission type with square flanges..... **$15.00**
3 cm. stabilizer cavity, transmission type..... 20.00
3 cm. wavemeter, micrometer head mounted on X-Band guide. Freq. range approx. 7900 to 10,000 Mc. .$75.00

30 MC I.F. STRIPS

Overall gain: 25 db. or more
Bandwidth: 4 plus or minus .4 mc @ 3 db. down.
Center freq: 30 plus or minus .5 mc.
Current drain: 30 plus or minus 5 ma.
New, less tubes..... **$17.50**

INVERTER PE 218

Input: 27.5 V DC, 90 AMPS
Output: 115 V AC, 400 CY, 13 AMPS
1500 Volt—Amperes .9 PF
MFR. BALLANTINE
New, Original Packing **$49.95**
Slightly used, ex. cond. **25.00**
Also available: PE 206. 800CY, 115 V. New **$15.75**

COAX CABLE

RG 17/U. 52 ohm imp. ..... **$.50/ft.**
RG 18/U. 52 ohm imp. armored ..... **.51/ft.**
RG 23/U. Twin coax. 125 ohm imp. armored ..... **.50/ft.**
RG 28/U. 50 ohm imp. pulse cable. Corona min. starting voltage 17 KV ..... **.50/ft.**
RG 35/U. 70 ohm imp. armored ..... **.50/ft.**
RG 57/U. 95 ohm imp. twin coax ..... **.35/ft.**

COAX CONNECTORS

831SP	$.35	UG 254/U	$ .75
831AP	.35	UG 255/U	1.25
831HP	.15	UG 146/U	1.00
UG 21/U	.85	UG 85/U	1.25
UG 86 U	.95		

Homedeil male to type "N" male adapter **1.25**

VARISTORS W.E.

D-171631	$ .95	D-168549	$ .95
D-167176	.95	D-162482	3.00
D-168687	.95	D-99136	1.65
D-171812	.95	D-166271	2.50
D-171328	.95	D-162356	1.50
D-163298	.95	D-161871A	2.85

THERMISTORS—W.E.

D-167332 (bead)	$.95	D-164699	FOR MTG. in "X" Band Guide $2.50
D-170306 (bead)	.95		
D-167613 (button)	.95	D-167018 (tube)	.95
D-166228 (button)	.95		

POWER EQUIPMENT

Plate Xfmr: 115 v., 60 cy. Tapped to give 2750, 2470, or 2240 v. on Sec., 750 ma. No C.T. 7 KV INS..**$34.50**
Step down transformer: Pri: 440/220/110 volts a.c. 60 cycles, 3 KVA. Sec. 115 v. 2500 volt insulation. Size 12"x12"x7" **$40.00**
PLATE TRANSFORMER. Pri: 117 v. 60 cy. Sec. 17,000 v. @ 144 ma. with choke. Oil immersed. Size: 26"x 29"x19" Amertran **$120.00**
Fil. Transformer: Pri: 220 v.a.c., 60 cy.: .05KVA, sec.: 5 v.c.t., 34,000 v. test. **$24.50**
Fil. Trans. UX6899 Pri: 115 v. 60 cy. Sec: Two 5V 5.5A windings 20 KV Test..... **$24.50**
Voltage Reg. Transtat "Amertram" type RH 2KVA load. Input 90/130 v. 50/60 cycle output 115 v.... **$40.00**
KS 8767: Fil. Xfmr. Pri: 115 v. 60 cy. Sec: 2 wdgs 5v. at 5 amp each. 15,000 v. ins. **$15.00**

COMBINATION TRANSFORMERS

(All primaries 117 v., 60 cy)

T2G167. 650 v. 2 ma; 650 vct 65 ma; 6.4 v, 4 amp; 6.4 v. .6 amp; 2.5 v. 1.75 amp. (Ideal for panadapter applications) **$5.25**
#5104. 800 vct, 150 ma: 5 v 3 amp; 6.3 v. 6 amp **$6.95**
KS 8931, 585 vct. 86 ma: 5 v. 3 amp; 6.3 v. 6 amp **$4.25**

OIL CONDENSER STANDARD BRANDS

.1 mfd. 10 KVDC #14F191..... **$15.00**
.06 mfd. 15 KVDC. 25F585-G2..... **8.70**
1.5 mfd. 6000 vdc..... **12.50**
.25 mfd. 20,000 vdc..... **17.50**
10 mfd. 1000 VDC..... **1.79**
3x10 mfd. delta connected synchro-capacitor, 90 v 60 cycles **4.95**
.1 mfd. 6000 vdc. 25F509G2..... **6.50**

VIBRATORS

TR 1210, 12 vdc, 5 pin..... **$1.00**
OAK V-6675, 24-32 vdc, 7 pin..... **1.00**
Mal. Type 6534C, 12 vdc, 5 pin..... **1.00**
Mal. Type G629-C, 12 vdc, 4 pin..... **1.00**
Radiaart VR2, 6 v, DC, 6-pin special..... **1.00**
Mfrs. quantities in all types available.

6-VOLT RELAY PANELS

Comes complete with 5 relays mounted on bakelite panel with 25 terminals:
1—SPST (NC) 1—DPST (NO)
1—SPST (NO) 2—DPST (Make 1, break 1)
Board Dim: 10" lg x 6" W x 25/8" H..... **$9.95**

CARBON PILE VOLTAGE REGULATORS

Type "A": Coil current .105 to .115 amp, 80 volts, Leland Electric..... **$3.00**
Type "C" Input: 22-30 v. coil, 30 amps. Output: 19 v, 5.7 amps. Spec. # VR9000-2c. Leland Electric (as shown) **$3.00**
#35X045B: 22v. .1 to 3 amps. for K-4B Gunsight. Webster...**$3.00**

131-N. Liberty St. New York 7, N. Y.

All merchandise guaranteed. Mail orders promptly filled. All prices, F.O.B. New York City. Send Money Order or Check. Shipping charges sent C.O.D. Rated Concerns Send P. O.

COMMUNICATIONS EQUIPMENT CO.

PHONE DIGBY 9-4124

of the incoming signal and, yet, to maintain the over-all bias at a negative potential.

A second voltage applied to the grid of the a.g.c. amplifier is obtained from the horizontal deflection system. This voltage is amplified in the 7B6 and then rectified by the diode section of the same tube. It is this rectified voltage which is finally employed as the a.g.c. voltage to control the gain of the r.f., input i.f., and 1st video i.f. amplifiers.

When the signal level increases, the a.g.c. rectifier develops more voltage across C_1 and R_1. This means more positive voltage for the a.g.c. amplifier (7B6) and a greater output from this tube because of the increased gain. The horizontal deflection voltage fed into the tube remains constant and a more positive bias for the tube will produce a greater output. This means more rectified a.g.c. voltage fed to the controlled stages. However, since the final a.g.c. voltage is negative, the gain of the controlled stages decreases, counteracting the increased video signal and reducing the output to the normal level.

When the video signal decreases, less positive voltage appears across C_1 and R_1 and the a.g.c. amplifier bias becomes correspondingly more negative. Less gain in this tube provides less voltage at its output and the negative a.g.c. voltage decreases. As a result, the gain of the controlled stages rises and the signal level is again brought back to the normal level.

Whereas in previous a.g.c. systems, the output of C_1 and R_1 was used as the controlling a.g.c. voltage, here it is used to control the bias of the a.g.c. amplifier. The final product of both systems is the same but this arrangement is more sensitive to carrier changes because of the addition of the amplifier. A divider network at the output of the diode section of the 7B6 feeds less a.g.c. voltage to the r.f. amplifier than to the i.f. stages. The potentiometer in the a.g.c. system permits the system to be adjusted for maximum sensitivity.

Probably the most elaborate a.g.c. system currently in use is that employed in the *RCA* television projection receivers. This is shown in Fig. 9. A portion of the video signal output of the fourth video i.f. amplifier is fed to the 6AL5 a.g.c. detector. Since the time constant of the diode load resistor (R_1) and condenser (C_1) is somewhat longer than one horizontal line, only the peak sync pulses are effective in developing a voltage across this combination.

The —110 volts is applied equally to the plate and cathode of V_1 and consequently has no effect upon the operation of this tube.

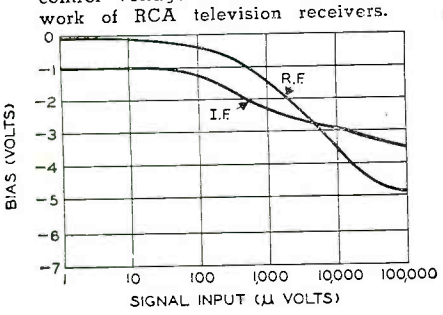
The voltage developed across R_1, C_1 is fed to the a.g.c. amplifier. Across

this path, however, we find two diodes designed as a two-stage clipper or noise-limiting network. Their purpose is to prevent noise pulses from seriously affecting this system. All television a.g.c. systems operate on the peak of the incoming signal and ordinarily this is the position of the synchronizing pulses. However, a sharp impulse of noise can extend even beyond these pulses and cause the system to react to it. In the *RCA* system, the double diodes provide a low resistance path across C_1 and R_1 whenever noise pulses are present. In this manner they prevent C_1 from charging to the peak value of the noise pulses. As soon as the noise passes, the normal sync pulses assume immediate control of the circuit. Without the diodes, C_1 and R_1 would charge to the peak value of the pulse and maintain this condition until C_1 returned to its normal level. How long this would take would depend upon the charge placed across C_1 by the noise pulse and the time constant of C_1 and R_1. Under extreme conditions, this excessive voltage might cause the receiver to become insensitive for as long as 10 horizontal lines. The visual effect would be 10 dark lines (appearing as a dark bar across the picture).

Under normal conditions, the plates of the diodes have a greater negative voltage than their cathodes. As a result, the diodes are non-conductive and the voltage developed across C_1, R_1 is transferred to V_3. However, when a large noise pulse arrives, the positive voltage developed across R_1, C_1 is great enough to lower the —110 volts reaching the plates of the diodes to the point where their plate voltage is less negative (or, what is the same thing, more positive) than their cathode voltage. At this moment the diodes conduct, shunting their low resistance across R_1, C_1 and preventing any large amount of voltage from developing here. When the noise impulse has passed, the diodes once again become non-conductive, permitting the normal voltage variations from R_1, C_1, to reach V_3. For additional protection against noise, the integrating network of R_2, C_2 acts to remove the effects of any noise impulses.

Thus, the only voltages which will affect the circuit are the normal variations in sync pulse levels due to changes in carrier amplitude. These are the changes to which we desire the circuit to respond.

Fig. 10. The signal input versus bias control voltage for the a.g.c. network of RCA television receivers.



The d.c. voltage at the cathode of V_3 is obtained from the voltage drop across R_3 and the center arm of the contrast control. With a weak signal input, this bias is sufficient to reduce the plate current of V_3 close to cut-off, causing the plate voltage to approach ground potential. (Note: Enough current flows so that the negative voltage developed across R_4 and R_5 counteracts the +30 volts applied to R_5). The r.f. bias voltage, obtained from the junction of R_1 and R_5 is zero volts and the i.f. bias to −1 volt. These biasing voltages permit the receiver to operate at maximum gain under weak signal conditions.

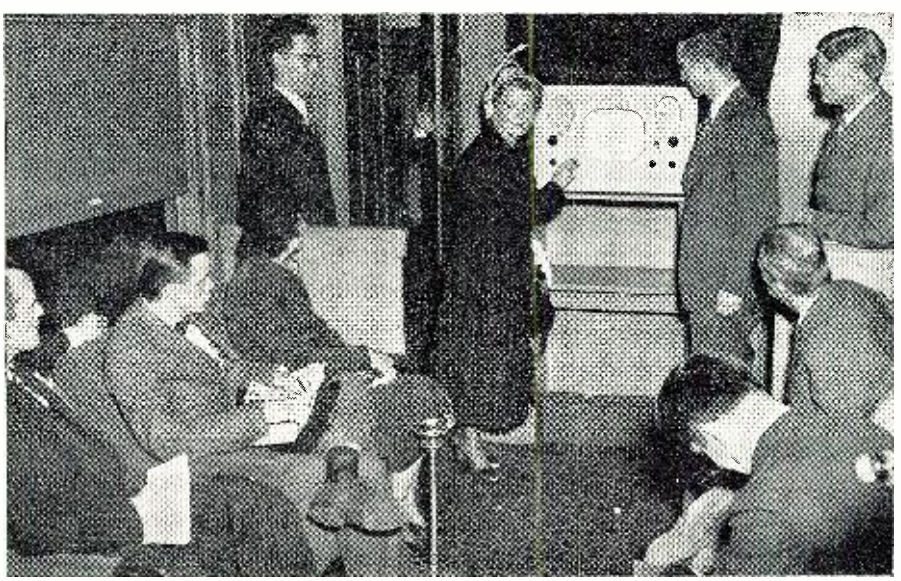
Upon the arrival of a strong signal, an increased positive voltage is developed across R_1, C_1. This causes V_3 to conduct more strongly, forcing the voltage across R_4 and R_5 to become more negative. (In any tube, whenever the plate current increases, the negative voltage across its plate load resistors likewise increases.) This drives the r.f. and i.f. bias voltages more negative, the precise amount dependent upon the strength of the signal. See Fig. 10.

The bias versus signal input chart (Fig. 10) indicates that the r.f. bias is lower than the i.f. bias up to signal inputs of approximately 8500 microvolts. Beyond this, the r.f. bias increases more rapidly while the i.f. bias tends to taper off, finally reaching −4 volts at extreme signal strengths. This particular design was chosen in order to obtain the maximum signal-to-noise ratio from the receiver. The r.f. stage is permitted to function at full gain on all relatively weak signals. At the same time the i.f. bias is gradually increased to prevent these stages from overloading. On strong signals both i.f. and r.f. bias voltages rise fairly rapidly. On very strong signals more bias voltage is applied to the r.f. tubes because more negative voltage is required to bring them to cut-off. In *RCA* television receivers, triodes are employed in the r.f. stage. Now, although the triodes are not generally classified as remote cut-off tubes, sufficient curvature is present to require a fairly high negative voltage for cut-off.

The behavior of the i.f. bias voltage is governed somewhat by the presence of V_4. The plate of this tube has a potential of approximately −2.5 volts and will not conduct until its cathode voltage becomes more negative than this. The cathode voltage, in turn, is determined essentially by the plate voltage of V_3, being connected to it through R_6. With an input signal of 1000 microvolts, the plate potential of V_3 is approximately −2 volts and V_4 remains non-conductive. When the input level rises to 10,000 microvolts, the plate voltage of V_3 becomes −5 volts. Now V_4 will conduct because its plate is 2.5 volts more positive than its cathode. Due to the voltage drop in R_6, the i.f. bias rises only to −3 volts. With increasing signal strength, the i.f. bias gradually approaches −4 volts. When V_4 conducts, it shunts R_7, throwing an additional load across R_4 and R_5 and preventing the i.f. bias from becoming too highly negative.

The setting of the contrast control determines the initial d.c. bias applied to the grid of V_3. If the negative d.c. bias voltage to V_3 is increased, the set operates with greater gain because the i.f. and r.f. bias voltages are less negative. With more gain, a stronger signal will reach the cathode-ray tube and produce greater contrast in the picture. *(To be continued)*

The second game of the World Series was witnessed by a group of newspaper and magazine writers on the Baltimore and Ohio train from Washington to New York. Shown at the receiver is Miss Frieda Hennock, member of the Federal Communications Commission, and right, J. H. Wallis, communications engineer of the B & O, and Frank R. Norton, television engineer for Bendix Radio. Fairly satisfactory reception was reported by viewers with best pictures when the train was either standing or traveling at high speeds. At moderate speeds, fluctuations in signal strength and slow passage of objects caused interference and heavy flicker.



ANNOUNCING!
THE OPENING OF OUR NEW LARGER QUARTERS AT 189 GREENWICH ST., N. Y. 7
(STREET LEVEL STORE)

R-H-S
SPECIALS OF THE MONTH

ANNOUNCING!
Greater Values Than Ever Before In Our New Larger Store At 189 Greenwich St., N. Y. 7
(Come In And Browse Around)

1 K.W. POWER SUPPLY KIT

2500-0-2500 Volts @ 500 MA
or
2000-0-200 Volts @ 500 MA
(oil-filled Xformer from BC610) ..$39.95
1—Swinging choke..... 14.95
1—Smoothing choke..... 7.95
1—Filament Xformer..... 9.95
2—2 Mfd.—3000v Condensers, ...each 3.45
2—872A Tubes.....each 1.95
2—Plate Caps for 872A...each .20
2—Sockets for 872A.....each 1.19
2—Hash Filter Chokes.... pr. .79
All Parts New! Reduced to $79.50

SELENIUM RECTIFIERS
Full Wave Bridge Type

INPUT	OUTPUT		
up to 18v AC	up to 12v DC	½ Amp.	$0.98
up to 18v AC	up to 12v DC	1 Amp.	1.95
up to 18v AC	up to 12v DC	5 Amp.	4.45
up to 18v AC	up to 12v DC	10 Amp.	7.45
up to 18v AC	up to 12v DC	15 Amp.	9.95
up to 18v AC	up to 12v DC	30 Amp.	14.95
up to 36v AC	up to 28v DC	1 Amp.	3.45
up to 36v AC	up to 28v DC	5 Amp.	7.45
up to 36v AC	up to 28v DC	10 Amp.	12.45
up to 36v AC	up to 28v DC	15 Amp.	18.95
up to 115v AC	up to 100v DC	.25 Amp.	2.95
up to 115v AC	up to 100v DC	.6 Amp.	6.95
up to 115v AC	up to 100v DC	5 Amp.	19.95
up to 115v AC	up to 100v DC	3 Amp.	12.95

OIL CONDENSERS
NATIONALLY ADVERTISED BRANDS
All Ratings D. C.

2x.1mfd.	600v	$0.35	1mfd.	2000v	$0.95
.25mfd.	600v	.35	2mfd.	2000v	1.75
.5mfd.	600v	.35	4mfd.	2000v	3.75
1mfd.	600v	.35	15mfd.	2000v	4.95
2mfd.	600v	.35	4mfd.	2500v	3.98
4mfd.	600v	.60	2mfd.	2500v	2.49
8mfd.	600v	1.10	.1mfd.	2500v	1.25
10mfd.	600v	1.15	.25mfd.	2500v	1.45
3x.1mfd.	1000v	.45	.5mfd.	2500v	1.75
.25mfd.	1000v	.45	.05mfd.	3000v	1.95
1mfd.	1000v	.60	.1mfd.	3000v	2.25
2mfd.	1000v	.70	.25mfd.	3000v	2.65
4mfd.	1000v	.90	1mfd.	3000v	3.50
8mfd.	1000v	1.95	12mfd.	3000v	6.95
10mfd.	1000v	2.10	2mfd.	4000v	5.95
15mfd.	1000v	2.25	1mfd.	5000v	4.95
20mfd.	1000v	2.95	.1mfd.	7000v	2.95
24mfd.	1500v	6.95	3mfd.	4000v	6.95
.1mfd.	1750v	.89	2mfd.	3000v	3.45
.1mfd.	2000v	.95	2x.1mfd.	7000v	3.25
.25mfd.	2000v	1.05	.02mfd.	12000v	9.95
.5mfd.	2000v	1.15	.02mfd.	20000v	11.95

HIGH CAPACITY CONDENSERS

10,000 mfd.—25 WVDC	$6.95
2x3500 mfd.—25 WVDC	3.45
2500 mfd.—3 VDC	.39
3000 mfd.—25 WVDC	2.49
2x1250 mfd.—10 VDC	1.25
1000 mfd.—15 WVDC	.99
200 mfd.—35 VDC	.59
100 mfd.—50 WVDC	.49
4x10 mfd.—400 VDC	.89
4000 mfd.—18 WVDC	1.95
4000 mfd.—25 WVDC	2.95
4000 mfd.—30 WVDC	3.25

FILTER CHOKES
HI-VOLTAGE INSULATION

8 hy @ 550 ma.	$7.95	325 hy @ 3 ma.	$3.45
8 hy @ 300 ma.	3.95	1 hy @ 800 ma.	14.99
25 hy @ 160 ma.	3.49	10 hy @ 250 ma.	2.45
12 hy @ 050 ma.	2.25	10 hy @ 200 ma.	1.98
30 hy @ 70 ma.	1.39	10/20 @ 85 ma.	1.59
.05 hy @ 15 amps.	7.95	15 hy @ 125 ma.	1.49
.1 hy @ 5 amps.	6.95	15 hy @ 100 ma.	1.39
4 hy @ 600 ma.	5.95	3 hy @ 50 ma.	.29
200 hy @ 10 ma.	3.49	30 hy Dual @ 20 ma.	1.49
600 hy @ 3 ma.	3.49	8/30 hy @ 250 ma.	3.50
.065 hy @ 2.5A	2.49	10 hy @ 100 ma.	1.29

RADIO TUBES
NEW! STANDARD BRANDS!

1B24	$5.95	726A	$4.50	1Q5GT	$ .95
1B26	4.95	800	1.69	1R5	.79
1B29	.89	801A	.49	1S4	.69
1N21	.59	802	2.95	1S5	.59
1N23	.59	803	3.75	1T4	.59
1N34	1.60	805	3.95	3Q4	.59
1P24	.89	807	1.19	3Q5	.69
2AP1	2.39	808	1.95	3S4	.59
2C22	.19	809	1.98	5Y4GT	.49
2C26	.29	810	4.89	6A7	.59
2C40	.74	811	1.49	6A8GT	.59
2C44	1.29	812	1.39	6AG5	.79
2C46	3.75	813	5.25	6AG7	.98
2D21	1.19	814	2.75	6B4G	.95
2J21	12.45	815	1.45	6BG6G	1.49
2J22	12.95	816	1.10	6C6	.49
2J26	9.95	826	.49	6D6	.49
2J31	11.49	829B	2.89	6F5GT	.49
2J32	14.75	832A	2.49	6F6GT	.49
2J36	24.95	833A	29.50	6F6	.59
2J37	18.95	836	.79	6H6GT	.39
2J38	14.75	837	1.49	6J5GT	.42
2J39	18.95	838	2.95	6J5	.55
2J40	18.95	841	.50	6J7GT	.55
2J46	18.95	843	.39	6K6GT	.49
2J49	26.95	845	3.29	6K7GT	.55
2J51	69.50	851	12.95	6L6G	.95
2J54B	18.95	860	1.98	6L6	1.23
2J55	18.95	861	11.95	6L7	.79
2K25	24.95	865	.79	6Q7GT	.55
2K28	6.95	866A	.85	6SA7GT	.49
2V3G	.79	866JR	1.10	6SC7	.55
2X2	.27	869B	18.75	6SF5GT	.59
3AP1	2.39	874	.69	6SH7	.49
3BP1	1.39	876	.39	6SJ7GT	.49
3B22	.59	878	1.29	6SK7GT	.49
3B24	.69	884	.79	6SL7GT	.59
3B26	.89	885	.78	6SN7GT	.59
3CP1	2.95	902P1	5.95	6SQ7GT	.49
3C22	19.95	905	4.95	6V6GT	.59
3C23	2.49	923	.69	6X5GT	.59
3C24	.29	954	.24	7A8	.69
3C30	.59	955	.35	7B7	.69
3C31	1.49	956	.45	7C5	.59
3DP1	2.25	957	.24	7C6	.59
3D21A	1.50	958	.35	7F7	.49
3E29	3.39	1611	.98	7Y4	.49
4B24	2.25	1613	.58	12A8GT	.63
4E27	12.95	1616	.75	12AT6	.49
5AP4	4.75	1619	.21	12AU6	.75
5BP1	1.10	1622	1.59	12BA6	.59
5BP4	2.45	1624	.85	12BE6	.59
5CP1	2.95	1625	.19	12J5GT	.49
5D21	18.95	1626	.25	12J7GT	.49
5FP7	.85	1629	.17	12K7GT	.49
5JP1	11.95	1630	3.95	12Q7GT	.59
5J29	18.95	1638	.69	12SA7GT	.49
5J30	18.95	1654	1.98	12SF5GT	.49
5LP1	11.95	1851	.89	12SF7GT	.59
5R4GY	.89	2050	.75	12SJ7GT	.49
5T4	.69	2051	.45	12SK7GT	.49
5U4G	.45	8005	2.29	12SQ7GT	.49
5V4	.72	8011	.65	12SR7GT	.49
5X4	.59	8012	1.98	14A7	.69
5Y3	.35	8013	.89	14B6	.69
5Z3	.55	8014	6.95	14Q7	.69
5Z4	.79	8016	1.39	24A	.49
6AB7	.95	8020	.89	25L6GT	.49
6AC7	.59	8025	3.45	25Z5	.47
6AK5	.89	9001	.39	25Z6GT	.45
6AL5	.59	9002	.35	26	.45
6C4	.25	9003	.35	27	.49
6D4	1.29	9004	.29	30 Spec	.39
6J4	5.49	9005	.39	32L7GT	1.19
6J6	.89	9006	.29	35/51	.59
6Q5G	1.25	CK1005	.29	35A5	.59
7EP4	17.95	CK1006	.69	35L6GT	.49
10Y	.39	CK1090	1.49	35W4	.39
12A6	.25	EF50	.50	35Y4	.69
12DP7	13.95	F123A	12.95	35Z3	.57
12GP7	12.95	F127A	17.50	35Z5GT	.39
15E	.89	F128A	69.50	36	.79
15R	.89	F660	39.50	41	.52
75TL	2.49	FG81A	4.75	42	.49
100TH	9.95	FG105	7.95	43	.52
211	.35	FG238B	39.50	45	.52
227A	3.75	GL146	10.95	47	.74
231D	1.49	GL605	39.50	50A5	.89
249C	1.75	GL697	29.50	50B5	.59
250TH	19.49	HY75	1.25	50L6GT	.49
304TL	.72	HY615	.49	50Y6GT	.59
304TH	3.39	ML100	29.50	56	.54
316A	.35	ML101	39.50	59	.95
327A	4.95	ML502	99.50	70L7GT	1.29
350B	1.95	VR75	.89	71A	.59
368AS	1.79	VR90	.65	75	.52
371B	.99	VR105	.65	76	.49
450TH	29.95	VR150	.65	77	.49
527A	4.89	VT127A	2.49	78	.49
531	2.50	VU111	.49	80	.35
559	.75	0Z4	.59	81	1.55
703A	2.95	1A5GT	.49	82	.89
705A	1.65	1A7GT	.59	83	.89
706CY	18.95	1H5GT	.54	83V	.89
714AY	5.95	1N5GT	.59	84	.59
715B	8.95	1LA4	.95	89	.69
715C	18.95	1LA6	.95	117L7GT	1.15
717A	.59	1LB4	.95	117P7GT	1.15
721A	.59	1LC6	.95	117Z3	.49
723A/B	5.49	1LD5	.95	117Z6GT	.69
724A/B	1.75	1LE3	.95		
725A	7.45	1LH4	.79		
		1LN5	.79		

All Tubes guaranteed, except for open filaments, shorts and broken glass, for which we check before shipment.

500 WATT POWER SUPPLY KIT
(Ideal for BC-191 & BC-375-E)

1—Transformer—Pri: 105/250v
AC 60 cyc in. 5v Steps
Sec: 1120-0-1120v @ 500 MA
2½v CT @ 10 AMPS
12v @ 14 AMPS
17v @ 2½ AMPS
32v @ .025 AMPS.....$32.50
2—Filter Chokes @ $7.95 ea.... 15.90
2—Condensers 3 Mfd @ 2000v DC @ $4.45 ea..... 8.90
2—866 Tubes @ $.89 ea..... 1.78
2—Plate Caps Ceramic @ $.20 ea..... .40
2—Sockets @ $.20 ea..... .40
1 Pair Hash Filter Chokes..... .79
Extra Special Buy $49.50

TRANSFORMER—115 V. 60 Cy.
HI-VOLTAGE INSULATION

3710v @ 10 ma.; 2x2½v @ 3A	$ 9.95
2500v @ 15 ma.	6.50
2500v @ 4 ma.; 2½v 2A. 6.3v @ 1 amp.	7.95
2150v @ 15 ma.	5.50
1750v @ 4 ma.; 6.3v @ 3A.	6.50
1600v @ 4 ma.; 700v CT @ 150 ma.; 6.3v @ 9A.	7.95
525-0-525v @ 60 ma.; 925v @ 10 ma.; 2x5v @ 3A; 6.3v @3.6A; 6.3v @2A; 6.3v @ 1A	7.95
515-0-515v @ 175 ma.; 5v @ 3A; 2.5v @ 5A	5.95
500-0-500v @ 25 ma; 262-0-262v @ 55 ma.; 6.3v @ 1A; 2x5v @ 2A.	4.49
500-0-500v @ 100 ma.; 5v CT @ 3A.	4.95
425-0-450 @ 300 ma.; 140-0-140 @ 100 ma.; 36v @ 1A; 6.3v @ 5A; 5v @ 3A; 110/220 Dual Pri.	8.95
450-0-425 @ 200 ma.; 150-0-150 @ 100 ma.; 40v @ 1A; 6.3v @ 5A; 5v @ 3A; 110/ Dual Pri. tapped	7.50
400-315-0-100-315v @ 200 ma.; 2.5v @ 2A; 5v @ 3A; 6.3v @ 9A; 6.3v @ 9A.	6.50
400-0-400v @ 200 ma.; 5v @ 3A.	4.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 6A; 78v @ 1A.	4.95
385-0-385-550v @ 200 ma.; 2½v @ 2A; 5v @ 3A; 3x6.3v @ 6A—PRI. 110/220.	7.95
350-0-350v @ 150 ma.; 5v @ 3A; 6.3v @ 7.5A; 6.3v @ 3A.	4.99
350-0-350v @ 35 ma.	1.45
340-0-340v @ 300 ma.; 1540v @ 5 ma.	5.95
335-0-335v @ 60 ma.; 5v @ 3A; 6.3v @ 2A; 0-13-17-21-23v @ 70 ma.—PRI. 110/220	4.95
325-0-325v @ 120 ma.; 10v @ 5A; 5v @ 7A	3.49
300-0-300v @ 65 ma.; 2x5v @ 2A; 6.3v @ 2½A; 6.3v @ 1A.	3.49
250-0-250v @ 100 ma.; 2x6.3v @ 4A; 6.3v @ 5A; 6.3v @ 1A.	4.95
150-0-150 @ 80 ma.; 150 @ 40 ma.; 6.3v @ 3.5A; 6.3v @ 1A.	1.98
150v @ 55A; 150v @ 2.13A; 5v @ 5A.	5.95
120-0-120v @ 50 ma.	.98
80-0-80v @ 225 ma.; 5v @ 2A; 5v @ 4A.	3.95
24v @ 6A.	3.50
3x18v @ 2A.	3.95
13.5v CT @ 3.25A.	2.95
3x10.3v @ 7A; CT.	9.95
12.6v CT @ 10A; 11v CT @ 6.5A.	7.95
3x6.3v @ 1A; 2x6.3v @ 2A; 10v CT @ 10A; 12.6v CT @ 1A.	4.95
6.3v @ 12A; 6.3v @ 2A; 115v @ 1A.	3.95
6.3v @ 10A; 6.3v @ 1A.	3.50
6.3v @ 1A; 2½v @ 2A.	3.45
5v @ 20A; Dual 110v PRI.	3.49
6.3v @ 21½A; 6.3v @ 2A; 2½v @ 2A.	5.95
5v—190A..... $17.50 6.3v @ 1A.	.98
5v—115A..... 14.95 8v CT 1A.	.98
2.5v @ 20A... 3.49 .6v @ 15ARMS	2.98
6.3v CT @ 3A; 5v CT @ 4A.	4.25

All Prices Subject To Change Without Notice

All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City. Send money order or check. Shipping charges sent C.O.D. Minimum order $5.00. 20% Deposit required with all orders.

RADIO HAM SHACK Inc.
189 GREENWICH STREET . NEW YORK, N. Y.

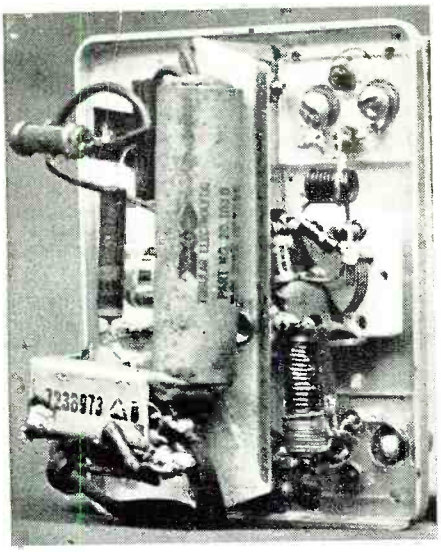
TV Booster

(*Continued from page* 57)

and consists of 2 turns of #24 cotton covered wire held in place with cement or coil rope. The lead length of L_2 is approximately ½" to the tuning condenser and must be mounted on it from the stator to ground. This is shunted by a 6800 ohm, ½w. resistor R_1. The plate coil, L_3, is wound the same as the grid coil L_2 with same diameter and size wire except it has 25 turns. The output coil L_4 is the same as the input coil L_1 except it has 10 turns and is wound over the "B plus" end of the plate coil, L_3. The plate and grid coils should be mounted at right angles to each other to minimize coupling.

Lead dress is not important except that the ground leads at the tuning condenser and tube socket should be made very short and of heavy wire. A common ground lead should be used for all r.f. circuits. The filament transformer was made from a discarded output transformer which was rewound for 6.3 volts to light the tube. The use of zero bias on the tube may not seem conventional but with reduced screen voltage the plate current is held to a safe value. By operating the cathode at ground potential more stable operation and better gain can be realized due to the elimination of any degenerative effects and better isolation between input and output circuits can be maintained. No provision was made for an *"On-Off"* switch but if the constructor so desires a switch could be incorporated which would connect the antenna straight through to the TV receiver when the booster is turned off. This will allow the optional use of the booster without disconnecting the antenna. An additional contact should be provided on this switch to break the a.c. line when in the *"Off"* position.

Operation of the booster is straightforward. The unit is placed in series with the antenna lead to the TV receiver. Connect it to the receiver with a short piece of 300-ohm twin-lead or any impedance line that matches the receiver input and hook the antenna lead-in to the input terminals of the booster. After the warm-up period turn the booster tuning control for the brightest picture raster and tune in the TV receiver in the normal manner. After the picture is received the booster should be readjusted for maximum brilliance pleasing to the operator. It may be necessary to back down the contrast control on the TV receiver if too much "snow" is encountered due to the increase in gain. In very weak areas two boosters may be used in series by connecting the output of one to the input of the other with 300-ohm ribbon and adjusting both for maximum gain. This may cause oscillation with some receivers having an r.f. stage as too much feedback will result. This will also cause an increase in noise which will show



Closeup view of chassis showing parts layout.

up as additional "snow" but if the contrast control is reduced it will be possible to receive very weak signals that could not otherwise be seen. In noisy areas it may be advisable to use coaxial cable for lead-in instead of twin-lead as the shielding will prevent noise pick-up. Two coax lines should be used, however, with their shields connected together so as to prevent unbalance of the antenna system. If the antenna lead-in is of a different impedance than the receiver, such as when coaxial cable is used with a receiver input of 300 ohms, the booster will help match the line to the receiver. The booster described above covers TV channels 1 to 6. If channels 7 to 13 are to be covered, smaller coils will have to be substituted and very-high-frequency construction techniques will have to be observed. One advantage of using a booster is to prevent radiation of the local oscillator in the television receiver from interfering with other sets in the vicinity. In very weak areas where noise is stronger than signal it is sometimes advantageous to put a booster right at the antenna itself and use another at the set end of the transmission line. This gives maximum gain without increase in noise level due to transmission line pick-up, as the signal is amplified before the line noise is added sufficiently to supply adequate signal to the second booster at the set. This entails remote control as well as weatherproofing the booster at the antenna and is rather complicated unless the booster is adjusted for single channel operation. One thing is important in using the booster at the antenna and that is to be sure and keep the booster power line away from open wire transmission lines or noise will be fed in by coupling. This is not necessary if coaxial cable is used. The input and output leads connecting the boosters should not be allowed to cross. In city locations where it is not practical to use an outdoor antenna due to landlord restrictions, etc., the booster will provide increased signal strength. —30—

Microgrooves

(*Continued from page* 55)

In many cases the regular audio system of the receiver will not reproduce the higher frequencies. The amplifier may either be rebuilt and a high-fidelity speaker installed, or the entire audio system replaced with a hi-fi amplifier, speaker, and speaker cabinet. Here again, a demonstration will convince the customer. There are many combinations of hi-fi amplifiers and speakers on the market which will give excellent results.

In custom-building, the customer's tastes and his ability to pay for them are the only limitations as to how far high-fidelity can be carried. For instance, he may desire the main installation in the living room, with speakers built into the walls and the record player concealed in a closet or bookcase, possibly with remote controls and extra speakers located in other parts of the house.

Don't overlook the possibility of *extra* players, either in custom-built installations or in regular replacements. Always recommend a good record *changer* for the living room or den and a small single-speed unit for the bedroom, guest room, etc.

Phono-Combinations

Many receiver manufacturers are including facilities for Microgroove operation in their new phonograph-combination sets. *Philco* was first; they now include Microgroove changers in at least three combination consoles, including the Model 1613. *Crosley* is completing plans for a new dual-speed record changer. Shown in Fig. 1 and 4, respectively, are the *Admiral* RC-182 two-speed changer and the *Webster-Chicago* Model 133 Microgroove changer. *Admiral* uses a separate arm for each function; the *Webster-Chicago* 133 is intended for use only with Microgroove records. Other record changers available are: the *Webster-Chicago* Models 246 and 256, which use a single pickup arm and stylus (with knob adjustment) to play both types of records; and the V-M Model 402 (also with single pickup for both types). *Knight* has a low-cost record player which uses the *Shure* 900MG pickup. *Webster-Chicago* also has announced several additional models of automatic Microgroove record changers, as well as replacement changers for existing radio-phono combinations. *Presto* is planning to produce a number of high-quality 12-inch turntable units, both with and without pickups. Their Model K-8 will also be modified to cut at 224 lines per inch and equipped with a dual-purpose pickup.

Attaching the LP phonograph to a straight receiver involves the usual simple procedure of installing a phono plug or jack and connecting to the receiver audio input. Here we again run into the problem of whether the receiver audio system is capable of the required high-fidelity response, and whether the customer desires full response.

Needles

Microgroove needles must, of necessity, be capable of giving many hours of high-quality reproduction. Some types of Microgroove pickups employ permanent sapphire needles; others use osmium-alloy tips. *Webster-Chicago,* for example, has developed a "Nylon Knee-Action Needle" (see Fig. 2D) with an osmium tip. The nylon knee cushions shock and aids in filtering out noise. Most needles of this type have a normal playing life of at least 1000 hours, or under average use about a year.

Precautions in Operating

Because of the extremely fine grooves, light needle pressure, and

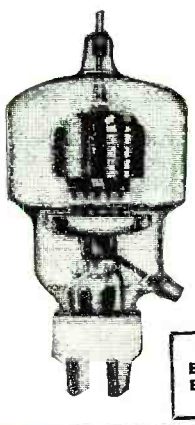
Webster-Chicago's new Model 133 automatic Microgroove record changer. Equipped with a new balanced tone arm, the changer will handle ten 12" or twelve 10" records at 33⅓ r.p.m. turntable speed so that up to four hours of continuous record play can be obtained with a single loading. The unit is mounted on a metal base.

MORE FOR YOUR MONEY—EVERYTHING FOR THE HAM

"YES SIR... IT IS EASY TO BUY BY MAIL AND PRICES ARE RIGHT"

WAR SURPLUS BUYS!
Radio and Electronic Supplies
Devices, Products and Materials
Terrific Savings
SENSATIONAL AND OUTSTANDING BARGAINS

POWER!! POWER!!

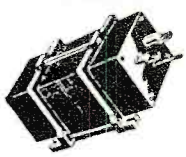


EIMAC 304TL
BRAND NEW JAN. INSPECTED
SUPER VALUE
BETTER ORDER 4 OR MORE TODAY
90¢ EA.
4 FOR $3.00
While They Last
Any Quantity

SUPER SPECIAL
BRAND NEW $3.95 EIMAC 304TH ea.
JAN. INSPECTED

304TL Transformers **Power!!**

Surplus Kenyon — Pri. 110 VAC. Secondary 5 V.C.T. @ 60 amps. Closed ends, open mtg. feet. Weight 22½ lbs. Excellent condition.... **$8.95**



SUPER SPECIAL
Also 5V. @ 115 amps.
Used.....$7.95 New.....$9.95
(Mail orders add 75c for packing.)

CLOSEOUT SPECIALS ON PART KITS

KIT 1 Asstd. Mica Condensers—Unmarked	100 for	$1.50
KIT 2 Asstd. Resistors ½ W-1W.	100 for	1.00
KIT 3 Asstd. Condensers—Tubular Bypass	25 for	1.00
KIT 4 Asstd. Condensers—Electrolytic	25 for	2.00
KIT 5 Asstd. Potentiometers—with or without switch	10 for	1.00

VACUUM CAPACITOR
50 MMFD. 20 KV. **$4.95**
BRAND NEW SUPER SPECIAL

SCOOP! 110 (MC) Rec. Bargain
BC-733 D Localizer Receiver

Freq. 108-110 Mc. Tube complement 10 tubes—1—12SQ7, 2—12SR7, 1—12A6, 1—12AH7GT, 2—12SG7, 3—717A. USED CONDITION. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. Has the best

SUPER VALUE
BETTER ORDER
While They Last
BARGAINS

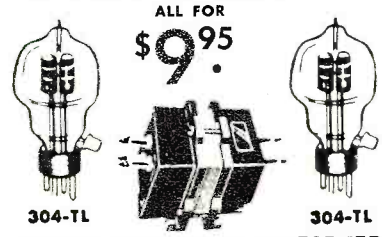
AVC system yet developed can use parts or use as a model for construction. 10 tubes, crystals, relays, etc. Schematic included, with dynamotor. Don't pass this up.
INDIVIDUALLY BOXED! **$3.95**

Bargain—2 for $7.50

SAVE ON THESE VALUES

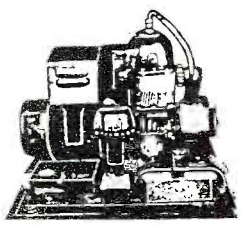
300 ohm Amphenol. Per C.	$ 2.34
150 ohm Amphenol. Per C.	2.16
75 ohm Amphenol (small). Per C.	1.98
Kilowatt 75 ohm Amphenol. Twin lead. Per C. ft.	7.20
3 Gang 410 mmfd. per Sect. Cond. Excellent Quality	2.95
4 Gang 150 mmfd. Variable	.95
Condensers—New: 2 mfd. @ 2500 W.V. Each	2.95
4 mfd. @ 600 V. Oil—round can. Each	1.19
Relay. Cramer type TD-2-120S—Max. 1 min. delay. Cont. 10 amp. 115V.	4.95
Relay, Leach, 115V-AC DPST. New.	1.50
Relay, Allen Bradley, heavy duty, 30 amp. 115V.-AC. Perfect for 1KW rig—Near new cond.	4.95
Toggle Switch—SPST—plus spring return	.19
Toggle Switch—H.D.-DPST—12 amp. 125 V.	.39
Siren, Commercial type, hand operated, very loud noise. Govt. cost $21.00. Special	4.95
Phosphor Bronze dial cable 16 str.—250' spool	.69
Cable—6 wire #16, glass insul. shielded, plastic covered—perfect for beam cont. Per ft., .12	10.00 per 100 ft.
Cable—6 wire #18, unshielded. Per ft.	.08
Cable—4 wire #18 Plastic—shielded. Per ft., 06	5.50 per 100 ft.
Cable—Single shielded grid wire #20-AN Specs. Special!—Per hundred	1.50

MIRACLE KIT VALUE
GOOD FOR 2 KW.
SPECIAL COMBINATION
ALL FOR $9.95



304-TL **304-TL**

KENYON FILAMENT TRANSFORMER
Primary 117 V. AC.—50-60 cycle Secondary. Will operate two 304 TL's, etc. Sec.: 5 Volts, C.T. at 60 amps. Shpg. wt. 26 lbs.
Two 304-TL's:
1 filament trans. BARGAIN..... **$9.95**



(HRU)

24-28 V. at 70 Amp. 2000 watts gasoline engine generator with electric starter. Power suppiy which can be used to operate 24-28 V. equipment, start airplane engines, charge batteries. ONLY. **$69.50**

Smash Values for YOU!

YOUR CHOICE ONLY $1.95
Two for $3.00
WAR SURPLUS BARGAIN
LOWEST PRICES
SURPLUS CATHODE RAY
5FP7 5BP1 5GP1
Brand New! Standard Make!
INDIVIDUALLY BOXED!

ORDER NOW
BE SURE TO ASK FOR OUR SPECIAL BULLETIN

SINCE 1930

DOW RADIO

1759 E. COLORADO BLVD.
PASADENA 4, CALIFORNIA
PHONE: in Pasadena, SYcamore 3-1196; in L. A., RYan 1-6683

small needle radius, extra care is required in operating. Be sure your customer is familiar with the following precautions: (1) Do not leave records on the record changer supports—they are likely to warp; keep them stored *on edge* in a record file, album, or cabinet. (2) Do not store records near radiators or other sources of heat. (3) Do not leave records on the turntable; this allows dust to gather in the grooves. (4) Handle records carefully; avoid scratching. (5) Clean records occasionally with a soft brush or lint-free cloth. (6) Do not leave the pickup arm resting on a record or turntable. (7) Never stop the changer while it is going through a changing cycle; wait until it is playing a record. (8) Locate the changer away from undue heat. (These precautions apply equally well to standard players).

Also caution the customer against allowing the pickup to be dropped onto a record manually. Unless care is exercised, it is rather easy to damage a groove. Most record-changer mechanisms are lubricated for 1000-hour operation and should need no attention before that time.

Individual Opportunities

So far we have discussed only those applications which concern the regular customer; there are many more. Consider the industrial possibilities—every store, factory, office, etc., which employs record changers or players is a good prospect for a Microgroove installation. The p.a. field is ripe for conversion; dance halls, roller rinks, and amusement parks should be easy to sell. Some of these, of course, have coin-operated machines which have been installed on a commission basis and probably will not be interested. Most establishments, however, should be definite prospects. Arrange demonstrations for operators of high-class restaurants and dining rooms for an automatic "dinner music" installation; explain the advantages and dignity of a hi-fi system for classical and semi-classical orchestrations.

The individual serviceman can probably think of numerous other applications which would fit into his own locality. Whatever the application, Microgroove systems are to be recommended. The serviceman who keeps his customers up-to-date will never have to worry about idle moments.

—30—

"Now, madam, are you certain there are no other parts that need explaining?"

220 mc. Converter

(*Continued from page 48*)

calibrated grid-dip oscillator is strongly recommended and makes the pruning of *LC* circuits a pleasure instead of drudgery. The oscillator should tune 30 mc. lower in frequency than the mixer and r.f. circuits, which for the amateur band 220-225 mc. will be 190-195 mc. The mixer output should resonate at approximately 30 mc. The antenna is designed to accept a coax type transmission line and the antenna trimmer extends through the front panel and is very useful in resonating the particular antenna in use.

Other Uses of the ARR-1

As is the case with so many pieces of surplus equipment, once the experimenter obtains a unit, other uses suggest themselves immediately. The ARR-1 is no exception. The writer has been asked about some of these. In general, the ARR-1 could be made into a converter for either 50 mc. or 144 mc. by merely altering the *LC* tank circuits to resonate at these ranges instead of at 220 mc. as just described. As a matter of fact any range from about 50 mc. on up to perhaps 300 mc. could be accommodated. The procedure here would be to select that segment of frequencies desired and resonate the *LC* circuits to that frequency. Roughly the polyiron slugs will cover a segment of frequencies approximately 25 mc. wide from 200 mc. up, while at 150 mc. the range will possibly be 8 to 10 mc. in width, and at 50 mc. the tuning range will be somewhere between 4 to 8 mc. in width. By loading the *LC* circuits with resistors the r.f. bandpass would, no doubt, be quite adequate for certain of the television channels in use, and the gain of the ARR-1 would be quite excellent in this type service. This has not been tried, however, at this location, as at the time of writing, television is still some distance away in the writer's area.

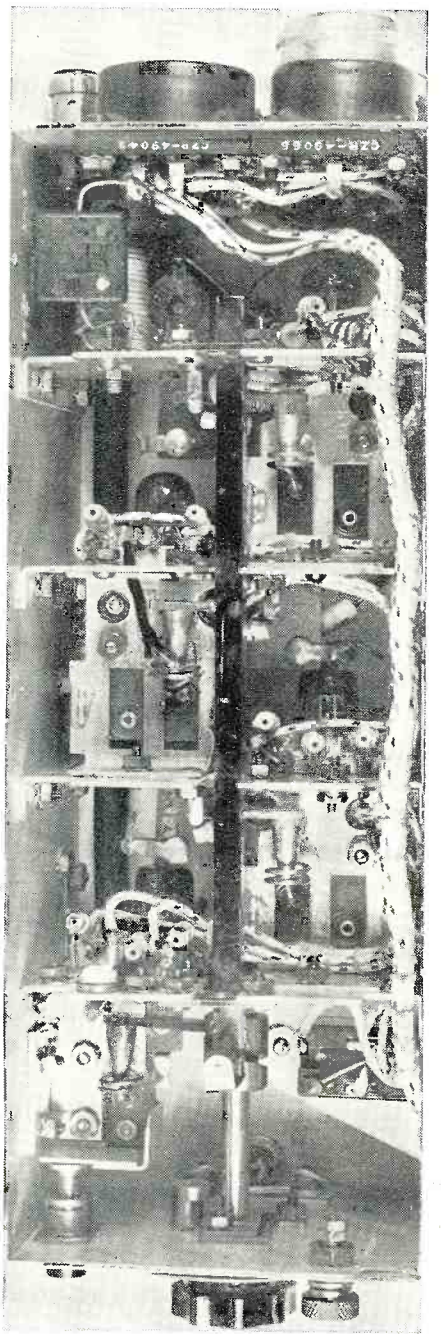
Another use to which the ARR-1 has been put is that of preselection only, that is, a 50 mc., 144 mc., or 220 mc. preselector. In this case the modification of the mixer and oscillator circuits is unnecessary. The last 954 stage is disabled at the outset and the first three 954 stages are used for a three-stage preselector. Merely resonate the *LC* circuits at the frequency desired and couple off the third tank circuit L_{104}-C_{118} with a two turn link in inductive relation thereto. Shield this lead or, better still, use a length of coax cable over to the station receiver operating on these frequencies. This is especially advantageous in connection with the SCR-522 receivers. The added r.f. gain in front of these 522 units really boosts up the signals. The same principle could, of course, be used in ahead of TV receivers, should the set be short of r.f. gain. This is the same principle used in some of the commer-

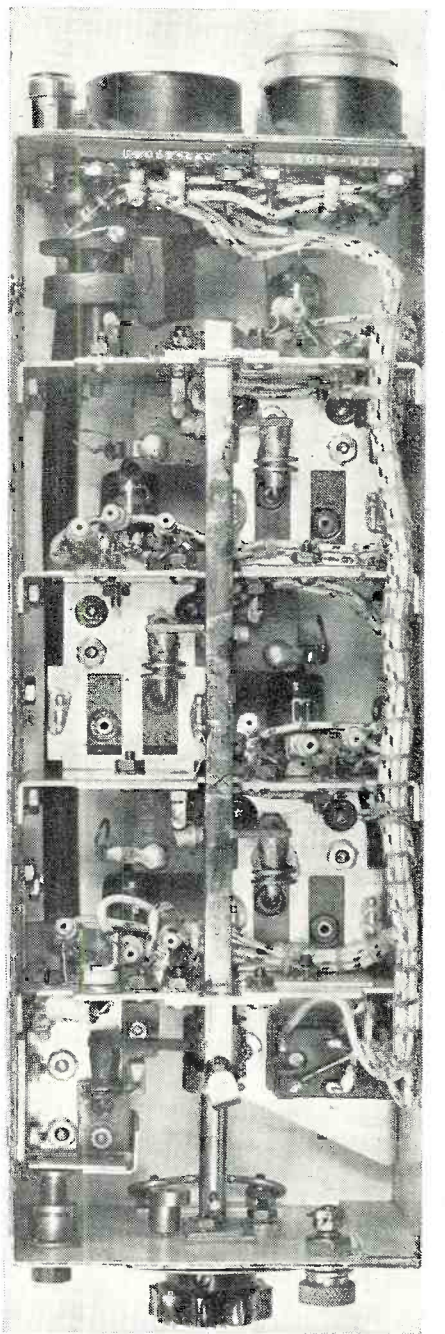
cially-built TV boosters, that is, merely preselection in the front end.

Along with the ARR-1, there is appearing on the surplus market a companion unit called the ARR-2. Inquiries have been received as to the function of this unit. Actually the ARR-2 (Type CW-46196) is similar to the ARR-1, containing the original r.f. cascade stages, plus the broad-band detector stage, but in addition, this ARR-2 unit contains the low frequency section as well as the subsequent audio stages. In this unit, provision is made for changing the low frequency (200 to 1500 kc.) by turning a crank. Six preset frequencies are provided in the equipment. A dynamotor is an integral part of this equipment. Otherwise the unit functions exactly like the ARR-1, the chief difference being that type 6AK5 tubes are used in the r.f. section in place of the acorns. Either unit will work satisfactorily for the purpose described in this article.

An intriguing possibility exists in using a couple of the ARR-2 units for amateur work. Employed in the man-

Fig. 4. (Left) Bottom view of the modified ARR-1 as a converter for 220 mc. In the third compartment from the top can be seen the new oscillator tank coil and the cathode lead running through the shield wall to the 955 acorn socket in the second compartment. The 30 mc. tank and bypass condenser C_{122} are also visible in the top compartment. (Right) Bottom view of the unmodified unit. The dial knob at the bottom controls the long square shaft running down the middle of the converter. Attached to this shaft are slugs which are run in and out of the fields of the r.f. stage coils to tune the unit. The top compartment holds the 954 acorn, broad-band detector stage. The coaxial cable in the picture is for the input antenna.





A "ONE STOP" SOURCE FOR ANY RADIO AND ELECTRONIC NEED

for TRADE . . INDUSTRY . . COMMUNICATION . . BROADCAST . . PUBLIC UTILITY . . VOCATIONAL . . TRANSPORTATION . . SERVICE . . EXPERIMENTAL and HOBBY APPLICATIONS

The New

FREE

B-A 1949 CATALOG No. 491

132 Big Pages . . . listing the top makes of most Any Radio and Electronic Need . . . Even the small items usually too troublesome for others to stock . . . Plus many rare values in Surplus and Special B-A Purchases.

Everything is clearly illustrated, minutely described . . . with Net Prices that tell you at a glance what each item costs you.

It will serve you as a Handy Reference . . . Will Save You Time and Money . . . you order at your convenience . . when, what, the quantities you wish to buy . . . no waiting for salesmen . . . no interruptions into your busy hours . . . no pressure to sell you more than you need.

Located in Kansas City, a foremost transportation center . . . in the exact center of America . . . days closer to Everywhere, combined with adequate stocks, our long experience in mail order routine . . . the B-A "Know How" acquired through 21 years of constant leadership in the Radio-Electronics distribution field . . . these are the basic reasons why you get faster service from B-A.

Write for it, if you have not already received it. Use the coupon below.

BURSTEIN-APPLEBEE COMPANY
1012-14 McGee St.
Kansas City 6, Mo.

☐ Send FREE NEW 1949 B-A Catalog

Name .....

Address .....

City..... Zone..... State.....

BURSTEIN-APPLEBEE Company
EVERYTHING IN RADIO AND ELECTRONIC DEVICES
1012-14 McGEE STREET, KANSAS CITY 6, MISSOURI

ner originally intended, that is, double modulation on the transmitter, it would be possible to effect confidential communication and theoretically eliminate QRM. Or they might possibly be used in remote control applications, wherein certain functions are performed from a distance and without the possibility of anyone taking over control merely by locating the frequency of the transmitter and attempting to "jam" the channel, so to speak. It would perhaps be wise, however, to check with FCC inspector to ascertain if this type operation is strictly legal. As far as the writer is able to learn, this type operation is quite OK on the 220 mc. amateur band.

—30—

Communications Receiver

(*Continued from page* 67)

14 mc. energy should appear at the grid of the 6J6 to tune the mixer plate circuit. Adjust condenser C_8 for maximum "R" meter indication.

Make sure this circuit is tuning. This can be determined by examining the position of the plates of C_8 when the "R" meter reads maximum. If the condenser tunes with the plates completely open or closed the circuit is not tuned and the value of C_7 should be changed.

Next change the frequency of the signal generator to 146 mc. Rotate the main tuning condenser until a signal is heard. If a signal is not heard vary the signal generator frequency until a signal does appear. If a signal appears when the signal generator is tuned to 155 mc. this means the oscillator frequency is too high and the oscillator coil turns should be pushed closer together. On the other hand if the frequency is 140 mc. the oscillator coil turns should be spread. Adjust the oscillator coil turns so the 143.5 to 148.5 mc. range is covered.

With the oscillator circuit adjusted to frequency, set the signal generator on 146 mc. Tune the converter to this frequency and reduce the signal generator input until a weak signal is heard. Adjust the inductance of L_1 and L_2 for maximum output by varying the spacing of the turns.

When this tuning is completed vary the frequency of the generator and converter over the two meter band noting the sensitivity. The output should remain comparatively flat over the entire two meter band. If not, repeat the tuning procedure until it does.

The sensitivity of this converter will exceed the leakage of most low priced signal generators. It is altogether possible the leakage may be of such a level that an "R" meter reading of "R9" will exist when the signal generator is not connected to the converter.

If such is the case final adjustment of L_1 and L_2 should be made on a received signal in the center of the two meter band.

If a signal generator is not available the oscillator can be set on frequency with a wavemeter. Since the i.f. frequency is 14 mc. the oscillator frequency should cover from 157.5 to 162.5 mc. This would give a half a megacycle overlap on each end of the band. By placing a voltmeter across R_1 injection voltage can be read. When a wavemeter is tuned to the frequency of the oscillator there will be a noticeable dip in injection voltage.

With the oscillator set on frequency using this method, L_1 and L_2 should be adjusted on received signals.

This two meter converter can be used in conjunction with any receiver capable of tuning to 14 mc. When used with the equipment described in the previous articles voltage regulation is automatically supplied.

If the converter is to be used with other receivers, the addition of a VR 150 to the chassis is advisable. An appropriate value of dropping resistor will be required.

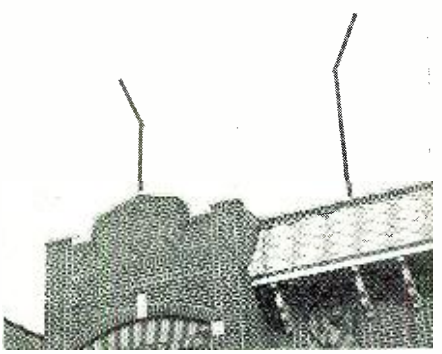
The design of this converter is somewhat different from that of the other units of this equipment. Every effort has been made to give the builder as much leeway as possible in the construction of the various units. At 146 mc. this is not possible. In this range of frequencies every lead becomes critical. If the instructions and photographs are followed, little, if any, difficulty should be experienced in the construction of this unit. On the other hand if the layout is changed the inductance of the various coils may require alterations.

A more serious problem may develop if regeneration becomes a factor. There is no indication of regeneration in the present design.

(To be continued)

COCKEYED ANTENNA SUPPORTS

THE antenna sticks in this photo look as if they'd just endured a hurricane, but actually they were made that way deliberately. They belong to W2WPD, Jackson Heights, N. Y., who found that the only supports on his roof for a ten-meter folded dipole were twelve feet apart, a little too little for a sixteen-foot antenna. He gained the needed four feet by offsetting the semaphore-like arms two feet from the vertical and guying them back to the base. The poles themselves are of wood, about 1 x 2½ inches cross section and fifteen feet high . . . . . R.H.



AFCA NEWS

This Association is a patriotic non-profit organization, with chapters in most of the larger cities, dedicated to developing and maintaining efficient personnel, commissioned, enlisted, civilian, for the supply (including design and development), installation, maintenance and operation of communications and electronic equipment for Army, Navy and Air Force and their supporting civilian activities. It publishes a magazine "SIGNALS" at its national headquarters in Washington. Every American interested in any way in communications is eligible and invited to join. Further details may be obtained by addressing the secretary at 1624 I St. N.W., Washington 6, D. C.

Chapter Notes

Baltimore

The first fall meeting of the Baltimore Chapter was held on October 12th at the *Consolidated Gas Electric Light and Power Company* of Baltimore. Mr. Ralph L. Thomas, Vice-President in Charge of Operations, gave a speech on the grid in the Baltimore area and various generating stations that supply current to that area. A demonstration followed of the load analyzer board and load dispatching board which are used to control the power supply in the network.

The *Western Electric Company* Point Breeze Plant will be host to the chapter at its next meeting.

Boston

The Boston Chapter will work with the chapters of other military associations to sponsor the third annual Industry-Army Day meeting at Boston on February 4th. Lt. Col. George T. Cottle of the Boston Chapter was host at the initial meeting held on October 28th to discuss arrangements. Major Walter Griscti from the Army Department in Washington outlined plans for Industry-Army Day. At another meeting held on November 4th, the chapter was represented by Mr. Charles F. Adams of the *Raytheon Manufacturing Co.*, and Vice-President T. M. Hennessey of the *New England Telephone & Telegraph Co.*

Decatur

Chapter members attended a dinner meeting at the Decatur Club on September 16th. Mr. F. L. Kahn, in charge of circuit design for the *Automatic Electric Company*, discussed the Strowger automatic telephone system and the automatic toll director.

Kentucky

A dinner meeting of the Kentucky Chapter was held on October 22nd at the Phoenix Hotel in Lexington. The guest speaker, Mr. Bernard T. Fagan, coordinator for the *Lafayette Vocational School* in Lexington, discussed the future of television. The program was concluded with a film of the Kentucky-Georgia football game.

Louisiana

The newest AFCA chapter was formed in New Orleans on October 28th. The organization meeting was arranged by Mr. W. H. Mansfield, AFCA chapter representative for the Southeastern part of the U. S., and Ralph Grist, both executives of the *Southern Bell Telephone & Telegraph Co.* in Atlanta, and A. Bruce Hay, Division Sales Manager of the *Southern Bell* in New Orleans. More than sixty topflight communications and photographic executives and engineers of the Army, Navy, Air Force and industry were present at the dinner meeting held at the Roosevelt Hotel. Brig. Gen. S. H. Sherrill, National Executive Secretary, who came down from Washington, outlined the aims and purposes of the Association and discussed its accomplishments.

Interim officers were elected as follows: Harry B. Lackey, president; Fred Weber, treasurer and A. Bruce Hay, secretary. Vice-presidents were chosen to represent the various fields of interest: Capt. Glenn W. Legwen, Navy; Col. A. H. Schroeder, Army; Col. Herbert DeBuys, Air Force; the Very Rev. Thomas Shields, S.J., president of Loyola University, colleges; George W. Healy, Jr., newspapers; C. C. Walther, industries; Jimmy Bryant, motion pictures; and Streuby L. Drumm, power utilities.

New York

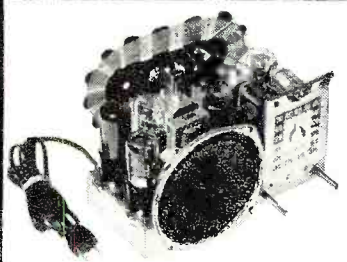
The New York Chapter held a dinner meeting on October 20th at the Seventh Regiment Armory, New York City. The program included the first public showing of a film captured during World War II, which was photographed in color by Eva Braun, of Hitler and his friends during the early days of the war. Major Horace Roberts described the work being carried on by the Signal Corps Photographic Center and showed a film covering the life of General John J. Pershing.

The following officers were elected for the ensuing year: President—Col. George P. Dixon; Vice-President—Lt. Col. Ralph G. Edwards; Secretary—Col. William H. Harrington; Treasurer—Maj. Theodore N. Pope.

Philadelphia

The first meeting of the fall season was held at the Officers' Club, Quartermaster Depot, Philadelphia, on Octo-

ROCK BOTTOM PRICES!
ON ALL TOP QUALITY ITEMS



CORONET 5 Tube Superheterodyne Receiver Kit

- Complete with plastic cabinet and carrying handle.
- 117V, AC-DC operated. Power supply rated at 30W.
- Tube Lineup—12SA7, 12SK7, 12SQ7, 35Z5, 50L6.
- Tuning range—540-1700 KC. Designed for fullest selectivity along entire band.
- Built-in loop antenna.
- All parts engineered to fit; no additional cutting or drilling to do.
- Nothing else to buy except solder. Kit packed complete including tubes.

This kit combines an excellent educational program with many hours of building and listening pleasure; particular stress being placed upon ease of construction. Easy step by step instructions are furnished, along with pictorial diagrams and voltage and resistance charts for efficient maintenance and further experimentation. Many circuit features employed by big name manufacturers are employed to make this set, when completed, comparable to any 5 Tube AC-DC Radio now on the market.

LIST PRICE $11.95

Dealers, educational institutions, write for quantity discounts.

BY-PASS CONDENSERS

Not just "fresh looking" but brand new guaranteed by-passes recently made by a reliable manufacturer.

Don't let these "new look" prices frighten you away. We haven't cut any corners in giving you a fine item for less money. Try a sample order today—return for our usual 100% refund if not satisfied. You have nothing to lose—up to 50% savings to gain.

Cap.	WVDC	Per ea.	Per 10	Per 100	Per 1000
.001	600		$0.54	$4.86	$40.00
.005	600		.54	4.86	40.00
.01	600		.54	4.86	41.25
.02	600		.63	5.67	43.75
.05	600		.72	6.48	52.50
.1	600		.90	8.10	57.50
.0005	6000v	$0.22	1.98	17.82	137.50
.001	6000v	.23	2.07	18.63	142.50
.005	6000v	.26	2.34	21.06	161.24
.05	6000v	.47	4.23	38.07	293.75

12 V. VIBRATOR PACK

270 DC @ 65 MA. Less Rectifier, 6x5...$2.95 ea.

TRIMMER ASSORTMENT

40 Assarted. Cover standard capacities....$1.00

RESISTOR ASSORTMENT

100 insulated carbon and wire wound resistors. Standard color coded. Wide assortment of useful sizes, ⅓, ½, 1, 2, 5, 10, and 20 W. 100 assorted.....$1.95

PAPER COND. ASSORTMENT

100 ossorted paper tubular and molded paper by-pass condensers. Wide assortment of standard capacities at 150V, 200V, 400V and 600 V. Every condenser guaranteed. Kit of 100.....$3.85

SOLDERING IRON

100W, 110v AC.....$1.50 ea.

OUTPUT TRANSFORMER

50L6 to 3.2 voice coil. Saddle mount. 21c ea. 10 for.....$1.90

LOOP ANTENNA

For portable and AC-DC sets, 2 windings. 12c ea. 10 for.....$1.00

RADIO HARDWARE ASSORTMENT

18 handy individual packages of most commonly used hardware consisting of: 325 various length screws, 4-40, 6-32, and 8-32; 175 Hex nuts, 4-40, 6-32 and 8-32; 150 Assorted washers; 100' wire.....$1.25

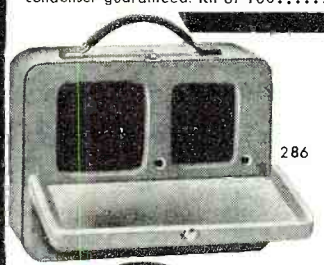
TUBES!

WAR SURPLUS TRANSMITTING TUBES

Each tube packed in individual, originally sealed carton. Every item covered by our usual 100% money back guarantee. Don't wait till there are no more to order! Supplies limited.

Deduct 10% from tube orders of $20.00 or over.

WL1B32/532A	$3.95
1B23	34.50
2X2	1.00
3BP1	3.95
3GP1	2.95
5BP1	2.95
5BP4	4.95
5CP1	3.95
304TL	1.49
371B	2.95
WL-531	17.95
705A	1.95
860	3.00
832A	2.95
872A	2.25
955	.50
CK1090	3.95
1619	.40
1625	.40
1626	.40
1629	.40
7193	.40
8020	3.95
9003	.50



286

261

RADIO CABINETS

BELOW MANUFACTURERS COST

No. 286. Leatherette covered. 9½x12½x5". Leather handle. Ivory—Brown trim. Cutout as shown. **$1.50**

No. 285. Same as above. Brown and Tan..... **$1.50**

No. 261. Leatherette covered. 12x11½x7½". Cutout as shown. Plastic handle.

With grill and dial glass..... **$1.95**

TERMS: *All items subject to prior sale. Prices subject to change without notice. A 25% deposit required on all C.O.D. orders. All shipments made F.O.B. Chicago, Illinois.*

IRVING JOSEPH

215 S. Halsted St., Chicago 6, Ill.

ber 14th. The chapter was in charge of distribution of AFCA information at the World Hobby Exposition held in Philadelphia from November 15th through 20th.

Pittsburgh

At a meeting held on October 12th, officers were elected as follows: President—F. E. Leib; 1st Vice-President—E. J. Staubitz; 2nd Vice-President—E. C. Stern; Secretary—K. A. Taylor; Treasurer—C. A. McKenney; Asst. Treas.—S. W. Dana.

Richmond

Chapter members attended a dinner meeting at Ewart's on October 13th. The speakers were: Capt. Robert J. Foley, assistant to Admiral Earl E. Stone, Chief of Naval Communications, who described many of the most interesting phases of submarine combat in the Pacific during World War II; and Brig. Gen. S. H. Sherrill, Executive Secretary, who discussed the progress made by the Association in the last year and its objectives in the light of the current international situation.

Sacramento

Dr. Otto J. M. Smith, of the University of California, was the main speaker at the Sacramento Chapter meeting held on November 3rd. His subject was "Russia's Bomb." An added feature on the program was the film, "Tale of Two Cities"—the story of Nagasaki and Hiroshima.

Southern California

The Southern California Chapter was successfully organized at the meeting held in Los Angeles on October 15th. The speakers were Capt. Harry C. Butcher, Naval Aide to General Eisenhower, and Col. Lloyd C. Parsons, Signal Officer of the Sixth Army. Chapter officers were elected as follows: President—Mr. H. W. Hitchcock; Vice-Presidents—Col. T. H. A. Lewis, Mr. Arthur C. Hohmann, and Mr. H. L. Hoffman; Secretary-Treasurer—Col. E. F. Zacker.

-30-

"You should see this place on Saturday night!"

TV Promotion

(*Continued from page 45*)

read and birthdays of the listeners announced.

Most dealers encourage the troops of kids who pile into their stores in the late afternoon and watch television with rapt attention because the smart dealer knows that not far behind the children are the parents. What interests the children is sure to be investigated by the parents.

Installation of sets in boys' clubs and schools serves the dual purpose of keeping the children off the streets and popularizing television.

Store and Window Promotion

The way in which television receivers are presented to the customer can greatly influence sales. Window displays tell the passers-by that you sell television and serves as the first link in the chain of events that can result in a sale.

Television offers the opportunity to be dramatic—to put something in the window that is different. Whether the window area is small or large, television can provide an impact presentation. Animated displays, photographs of station equipment, pictures of the stars and programs available on television, all help contribute to customer interest.

The greatest of all eye-catchers is, of course, a television set in operation. What type of set and how many sets to be displayed will depend on the size and shape of the window. If the window is deep enough projection units can be shown, but no matter what type of receiver is shown in operation it must be in perfect focus at all times and shielded from glare or reflection. Nothing will harm the dealer more than to display a set with a fuzzy, poorly aligned picture on the screen.

It has been proven time and again that selling is easier when the prospect is removed from the distractions of the store and other customers. Accordingly, most successful dealers have set aside individual displays and sales areas for television. Small shop owners whose space is limited achieve the feeling of remoteness by setting aside one section of their display space exclusively for television sets.

New techniques for getting customers into the store appear daily, however, for the kick-off campaign just before the video station goes on the air most dealers use their mailing lists to extend invitations to visit the store to prospective TV buyers. If a definite "date" can be made, so much the better. In this case, however, it is advisable to follow up the invitation with a phone call. If the customer feels the dealer has a personal interest in him and is not using his name as one of a mass market, the response will be greater.

One Chicago dealer made an arrangement with various women's clubs whereby the club received 25 cents for

each of its members who put in an appearance at his store and looked over his television display. Thus he was able to bring into his establishment the women who set local patterns, styles, and trends while at the same time accurately measuring the results of his promotion.

The Dealer-Sponsor

While most dealers handling television are not in a position to assume the role of program sponsor, such an advertising medium should not be completely overlooked. It might prove worthwhile to investigate the cost of sponsoring a program or one minute spot. Because of the limited audience for television at the present time costs are low when compared with similar services on radio. Television advertising takes diverse forms. It can range from the sponsorship of a special event to a one minute spot announcement. Between these extremes are newscasts, style shows, sport interviews, homemaker programs, dancing lessons, model airplane building, etc. Television is a versatile advertising medium and has the advantage of radio's auditory impact coupled with the asset of visual presentation. The power of a television sales message should not be underestimated as it comes closer to "personal" selling than any other mass media.

Ready-made television shows are available to the small sponsor at moderate prices. These packaged productions have the advantage of removing all responsibility for production details from the shoulder of the sponsor. In this way, even small business concerns can afford professionally produced spots on television.

Installation and Service

Television installation is generally handled in one of two ways. The dealer may either establish his own installation and servicing department or may farm out his work to contract organizations.

In cases where installations will require the services of two or three men full time, it may pay to make arrangements with a contract organization. The contractor is advised of the job by the dealer and is compensated either by the dealer or by the buyer of the set upon installation. Usually a set will be installed and servicing guaranteed for a year on a service policy. Thus the buyer is protected against faulty installation or from loss in case his set does not function properly or a part needs to be replaced.

No matter which method is used, it must be done properly. Nothing will do more harm to television sales than examples of poorly installed sets and dissatisfied customers. A conscientious dealer won't allow a set to remain unless it is operating properly. Often owners will feel that it is working "good enough" but goodwill, more sales, and complete satisfaction are obtained if the set is replaced when necessary.

Promotion and merchandising of television sets doesn't stop at the sale and installation. A sound, friendly follow-up system results in pleased customers and more business.

Hudson-Ross, a Chicago television and radio dealer, has a unique method for getting live prospects.

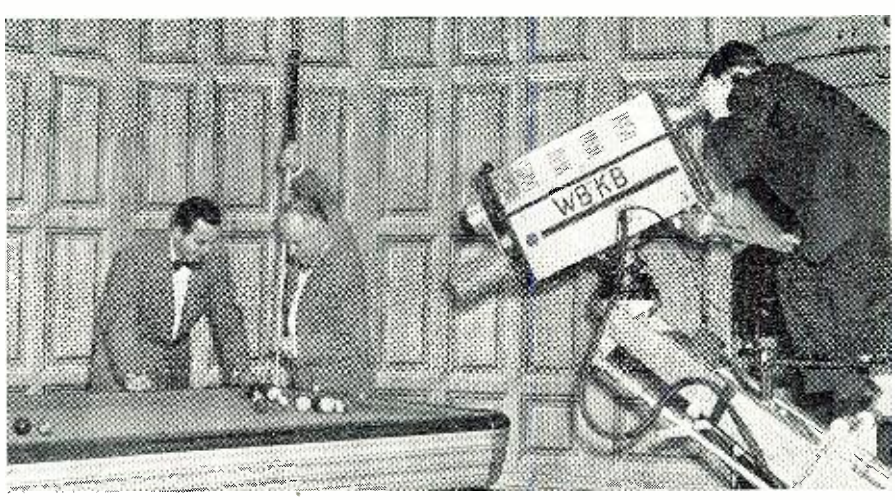
A customer is called a couple of weeks after installation and is asked if he's completely satisfied with his TV set. He is then asked if he would like to reduce his liquor bill.

"What can you do to help me reduce my liquor bill?" is usually the surprised response. "You're in the television business."

"Just this," is the smart promotional answer, "if you'll give me the names of the people coming to your house every night to watch television, we'll sell him a television set and then you won't have to play host to so many and your liquor bill will be reduced."

It is surprising how many sets are sold this way, and in dozens of other ways which can be invented. The public wants TV. It's willing to be shown. In five years television will be one of America's ten largest industries. You might as well be a part of it. —30—

Andy Ponzi, three times world's pocket billiards champion and present national champion, shows Sportcaster Milt Hopwood a fancy shot in the WBKB studios in Chicago. This type of studio program is finding wide audience acceptance.



Bad Audio?

(*Continued from page 43*)

value to one of 500,000 ohms. This improved the response with relation to the position of the setting of the volume control. A series carbon resistor of 560,000 ohms was installed between the audio coupling condenser and the high side of the volume control and 56,000 ohms was added in series with the 15,000 ohm resistor connected to the same terminal of the volume control. Two further changes were made to the input grid circuit. The value of the grid return resistor was reduced from 15 to 2 megohoms and the coupling condenser next to the grid increased in value from .004 μfd. to .05 μfd.

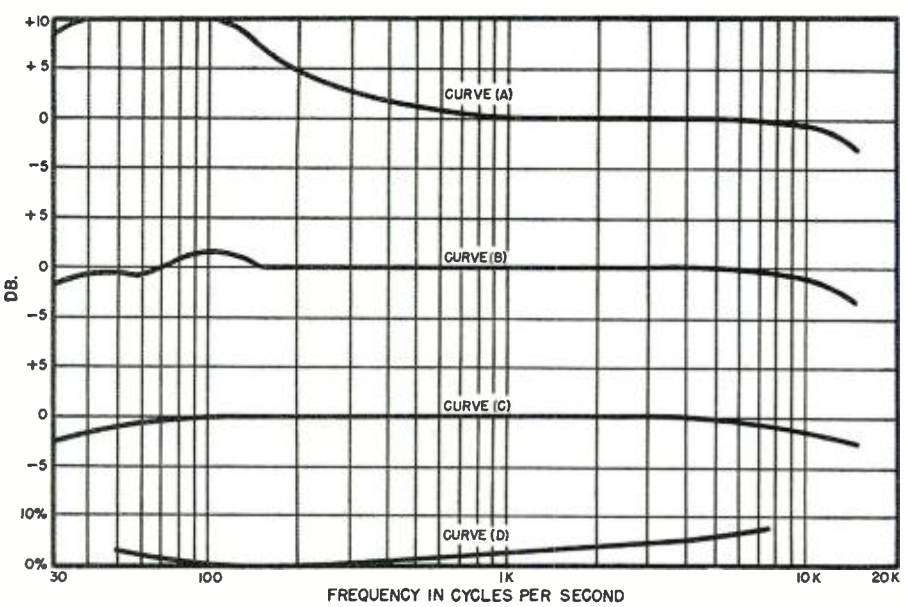
The 6J5 used as a phase inverter was removed and in its place a 6SN7GT was installed with appropriate circuit changes. This provided a second audio stage, as well as a separate phase inverter element. There was another advantage gained as inverse feedback was to be introduced around the audio system from the voice coil to the cathode of the input section of the 6SN7, now the second audio stage. This feature would not have been possible without the added triode element, as it was desired to keep the feedback loop free of the tone control system of this receiver. Experimental determination of the amount of gain reduction showed that 4 db. at a reference of 200 cycles worked nicely and provided adequate damping of the loudspeaker when it was mounted in the recommended baffle. Fig. 5 shows the modified audio system of this second receiver. Curve *A* of Fig. 6 shows the averaged response of the amplifier, working into a resistive load, after the changes had been made. Curve *B* shows the response with the 755-A loudspeaker as a load, readings being taken with a voltmeter in shunt with the voice coil windings, again using the optimum settings of the tone controls.

While at first glance, the modification appears to be a major operation, in reality it was not. Listening tests showed such marked improvement in performance that the work involved was fully justified. Fuzziness and ear fatigue had been eliminated and with the new output transformer installed it was possible to deliver between 8 and 10 watts to the speaker.

The third project covered a console model receiver of 11 tubes. AM and FM reception was provided in addition to the phonograph unit. From the preceding studies, it was decided to first make all tests with a resistive load on the amplifier and with the loudspeaker in the circuit last. Curve *A* in Fig. 7 shows the response obtained from the unmodified receiver with a median setting of the tone control. From this setting, some change in the amount of treble was obtainable but in all cases the results were short of the desired quality which an FM receiver should be capable of producing. Curve *B* shows a run made of the distortion of the amplifier, with a peak amount of 23% at 50 cycles. Here again insufficient power was being delivered considering the output tubes used in the receiver. Once more it was necessary to change the output transformer in order to provide satisfactory performance.

Analysis of the amplifier connections indicated that a most unconventional method of attempting to secure phase inversion had been tried. An unbypassed resistor in the cathode circuit of the output stage was supposedly functioning as a phase inverter although tests proved that, as a result, the second output tube was contributing little to the output of the receiver. A 6C4 miniature triode was installed in the set and wired to function as a self-balancing phase inverter. This

Fig. 9. Response curves of the third audio system tested after modifications.



delivered equal and opposite voltages to the two output grids of the 6V6's. The inverse feedback path was to the cathode of the output stage. This was altered to include the entire audio system with return being made to the cathode of the input tube. An unbypassed cathode resistor to this stage did the trick. This loop was adjusted for 10 db. of gain reduction at 400 cycles, again providing adequate damping of the loudspeaker. With this addition and the changes mentioned, the response of the receiver became more like that of a true console.

Another modification rendered the tone control system independent of the bass boost which was incorporated in this receiver by means of a tapped volume control. As the volume was increased less boost was incorporated while adjustment of the tone control affected the treble register alone. The changed audio system, as finally wired into the set, is shown in Fig. 8. Fig. 9 shows four performance curves for this receiver. Curve *A* is the response of the set with the 755-A loudspeaker as a load and with the modified bass boost system. Curve *B* was made under the same conditions only without modification of the bass circuit. Curve *C* is the performance of the audio system using a resistive load while Curve *D* shows the distortion when using the loudspeaker as the load. Obviously there is a tremendous improvement over the results of Curve *B* of Fig. 7, to which reference should be made. Listening tests with a critical audience proved the value of the changes.

Incidentally, it should be pointed out that all of the performance graphs have been drawn on identical scales in order to permit easy comparison of the results obtained.

Upon completion of the work, the question was raised as to why such changes should be necessary. Frankly, this question has me stumped. The modifications made on the equipment were simple and inexpensive and why they were not incorporated in the original equipment is puzzling. The appreciation of improved musical reproduction is not a matter for quick market assimilation but the eagerness with which the public is accepting the imported phonograph records with their increased frequency response is indicative of the demands that the public may soon be making of their radio sets.

What is the answer to the problem? I cannot suggest all of the possibilities but I can point out several practical steps than can be followed. If the manufacturer is really interested in offering quality merchandise let him return to the fundamentals of good audio practice and incorporate the more easily adaptable triode output stage, thereby eliminating the need for a feedback circuit and plate stabilization bypassing of the beam power tubes with its attendant attenuation of the higher audio frequencies.

Next, let the buyer determine what he is purchasing by means of a fair

test of the receiver made by an independent testing organization—at the dealer's expense—before investing in the set.

Finally, may I suggest a return to absolute honesty in advertising whereby no claims of set performance are made which cannot be fully justified.

Now that a few simple techniques for improving home receiver performance have been outlined, it is to be hoped that new models will reflect better engineering design, improved components, and better use of circuits in order to provide really efficient overall performance. For too many years the emphasis has been not on improving receiver performance but in cutting production costs. The situation has now reached the point where the engineering society to which the majority of radio receiver designers belong has seen fit to condemn the practice as suicidal.

An ever-increasing number of independent, custom-builders of equipment is making itself felt in the industry as more and more people are turning to the high fidelity equipment available from such sources. These pioneers stand a good chance of becoming the purveyors of much of the radio receiving equipment in the future solely on the basis of the quality of the product they are able to offer the public.

—30—

Servicing Simplified

(*Continued from page 72*)

C-5. Inoperative converter tube.

D-5. Open or shorted input i.f. transformer (primary or secondary).

E-5. Open or shorted oscillator anode circuit.

Should the mixer stage prove operative we can then go ahead and check the local oscillator. Regardless of the oscillator circuit (Armstrong or cathode tap) the grid bias is dependent upon the activity in the grid tank circuit. If the grid tank condenser is shorted, the grid bias rapidly reduces to zero and the local oscillator section of the mixer tube is shocked momentarily. This circuit discontinuity should produce an instantaneous surge condition at the oscillator grid which would beat against the tube and circuit noise in the mixer stage and produce an audio modulated radio frequency signal which would pass through the i.f. stage, be demodulated in the second detector and actuate the speaker as an audio frequency disturbance. Hence, to test the local oscillator (at various dial settings) short the oscillator tank either at the oscillator tuning section (rotor-to-stator) or at the grid-to-grid return section of the oscillator coil. As has been previously discussed, should the circuit be operative a distinctive circuit disturbance noise should be noted at the speaker.

Should no click or noise be apparent, it is reasonable to assume that the local oscillator is inoperative and one of the following causes apply.

A-6. Defective mixer tube (oscillator section).

B-6. Open or shorted oscillator coil.

C-6. Shorted oscillator tuning or trimmer condenser.

D-6. Open or shorted oscillator grid coupling condenser.

We have now "disturbance-checked" the receiver through to its first stage. We now make the final test. (Which conversely is the first stage of the radio receiver.) Short the cathode of the r.f. amplifier to ground. Should we still receive the characteristic click, the trouble with the receiver is most probably in the antenna or r.f. amplifier grid circuit. This may be determined by a routine ohmmeter check. Should the circuit disturbance noise, on the other hand, be absent, we have finally located our evasive fault in the r.f. amplifier stage and we may locate and repair the fault with the aid of a voltohmmeter. The fault would probably be:

A-7. Inoperative r.f. amplifier tube.

B-7. Cathode resistor or cathode bypass condenser shorted to ground.

C-7. Open or shorted second r.f. transformer (primary or secondary).

D-7. Open secondary first r.f. transformer.

E-7. Open or shorted r.f. amplifier screen circuit.

The above tests, although lengthy in reading, are relatively simple and quickly performed, requiring usually less than fifteen minutes to troubleshoot a receiver. The reader is advised to read the outlined procedure twice and perform the tests as he reads. In this manner, he will become acquainted with the procedure and the characteristic disturbance (click) resulting from the shorting tests.

The authors again want to state that the above technique is not necessarily the only method to employ. There are probably as many methods as there are radio servicemen. However, there exists a few fundamental methods of troubleshooting of which the technique described is one. As is evident, the method described starts from the speaker end of the receiver with the serviceman probing his way toward the antenna end. With another basic method, troubleshooting is started at the antenna end of the receiver and testing proceeds toward the speaker end. The authors plan to discuss such a method in a later article. It should be borne in mind, that in radio servicing as in any other trade or art, copying a method or style should not be disparaged unless a man dogmatically performs a copied method without knowing what he is doing. It is the opinion of the authors that servicemen should perform and copy several methods of troubleshooting and in so doing, they will subconsciously develop a method of their own which is a combination of the various methods copied and usually results in the fastest servicing by the individual concerned.

—30—

FREE!

Get Your Free

TABOGRAM

Crammed with Bargains You'll Never Again See!

Write Now or Phone WO 2-7230

XMTR SPECIALS!

BC457(4-5.3Mc) or **BC458**(5-7.3Mc) AS IS w/oTubes **$3.49**
w/Tubes 5.95
LikeNew 7.95

BC456 Modul As Is w/o Dyn& Tubes **$1.69**
w/Tubes&Dyn ... 4.98

BC375or191 As Is w/oTU & Tubes **$7.95**
w/TU&Tubes ... 12.95

GIBSON GAL Xmtr 8280 Kc LikeNew **$5.95**
GG Lamp&Ant ... 89c
Ask Info on ALL G'Gal Accessories

READ THIS AD
AND SAVE PLENTY $$

Collins ART-13 SPCH AMPLIFIER

Dynamic or Carbon Mike or line impt. Audio Driver to PPG & Monitor Tube. Less Tubes........ **$4.50**
SAME with CLIPPER KIT, TUBES & Data. NEW $8.25

HIPOWER VAR. ANT. NETWORK 1001A

1KW RF NEW 1.5 to 7 mc's convertible to Hi-freqs. PiNetwork adjustable IN & Output CASED 15x15x23" RACK MTG Ribboncoil & 250mmf/7000V V-condsr RFmtr. Insltrs Techmanual will match most ANTS. NEW requires recementing coil turn SPECIAL...................... **$9.95**
Same Unit NEW.................... 12.95
SAME UNIT, NEW, broken coil........... 8.95

"TAB" THAT'S A BUY!

METER 200 Microamp DC GE 4"

Sq. 5 Scales AC&DCV&ohms Red & Black K.E. pointer NEW.............. **$7.95**
TestLeads&Clips SftInsul 30amps.....49c
Test Leads&Red&Blk insltd Prods Hi Qual 49c

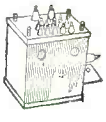
Range	Description	EACH
5 Ma	Weston2½" Bklt Csd...	$ 1.49
1 Ma	DeJur 2½" Bklt Csd...	3.95
25&2.5Ma	GE Galvnmtr zero ctr...	3.95
1 Amp	RF 2½" GE Bklt Csd...	3.95
5or9A	RF 2½" GE/Wstg B'Csd	3.49
750 Ma	RF 2½"Csd&CoupleWstn	3.49
15 Amp	DC 2½" Csd Hoyt.....	2.95
240Amp	DC 50 MV mvt2½"B'C.	2.49
30 Volt	DC AN 2½" B'CsdWst..	2.49
10000 V	DC 1000 ohms/v3½" B'Csd	12.95
150Volt	AC 25-125 cyc2½"Wst& GE	3.95
7.5 Volt	AC 3½"BkltSq.RA35 Wstg	4.49
15 Volt	AC 3½"BkltSq.Weston 476	4.95
360°	I-82 Bendix Autosyn....	4.95

Save Money with FOTOFLASH!

Replaces $2000 Worth of Flash Bulbs. On one bulb—12 million lumens, up to 30,000 flashes.

BASIC KIT—Complete Power Supply including tubes, complete instructions and FOTOFLASH LAMP & reflector. For 115V AC. ONLY...................... **$29.95**

STUDIO KIT—Famed Air Corps 1503 Set for 115VAC or battery with TWO lamps $53.95



Complete TV Voltage Supply Kits

High, Low & Filament Voltages

FEATURING: Herm Sld W.E. USN oil filled XFMR inputs 105,115,125 VAC 50-425 cps Outputs 600VCT or 300 VDC/175Ma and 6.3V/10A.5V/8A,2.5V/3A, 5V/3A. H.V. insulated.

10000V, 300VDC & ALL Filaments Supply Kit

Above Xfmr & 2-3B24 Doubler-Rect & 5U4G rect. & All cndsrs, sockets, choke & data "TAB" Special.$29.95

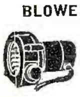
5000V, 300VDC & ALL Filaments KIT

Same Xfmr plus 5U4G&3B24 rectifiers, condsrs, choke & sockets, diagram $21.95
Transformer Only 16.95

KIT 866A'S & XFORMER

115VACin 2.5VCT/10Aout 10KVinsul &Tubes& sockets.only **$5.95**
Similar872Akit 12.95

BLOWERS—COOL THAT TUBE!



40CFM/28VACDC ..$ 2.98
100CFM/12VACDC . 5.95
100CFM/28VACDC . 4.95
12/28to115VACXmfr 1.69
250CFM/28VACDC . 8.95
SameW/28-115Xfmr 10.95

PHOTOFLASH CONDENSERS & FILM

8mfdGE/660VAC/3000VDC intermittent ....4 for $11.95
16mfd/660VAC/3000VDC intermittent 7.95
15mfd/330VAC/2000VDC intermittent 4.50
25mfd/330VAC/2000VDC intermittent 7.95
16mm/PAN/50Film GSAP Camera 54/ 5.49
16mm/PANFilm GSAP....10/ 1.49

PRECISION RESISTORS

"TAB" — Specialists in precision resistors. Write for quantity prices. Write for List.
.116-95000ohms@30c ....10/$ 2.50
100K-950Kohms@40c; 10/ 3.50
1Meg-20Megohms@75c 10/ 6.50

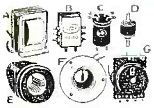
VacuumPrecisionHiV Resistors
.12,.25,.6,.75,.83,.99,1,1.5,2,3,3.75 megohms½%accy@$1ea;10/$ 7.50
Sld 10/12Meg10KV9W@ 1.35; 10/ 10.00
MVZ8/20W/30Meg25KV@1.98; 6/ 10.00
MFB105/1Meg½%accy@ 1.98; 6/ 10.00
20MegJAN-R29/20KV½%accy. 25.00

TUBES...

6C4, 12A6, VR92...........23c
954, 956, 957..............33c
10 for.......$2.98; 100 for $25
388, 955, 1625, 9001, 9006.40c
2X2, 6H6, 6H6GT, 6SA7GT, 7C4/1203A 49c
1LN5, 1P5GT, 6AC7, 6K6GT, 6SH7, 6SN7GT, 6V6GT, 12SG7, 24G/3C24, 826, 1613/6F6X, 2050 ....69c
2C40/446A, 6K5GT, 6L7, 6SL7 ....75c
6AB7/1853, 6AK5, 211C, 215A, 866jr 89c
REL36 ACORN sim 6J4 gnd grid SPECIAL 98c
5T4, 6B4G, 807, 816.....$1.15
3BP1, 5FP7, 9JP12....... 1.49
9LP7, 710A/8011 .... 2.69
G.E. GL434A similar 7C29/1KW HF RF $7.95

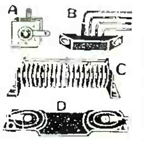
WRITE for COMPLETE TUBE List
Send "TAB" all inquiries—Quantity Prices.

TELEVISION COMPONENTS



A.V'outpt Xfmr sim RCA204T2 ..$2.98
B.Utah9318 H'Blkg Osc. Xfmr H'sld $1.49
C.UTC88662 V'BlckgOsc Xfmr H'sld $1.29
D.Eric HiV Cndsr 500mmf 10KV....40c
E.Yoke MagnDefl simRCA201D1 .. 4.59
F.FocusCoil for MagnFocKinescps.. 3.95
G.HiV Flybak H'outXFMRSimRCA211T1 ....$5.49

RECTIFIERS



A. SelFED 100ma **81c**
A. SelFED 200ma **$1.08**
B. Bridge — 210 Vin/100out/40ma ...**79c**
D.Sel CT 36Vin/28 out 1.5amps ..**$1.49**

Bridge-Type (C)

In	Out	Amps	Price
18	14	1.35	$2.49
18	14	3.5	3.49
18	14	5.	4.85
36	28	.320	1.49
36	28	3.5	6.75
36	28	5.	7.50
90	75	0.15	1.49

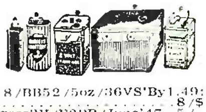
XTAL Diodes & Thermistors New

1N34@**$1.08**, 2/**$2.10**, 10/**$9.85**
1N21,21A,22,23,23A ea. **$1**; 12/**$10**. 1N21B, 1N26 @ $2: ....10/**$17.50**
1N35 Dual Diode..........**$2.29**
D168391 Comp THERM @ **$2**; 3/**$5.00**. D170396 HF pwr meas @ **90c**; 3/**$2.50**. 1C Bulb Time Delay @ **90c**; 3/**$2.50**.

RELAYS—FAMOUS MAKES

AUTOMATIC RA74 Remote Control Reset Stepping Twin Coil 24to30V DP10 Circuit.....$8.95
W.E.263A Telephone 275 ohm dual coil 2 section each 25 pole DTNO paladium cts $10.95
CLARE A12280/115V-60 cy/3SPDT & 3SPNC..........$2.98
CLARE Octal based 115VAC/DPNC & SPNO $3.98
CH/B8/ operates 7to24VDC/200to1200 Amps $2.98
S'DUNN 32AXX10 Reset&overload 10ma &115 VAC $4.95
KURMAN 4maSens650ohm/DP1NO&1NC/5Amp $2.25
A Bradley 702/110VAC/3PSTD break 25Amp......................$4.49
ADVANCE 4001B Antenna DPDT&SPNO 15Amp.Ceramic HF ins 75to110V $2.75 @&Rec115VAC $3.25
A Bradley Overload adj18.1/15.2/12/9&6.3A $3.98
GE Inst V'Rel Calib 70.85,110,160Vfor 115VAC $9.95
A'Chalmers Prec.Comp 194 Therm O'Load $7.95

BATTERIES—DRY & STORAGE



A.BR18/BB52/5oz/36VS'By1.49; ....8/$10.00
B.Burgess3V/F2BP/June'47 5/ 1.00
D.BB54/2V/27A Willard S'B. . 1.98
E.Willard 4V/40AH/TBY S'B.. 5.95
F.BB206U/2V/11AHWillard S'B. 1.89
EVEREADY Hevi-DutyMinimax BA43p/oSCR284 90/45/1½V w/octalsckt&handle2⅝x4¾x6¼" 3Xsld Late'47 @ 1.39
2 for $2.49..............10 for 10.00

ANTENNAS

AN-30 Telescopic Whip Adj 12" to 9 ft. NEW, ea. **$1.49**; 2 for.......**$2.49**
AT5/ARR1,AT1/APN2 30cm/12" w/coax conn &w'pf gask&flange for mobile mtg. **$1.49**; w/P1.259 ...**$1.75**
AN130B SpringSwiv'ldWhip END L'DD 33"lg. $1.25; 2 for **$1.98**
P108/LU3 12cm coax fitting **$1.98**
AS23/AP w/coax fitting. 2.98
MS49-54, 18 ft. whip.. 3.98

DYNAMIC MIKE
& Xfmr Special!

A Terrific Bargain! Combination high gain dynamic miketransformer (UTC/Super Elec 3wdg. 600CT&4000 ohms tapped 250 & 150ohms. Fully shielded H'sld) plus excellent fidelity sound power telephone. While they last **$1.49**

COBALT BAR MAGNET

Wide Hystereis (hi-retentivity) charged COBALT bars 3⅞x½x¾".............Pair for **79c**

KITS...

BASIC ALL-ELECTRONIC VTVM

Build Ultra Sensitive VTVM **Kit**, similar to RCA Voltohmyst Jr. Includes PRECISION resistors: 4" Sq. GE 200 microamp meter (reads 3-10-30-100-1000VDC; 10-30-100-300-1000VDC; 1000/10000/100000/1meg/10megohms). 11 megohm input resistance. Full data & schematic. Less case $19.95

BASIC 3" SCOPE KIT

Sensational visual tester foundation. 3BP1 CRT plus 5Y3GT & 2x2 tubes, 115V60cysXfmr-1320 V, 375VCT/110ma, 5V/3A, 2.5 V/3.25A. All cndsrs & choke for Lo & Hi Volts supply & sockets. Less chassis, amplifier & sweep circuits.......$16.95

AMPLIFIER KITS

Biggest Amplifier Kit Buys—Never Before at these Low Prices!!

HIGH FIDELITY—A Hi-Fi circuit with perfect linear response, phase inverter & full tube complement featuring 2-2A3 PP output, 6SJ7 and 6SN7. **All parts**, tubes, controls, diagram & remarkable RCA Audio Amplif Chassis described below. Less Output Xfmr. THIS IS A TRULY OUTSTANDING BARGAIN AT $14.95

17.5 WATT AMPLIFIER KIT—Similar above with all major components except 2-1619/6L6 delivering 17.5 Watts.

14 WATT AMPLIFIER KIT—Similar above except 2-6V6GT delivering 14 Watts.

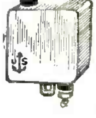
17.5 OR 14 WATT KIT, less output Xfmr. ONLY....$12.95

RCA Audio Amplifier Chassis for AMPLIFIER KITS. Heavy duty porcelainized chassis. Gray rustproofed 7¼x12¼x2¼". 9 Amphenol sockets incl 6 octal, 3 inpts, cutout for pwr transf & choke. Chassis marked for 2mic, Vol. Tone. Fuse. Tubes (7). Complete with 3FP triple section Electrolytics.

VOLTAGE REGULATORS

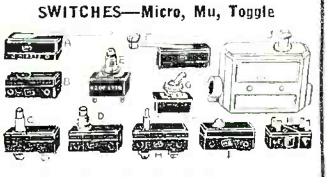
CONSTANT V'REG NEW RAYTHEON in 95-130V/60 cy; Output 115V/60 cy Csd $10.95
RAYTHEON in 198 to 242 Vinpt/50-60 cys; Output 220V/500 Watts/0.5% Rgltn Rack mtg............$36.00
SOLA CONSTANT V'REG USN Cased in 95 to 190V/50-60 cys; Output 115 or 220V 2KW/17.4 Amps/Constant Duty 1% Regulation LN*...........$108.00
Same Unit NEW. USN Cost $369. Only $130.00

NAVY LINE FILTERS



Cased Filters 0.1 to 1000 mc's/USN $1.29
TOBE 30amp 250 VACDC filters 0.15 to 1000mc's USNcsd Cont duty $4.50 @...........2 for 8.00
GE 100 amp filtrs & 2x5 mf/50V oil filled Cndsrs operates 110VACDC SPECIAL $1.98

SWITCHES—Micro, Mu, Toggle



A.MU/leafSw3½"DPNO&NC/15A $0.98
B.MicroSwPinPlungerSPDT/10A.. .54
C.MicroSwPlungerSPDT/10A ... .59
D.MicroSwPlungerSPNO/10A ... .69
E.ArrowH&HPlungerSPNO/6A .. .39
F.MicroSwRollerSPNC/10A ..... .89
G.AH&HToggleDPDT/6A@30c:4/ 1.00
H.MicroSwPlungerSPNO'NC .... .59
I.Mu&MicroSwsSPDTw/reset .... .65
J.MicroSwSPNC/30A/Csd 1.25
K.SwitchetteDPNO&NC@30c:SPNO .25

TOP TRANSFORMER BUYS!

Power Transformers—115V/50-60 cps input

Volts Out	Ma.	Filaments	EACH
250 CT	60	6.3V/1.5A Small	$1.49
500 CT	60	6.3V/4A Herm Csd	1.29
700 CT	150	10V/3.25A, 6.3VCT/2A, 5V/3A & 2.5V/10A HV insul Csd	5.95
700 CT 115 Isol	120 100	2x6.3V/2A & 5V/2A Csd HiVolts insulated	3.25
840 CT 540 CT	110 21	6.3V/1A, 6.3V/.6A, 2x5V/3A USN Csd 2X safety factor	4.95
880 CT	125to250	6.3V/3A, 6.3V/2A & 5V/3A	4.45
1100 CT	150	6.3V/3A & 5V/3A HV insul	4.50
3200 CT 780 CT	200	12V/.5A	12.95

Plate Transformers—115V/50-60 cps input

Volts Out	Current	EACH	Volts Out	Current	EACH
500	3 Amps	$10.00	1200 CT	300 Ma	$4.50
7500V or 15000Dblr	35 Ma	15.95	10800V or 21000Dblr	95 Ma	19.95

Filament Transformers—115V/50-60 cps input

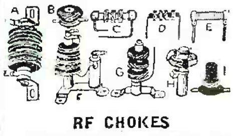
Rating	EACH	Rating	EACH
2.5V/40A GE 25 KV ins 2.5V/10A/10Watt	$7.95 3.95	6.4V/12A, 6.4V/10A, 3x5V/3A, 2.5V/1.7A	$4.95
5V/6.5A/36 KV insul & UX socket	7.95	7.5VCT/6.5A 6.3VCT/3A	3.75
5V/60A KENYON HVins	6.95	7.5V/12A/HV insul	4.95
5V/115A	10.95	10V/8A/12KV	6.95
4x6.3V/4A, 3x5V/4A	4.50	12VCT/.7A, 10VCT/10A, 2x6V/2A, 3x6V/1A	7.95

SPECIAL TYPES

Input	Output	EACH
6, 12, 24 or 115VDC, or 230VAC	420VCT/85Ma, 6.3 V/3A, Univ. Vibrator Xfmr	$2.49
110V 220V	110 to 220V/250Watt 220 to 440V/250Watt	4.95
115 or 230V	AutoXfmr 1.8 KW	16.95
115 or 230V	AutoXfmr 2 KW	19.95

FILTER CHOKES

13.5Hy/1Amp/42ohm/17KV insulation $54.00
15-29Hy/150ma Swinging Cased 2.95
12HY/300ma 3.95
3Hy/40ma 3/ 1.00
15Hy 400ma or 20Hy/300ma/12KV ins... 7.95
8Hy/150manewUTC crckdBklteT'Bd ..2/ 2.25
50HY/125ma Csd 1.95
8Hy/100ma/ 1.10
12Hy 275ma 3.29



RF CHOKES

A.HAMMARLUND CH500/2.5 MH/8ohms/500ma .....$.98
A.20MH/500ma/14.75 ohms DCR 8mmf distCap w/mtg ft &4¼" mtg ctrs, lug term, ceramic core $0.98
B.SICKLES 85MH/250ohms/ceramic form $0.70
C.NATIONAL R300/1mh/300 ma/10ohms@ 28c; 4 for $0.98
C.Two 2.5MH/125ma&.01&.002cdrs&Resist $0.45
D.5MH/300ma, pi wound $0.29
E.MILLER 2½&5mtr/2.5MH/27ohms/1A@25c; 5 for $0.98
F.NATIONAL R152/80 & 160 mtrs/4HM/600ma/10 ohms $0.98
G.SICKLES HF 20MH/200ma 75ohms $0.49
H.Hash Chokes for Mercury VaporRec@25c; 5 for ..$0.98
I.SICKLES 1.5MH/200ma, ea. 25c; 5 for $0.98

SPRAGUE FPElectypes 30 mfd 350VDC 39c ea.; 3 for $1; 10 for $3; 100 for $27.50

THAT'S A BUY "TAB" THAT'S A BUY

DEPT. 1RN SIX CHURCH ST. NEW YORK 6, N.Y., U.S.A. - CORNER CHURCH & LIBERTY STS. ROOM 200

"TAB" MONEY BACK GUARANTEE
$3 MIN. ORDER F.O.B. N.Y.C.
ADD SHIPPING CHARGES AND 25% DEPOSIT. PHONE WO. 2-7230

International Short-Wave

(*Continued from page 63*)

man, 10, Oban Road, Westmere, Auckland, W.2, New Zealand. Headquarters of this group is 100, Adams Gardens Estate, London, S. E. 16, England.

United States—An organization *new* to this department is the *Dial Spinners Club;* anyone wishing details should write to club headquarters at 907 Fulton Street, Rapid City, South Dakota. (Cooley, Pa.)

The Short Wave Listeners Registry has chosen these officials for the coming year—Bill Camp, editor; Russ Bearinger, president; Glen Jensen, first vice-president; Mrs. Arthur McArthur, second vice-president; Steve Sidor, secretary; Bill Cooley, publicity; Bob Camp (W3NJL), radio editor. Data concerning this club is available from 1042 Water St., Moosic 7, Pennsylvania.

Officers recently chosen by *Silent QRM'ers* are—Belle Aaron, president; Gustave Thomka, vice-president; Mary A. Matthews, secretary; Leonard M. Tompakov, treasurer; Betty Peck, YL director; Arthur Levi (Belfast, Northern Ireland), overseas representative; Herman Dallmeier, publicity director. For information on this organization, write to Miss Aaron at 1032 N. Broadway, Baltimore 5, Maryland.

* * *

This Month's Schedules

Algiers—Radio Algiers has been heard testing on its old frequency of 11.835 at 1130-1215. (Bluman, North Africa, via Swedish DX broadcast)

Andorra—NNRC reports *Radio Andorra* heard on 5.996 at 1630-1800 with bad QRM.

Anglo-Egyptian Sudan—Radio Omdurman has moved to 9.670; heard weakly in 2310-2345 transmission. (Beck, N. Y.) I believe this is the station Ferguson, N. C., and I have been hearing on 9.515 (some nights as high as 9.525); it is a "wanderer!"

Angola—CR6RF, 8.090, Caixa Postal 19, Benguela, Angola, verified with attractive card; now heard signing on 1330. (Cushen, N. Z.)

Argentina—LRY1, *Radio Belgrano,* Buenos Aires, noted recently 5 kc. lower than listed 9.455. (Kary, Pa.)

Australia—Melbourne has replaced VLG6, 15.24, with VLA11, 9.58, at 0100-0145 in beam to Europe (in French), and at 0200-0315 to Britain-Europe instead of VLC, 15.200. (Balbi, Calif.) In the Britain-Europe beam at 1500-1655, VLC, 15.200, has been replaced by VLC9, 17.840; VLC9 also is now used to South America at 1710-1815 instead of VLC. In the West Coast of North America beam at 2330-0045, VLG11, 15.200, is now used (daily *except* Saturdays); VLG11 formerly was beamed to Africa for this period. VLC9, 17.840, also has replaced VLC10, 21.680, to Britain-Europe at 0200-0245.

In Newfoundland, VLG6, 15.230, is heard 1500-1530 when is "blocked out."

MAKE A BEE-LINE TO Kayline!

★ SAVE MONEY • SAVE TIME ★

★ BIGGEST VALUES ALWAYS ★

KAYLINE SERVES THE RESEARCH LABORATORY, INDUSTRIAL USER AND AMATEUR

6 AK 5 BRAND NEW TUBES (Only 2 to a customer) **$.59**

Miniature Tube Sockets. 7 prongs socket and shield assembly complete ..... **$.25**

BRAND NEW TUBES
Immediate Delivery

2C44	$0.70	864/5T24	$0.80
2E22	1.39	872A	2.45
2C26	.55	826	1.00
2X2/879	.75	954	.65
3A4	.49	957	.65
3B24	1.25	991	.50
3B26	1.75	958A	.65
5R4GY	1.29	1201/7E5	.40
6AC7	1.00	1665/2050	.90
6AG7	1.00	8011	4.95
6L6GA	.95	8014A	4.95
7C4/1203A	.35	9001	.80
12A6	.45	9002	.80
12SH7	.69	9003	.80
15R	1.49	9006	.80
211	1.15	CNU7193	.49
371B	2.95	CRP72	1.00
446A/2C40	.70	E1148	.40
446B/2C40	.70	HY615	1.25
417A	4.95	OC3/VR105	.75
705A	1.75	OD3/NR150	.75
715B	9.95	RK34	1.00
723AB	7.95	SN4	3.50
724B	.95	VT138/1629	.50
807	.95	VT-127A	1.50

#44 Pilot Bulbs—6 to 8 volts. Box of 10 ..... .40c

CRYSTAL X'DIODES

IN21B ..... $2.00 IN23A $1.00

RADAR RECEIVER

A "hot" receiver covering the 174 to 210 MC Television band. Has individually slug tuned antenna R.F., Detector and oscillator circuits resulting in maximum sensitivity; contains 2 F.F. and 5 I.F. stages detector and video amplifier. Complete with 110 volt AC power supply and 14 tubes..... **29.95**

TRANSMITTER

Range 150-200 Mc

BC-1072-A—An outstanding Kayline value.

24.95

HIGH VOLTAGE TRANSFORMER, plate; 2100 volts @ .01 amps. New..... **$4.95**
59 HENRIES, 100 MA CHOKE.... **$3.50**
12-12 HENRIES, DUAL CHOKE 200 MA DC **$4.25**

6" Standard Brand LONG NOSE PLIERS **$1.00**

OIL FILLED CONDENSERS

GE Pyranol Capacitors, 4 MFD. 3000 volts DC **3.95**

Solar 10 MFD, 600 volts DC **1.95**

GE Pyranol Capacitor, 2 MFD, 2000 volts DC..... **1.50**
GE. CD, Aerovox, Solar, Sprague.

1 MFD 5000 volts	$3.95
5 MFD 330 volts AC	1.00
2 MFD 600 volts	1.00
4 MFD 600 volts	1.25
6 MFD 600 volts	1.50
7 MFD 600 volts	1.50
15 MFD 600 volts	2.75
2 MFD 1000 volts	1.25
8 MFD 1500 volts	2.50
2 MFD 3000 volts	1.95
1 MFD 3600 volts	3.50
1 MFD 5000 volts	3.95
.25 MFD 2000 volts	1.00
.50 MFD 2000 volts	1.00
.1 MFD 3000 volts	1.00
.1 MFD 7500 volts	2.00
.05 MFD 7500 volts	2.75
.035 MFD 10000 volts	3.95
.1 MFD 10000 VDC—G. E.—Pyranol. Cat. 14F101	8.95
.2 MFD 5000 VDC.	1.95

WESTINGHOUSE INERTEEN CAPACITORS

16 MFD 330 VAC..... **$1.95**
8 MFD 330 VAC..... **1.25**

PAPER TUBULAR COND.

.1 1000 VDC—Aerovox **$0.10**
.05 400 VDC—8 for ..... **.50**
.01 100 VDC—Midget-Solar, 25 for. **1.00**

ELECTROLYTIC COND. FP TYPE

40/30/10/10 MFD at 500/350/350/300 VDC **$1.00**
20/20 MFD at 250 VDC..... **.39**

MICA CONDENSERS

.0005-500 volts-AER-CD-Solar. Per 100 **$2.95**

JENNINGS VACUUM COND.

12-25-50-100 MMF. Write for prices.

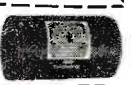
HAMMARLUND TRANSFORMER

Transformer IF part #SA166A 455KC..... **1.00**

TELEPHONE HANDSETS **$1.95**
PL55 PLUGS ..... **.19**
PL68 PLUGS ..... **.19**

COIL FORM, Hammarlund SWF-5 4 for $1.00 **$.29**

DYNAMOTOR



Dynamotor Model 5051

DC input	DC output
volts 27.0	volts 285
amps 1.50	amps .060

75c

METER Model MD 3001, MA 0-1 range. Two scales—0-5 DC KV. 0-10 DC Milliamperes. **2.95**

SYNCHROS Navy types. 5G. 5CT. 5HCT. 6G. 6SF, 6DG. Kayline has complete SD-3 Navy Radar Sets in stock. Write for information.

1" MIDGET METER. in all aluminum case. 0-1 MA. **3.95**

HEAD SET. Fine brand new miniature ear phones. 8000 Ohms, light weight. Special Purchase **2.49**

100 PC. CARBON RESISTOR KIT. Comprises 100 all insulated ¼, ½, 1 and 2 watt resistors in the most popular manufactured brands. **All Guaranteed to R. M. A. Color Code.** Only 2 to a customer ..... ea. **99c**

BENDIX TUNING METER. type MT 31-C. complete with cord and PL-55 plug. 0-300 MA. **2.95**

ALLEN BRADLEY CONTACTOR. Bulletin 702, 115 volts, 60 cycle, size 1. Write for quantity prices.

TRANSMITTING KEYS: Type R-50..**69c** Type J-45..**79c**

TELEVISION SPECIAL. 30 Meg. IF Transformer. While they last. (Type T-103).... **35c**

HAMMARLUND RECEIVER COILS. Large variety. Order by SA Part Number. Priced for closeout..... ea. **49c**

WAVEMETER

Here's an amazing value on Wavemeters which tune from 150-210 mc and contain high quality resonant cavity wavemeter oscillator heterodyne amplifier electric tuning eye complete with 19 tubes, 110 v AC power supply. The tubes alone far exceed the entire price..... **14.95**

SPECIAL VALUES

RSS-8 amphenol steatite sockets..... 12c
Mica-filled octal sockets..... 7c
Black bakelite MIP octal..... 7c
Grid Caps for 2x2 tubes..... 10c
Sockets for 2x2 high voltage mica-filled..... 25c
3AG fuse holder panel type..... 19c
2.5 M. H. Choke. Trans. type. Mounted... 19c

We welcome your inquiries regarding MAGNET WIRE and miscellaneous RADIO HARDWARE

RELAYS

2500 Ohms, 4 Ma SPDT, 5 prong plug in type, hermetically sealed, all brand new..... **75c**

INQUIRIES INVITED ON OTHER PARTS AND EQUIPMENT NOT LISTED HERE!

CARDWELL VARIABLE CONDENSERS

No.	TYPE	MAX. CAP.	MIN. CAP.	No. PLATES	AIR GAP	LGTH.	LIST PRICE	OUR PRICE
PL-6043	EV-140-AD	140	5	27	.020	3 11/16	$7.60	$1.50
PL-7105	NT-50-GD	50	7	11	.070	4 5/32	7.60	1.95
PL-8005	XR500-PS	475	18	21	.030	2 1/16	6.50	2.95
PL-7101	NP-75-DS	75	11	19	.084	4 5/32	5.20	1.95

TERMS: All Shipments F. O. B. Baltimore, Md. 20% deposit required on all orders, balance C.O.D. Minimum order accepted $2.00.

CABLE ADDRESS: KAYDISCO

Kayline DISTRIBUTING CO.

1803 N. LONGWOOD STREET
BALTIMORE 16 MARYLAND
Phone Wilkens 6464

Unless Otherwise Stated All Items are Sold as is.

Azores—CS9MB, 11.090, Ponta Delgada, appears now to be on winter schedule of 1500-1600. (Ferguson, N. C.) Winter schedules, as given by Swedish DX broadcast, are 1500-1600 on 11.090 and 1700-1900 on 4.845.

Brazil—Sao Paulo is now using ZYB-9, 15.155, paralleling ZYB-8, 11.765; news in Portuguese at 2100; complete schedule not known; ZYB-7, 6.095, is not heard, so presumably the 19-meter channel is a replacement. (Kary, Pa.)

Pernambuco has been heard on 9.655 to 2200 sign-off, fine signal. (Balbi, Calif.)

PRE-9, 15.165, Fortaleza, is heard daily around 1530 announcing in *English* and asking for reports to Caera Radio Club, P. O. Box 222, Fortaleza, Brazil. (Radio Australia)

British Guiana—ZFY, Georgetown, formerly 6.000, has dropped in frequency to around 5.984 where it has a much better signal. Closes around 2015 EST (9:30 p.m. British Guiana time). (Ferguson, N. C.) At times has been heard as late as 2200 closing down. (Rosenauer, Calif.)

Burma—According to Major, W. Australia, *Radio Rangoon* is currently scheduled 2015-2030, 9.543; 0115-0145, 9.543; 0915-1015, 9.543, *and* 6.035; news 1000.

Camerouns—Radio Douala, 9.149 (measured), has been heard by Kary, Pa., from tune-in at 1525 to sign-off at 1601; this was on a Sundy when program consisted of uninterrupted dance music (U. S., French, South American, and so on); at 1600, man announced "Ici Radio Douala," said goodnight to all (in French), and went off the air with a march selection (*not* "La Marseillaise"); signals were unusually strong but were subject to rather strong sideband QRM from a powerful teletype station on 9.150. It is possible that on weekdays this station runs only to 1400. I checked this outlet on a Sunday more recently and found program similar to that reported by Kary, except that sign-off at 1601 was quite abrupt after announcement—without any musical signature.

Canada—CBLX, 15.090, Montreal, varies at times to 15.088. (Kary, Pa.)

Latest winter set-up for CBC's International Service is—To Europe, 1000-1128, CKNC, CKCX; 1130-1330, CKNC, CKCS; 1330-1345, CKCS; 1345-1400, CKCS, CKLO; 1400-1420, CKLO; 1420-1700, CKLO, CHOL; 1700-1715, CKLO; 1715-1815, CKLO, CKOB; 1815-1830, CKLO. To Australia, New Zealand *(Sundays only),* 0345-0535, CHOL, CHLS. To Latin America and Caribbean, 1845-1925 (*English* to Caribbean), CKCS; 1845-1925 (Spanish), CKRA; 1930-1945 (Portuguese), CKRA; 1945-2025 (Portuguese), CKRA, CKLO; 2030-2130 (Spanish), CKRA, CKLO; 2130-2145 (French), CKRA, CKLO; 2145-2220 *(English),* CKRA, CKLO. To North West Territories (winter service to Artic settlements, *Sundays only*), 2310-2400, CKLO, CKOB. Channels used are CKNC, 17.82; CKCX, 15.19; CKCS, 15.32; CKLO, 9.63; CHOL, 11.72; CKOB, 6.09; CHLS, 9.61, and CKRA, 11.76.

CHNX, 6.130, Halifax, Nova Scotia, is back on the air after a prolonged absence, relays regular programs of medium-wave CHNS. (Kary, Pa.) Has much better signal than formerly, may have increased power and/or put into operation a better antenna array. (I hope to have details next month, including complete schedule. However, appears to run around 0600 to 2200 or later.—K.R.B.)

Art Hankins, Pa., reported CFCX on 12.010 to the station and received a verification for its 6.005 outlet. Officials stated: "There wasn't any doubt that it was CFCX which you heard, but our transmission is on 6.005, which leads to the presumption that what you picked up was some sort of a harmonic signal. CFCF is relayed by CFCX, power output is in excess of 75 watts; schedule is weekdays 0630-0000, Sundays 0800-0000; address, Canadian Marconi Co., P. O. Box 1690, Montreal, Quebec, Canada." (I have heard this harmonic for a long time.—K.R.B.)

Celebes—Radio Indonesia, Makassar, formerly operating as *"Radio Makassar,"* in a verie-letter to Kary, Pa., stated transmitters are on 9.550 and 5.030, the former with 10 kw.; announcement of station in Dutch is "Dit is Makassar, Radio Indonesia," in Indonesian it is "Disini Makassar, Radio Indonesia"; weekdays programs are 2200-0130 (2200-0000 in Indonesian; 0000-0130 in Dutch); 0400-1000 (0400-0700 in Indonesian; 0700-1000 in Dutch); and 1700-1900 (1700-1800 in Indonesian; 1800-1900 in Dutch); Sundays, 1900-0130 (beginning on Saturdays 1900-0015 in Dutch; 0015-0130 in Indonesian); 0400-1000 (0400-0700 in Indonesian; 0700-1000 in Dutch).

Station officials wrote Kary: "Perhaps, do you know the way to get some recordings of the latest songs? It's impossible for us to buy them here. Of course, you know we can't get dollars to buy gramaphone records. Perhaps one of the American broadcasting stations can help us?" *(NOTE: This appeal should be a challenge to our readers. If anyone would like to contribute some up-to-date recordings to this station, the QRA is* Radio Indonesia, Makassar Studio, Strandweg Zuid 2, Makassar, Celebes, State of East Indonesia.—K.R.B.)

Ceylon—Major, W. Australia, airmails me that by this time it is likely that *Radio SEAC* will have been handed over to the Ceylon Government, after which it is to be known as *"Radio Ceylon."* At the time this was compiled the *Sunday* beam from *Radio SEAC* to the British Isles was being heard well here in West Virginia on 15.12 and 17.77 at (winter schedule) 1330-1530.

Chile—CE920, 9.200, Puntarenas, is heard signing off at 2200, signals rather poor. (Kary, Pa.)

China—XORA, Shanghai, formerly on 11.705V, now appears to be using 11.850 where it is badly QRM'd by BFEBS, Singapore, and/or All India

REMEMBER *it's* EXCLUSIVE!

Only Quam manufactures the Adjust-A-Cone Speaker! It is designed with a voice coil, which instead of being permanently glued to the basket as in ordinary construction, can be adjusted laterally and accurately centered before leaving the factory.

This means that rubbing voice coils, generally so common when they are glued, are practically eliminated in Quam Adjust-A-Cone Speakers.

It is developments like this, ensuring perfect performance and customers' satisfaction, that make Quam Speakers the logical choice of the serviceman!

Write for Catalog of Quam Adjust-A-Cone Speakers

QUAM-NICHOLS COMPANY
522 East 33rd Place, Chicago 16, Illinois
Quam Speakers are listed in the Radio Industry Red Book

HOW TO GET THE MOST FROM YOUR RADIO "KNOW-HOW"

FREE MANUAL TELLS HOW!

Here is your opportunity to learn all about an amazing new simplified way of fixing any radio. There's nothing complex to learn, no calculating is required. Can be used by beginners or experts. It's as simple as ABC—and quick, too. You can use it on easy or "tough" jobs.

In simple, direct language, the informative 28-page illustrated manual, "The Inside Story" explains why old-fashioned methods actually hamper your servicing ability. It explains why experts have agreed that you can't blame yourself when you're stumped on those extra-tough jobs . . . obsolete servicing methods are preventing you from using your real ability.

So why not find out for yourself how you, too, can take advantage of the remarkable new STETHOSCOPE SERVICING METHOD. You owe it to yourself to get the FREE manual at once. It's chock-full of useful and helpful information, too. It gives you valuable hints and kinks from the experience of top radio engineers.

Become the outstanding expert in your locality.

MAIL COUPON FOR YOUR FREE COPY TODAY

FEILER

MAKES TOUGH JOBS EASY

FEILER ENGINEERING CO., Dept. 1H9
945 George St., Chicago 14, Illinois

Please RUSH my FREE copy of "The Inside Story." I enclose stamp to cover handling.

Name.....

Address.....

City.....Zone....State....

Radio. (Balbi, Calif.) Shanghai sometimes is as high as 11.852; both it and Singapore vary back and forth around 11.850 in an attempt to get a clear spot! (Fern, Hawaii, via NNRC) Has been measured as high as 11.868. (Hutchins, Radio Australia)

XGOY, Chungking, has a strong signal on 7.153 now (in parallel with 11.913) mornings to sign-off 1045; often the 0900 news is better on 7.153 than on 11.913. (Balbi, Calif.) XGOY's 15.17 outlet is heard here in West Virginia at weak level to as late as 0730, news 0700; it is "squeezed" badly by Oslo on low side and BBC on high side.

Recently, Desouza, Singapore, Far East monitor for *Radio Australia,* checked 11.400 for a Chinese station previously reported as operating there with call XAET; he did not locate this station on 11.400 but did find XAET on 12.700, daily from around 0600 to sign-off 0800; entirely in Chinese and at times relays XNCR (Communist-controlled outlet); usually this XNCR relay is 0630-0700; call-sign XAET is repeated three times at 30-minute intervals.

Cushen, New Zealand, reports XRRA, Peiping, heard on 6.095 at 0530.

The station heard rather widely in Chinese on 12.120 in December 1947 on the East Coast to 1930 sign-off and announcing as "XAEE" apparently was in reality XKPB, Taiyuan, Shansi, China. (Kary, Pa.) Incidentally, Australians have recently reported XKPB has been heard mornings, around 0500.

XLRA, 11.490 (may be as high as 11.5), is heard in Massachusetts at 0625 with good level; XTPA, 11.650, Canton, is heard well around 0635-0815. (Harris)

Latest schedules received by Rosenauer, Calif. from XGOA, Nanking, are: To North America, 15.105, 2100-2300; to Philippines, Australia, New Zealand, and South Pacific Island, 15.105, 0400-0530; to Mongolia, Tibet, Japan, and Pacific Islands, 15.105, 0550-0730; to India, South Africa, and Europe, 15.105 and 11.880, at 0800-1015. It was explained: "The Central Broadcasting Administration operates *two separate services* from its Nanking outlet XGOA, The Central Broadcasting Station. The *local* service is heard over 660 kc., 5.985, and 9.730; the *Overseas Service* is presently heard on 15.105 and 11.880." Incidentally, XGOA's 15.105 outlet has been sending a fair (readable) signal to Eastern North America lately in the 2100-2300 beam, news 2115, 2230; signal improving.

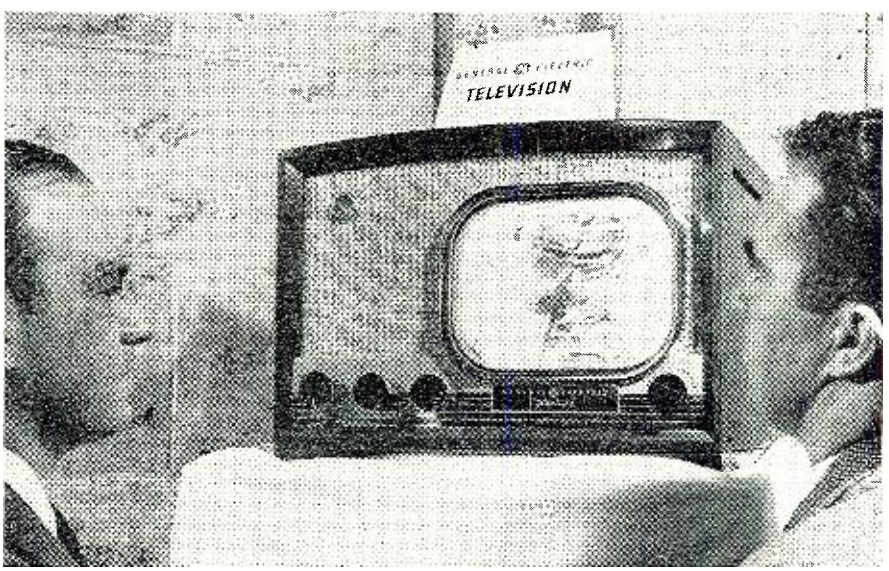
Colombia—Bogota appears to have another *new* group—HJKJ, 6.160 and HJKL, 950 kc., at 0650-2300 daily. (McPheeters, La.)

McPheeters, La., has received a letter from *Radio Pacifico,* Cali, with stations HJEX, 6.054.3 and HJER, 1030 kc. The letter (in Spanish) stated: "Indeed, by a special exchange worked out between Radio Pacifico of this city of Cali, and 'La Voz de Pereira,' of Pereira, Colombia, we have definitely remained located on 6.054.3 and 'La Voz de Pereira' moved to 4.865, as the Sociedad de Comercio which is in charge of the undersigned (Radio Pacificio) holds the concession for the frequency of 6.054.3 and was formerly owner of the already-mentioned Pereira transmitter." *Radio Pacifico* is on the air 0630-2230. It was stated they are anxious to receive reports, especially those in which reception of their station is compared with that of other Colombian transmitters.

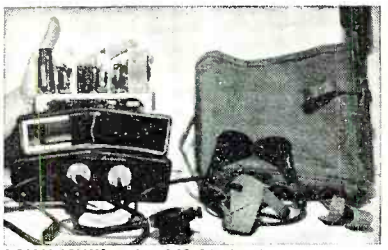
Cuba—COBC, 9.380, Havana, operates 0700-0000, fair signal, but badly QRM'd by a phone station (may be harmonic); COCW, 6.327, Havana, is scheduled 0600-0000, announces *"Cadena Rojo."* (Weisburg, N. Y.)

Curacao—PJC2, 7.250, Willemstad, sends schedule of 1130-1230, 1800-2130. Sometimes has been heard as late as 2155, however. Has *English* program

Television took a major role at the recent Los Angeles meeting of the American College of Surgeons. An actual major operation, which was under way at the General Hospital, was televised direct to the convention hall.

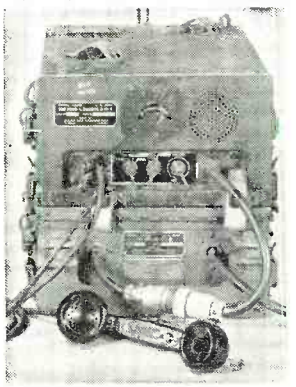


CHECK THESE BARGAINS

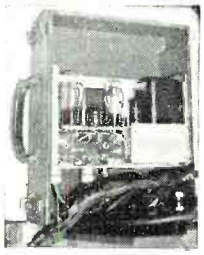


NAVY "WALKIE TALKIE," Model "M" series, 2.3 mc to 4.5 mc crystal controlled receiver-xmitter. Ideal for hams, forest service, foreign trade, marine, etc. Uses 7 peanut tubes and ordinary dry batteries that fit into same case. Wt., less batteries, 6 lbs. With all tubes, mike, headset, antenna, carrying bag, diagram and 2 matched xtals.
LIKE NEW, 2 for $58.00, Each $29.95

20 to 28 MC FM PORTABLE TRANSCEIVER. BC-620 for 11 and 15 meters; can be extended to 10 meters by adjusting IF's; similar to BC-659 at right, but without speaker or handset.
NEW, orig. boxes $19.95
LIKE NEW 14.95



Accessories for BC-659 and BC-620
Crystals for BC-659, any channel 27.0 mc to 38.9 mc or for BC-620, channels 20 mc to 27.9 mc, ea. .. $1.00
Battery BA-41 for bias and mike, unused $0.65
Battery Case CS-78 w-plug, U-2 ..... 1.75
Handset TS-13 w-PL-55 and PL-68, U-1* 3.95
Diagram BC-659 or BC-620 .... .65
Alignment Tool TL-207, U-1 .. .95



VIBRATOR POWER SUPPLY PE-120 for BC-659 and BC-620; operates from 6, 12 or 24 v. depending on vibrator. With 12 or 24 v. vibrator, battery cable and plug. UNUSED $12.95 U-1 $9.95 U-2 ..... $7.95

SOUND-POWERED HANDSET TS-10 with cord and plug. NEW, per pair $27.85

INTERPHONE AMPLIFIER BC-347 aircraft type. Input: 200 ohm to single or push-pull plate. Complete with 6F8G tube, 2 hi-fidelity ouncer xfmrs, etc., in case 2½"x4"x6". BRAND NEW, orig. cartons $2.95

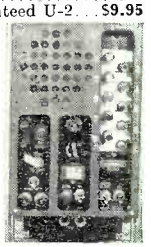
CIRCUIT BREAKER, 115 v. 60 cycle, 120 amp; part of RA-38 Rectifier, UNUSED $19.95

SWITCHBOARD BD-9, portable 4 cord w-drops. U-2 $4.95 BD-11, 12 line, U-2 ..... $9.95

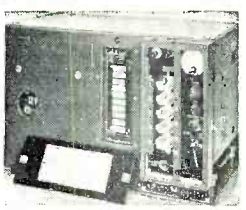
VIBRATOR, 6 prong 6 volt sync. Mallory No. 538C for BC-1335 mobile set. NEW $2.49

PORTABLE TELEPHONE EE-8, checked and guaranteed U-2 .. $9.95

20 to 28 MC FM RECEIVER BC-603 for 11 and 15 meters; can be tuned to 10 meters with slight modification; superhet, BFO, squelch; 10 pushbuttons and manual tuning. Makes fine 10 meter converter or I.F. strip for 88 to 108 Mc wide-band FM; with all tubes, speaker, case, diagram. FREE CONVERSION INSTRUCTIONS for 88 to 108 Mc FM; also easy change to 115v AC. UNUSED, repacked, with dynamotor $22.95
USED, good, with dynamotor 15.95
USED, without dynamotor 12.95



TELEGRAPH SET TG-5, bat. operated; includes key, earphone, buzzer, bell and sensitive relay, in case 7"x5"x4". 8 lbs. U-2.
Each ..... $3.65 Two for $6.95



20 to 28 FM TRANSMITTER BC-604 for 11 and 15 meters; can be operated on 10 meters by use of proper xtal; 10 channel pushbutton xtal controlled; with all tubes, meter, diagram, case and covers; less xtals; Used, excellent, with dynamotor $19.95
Used, good, with dynamotor 15.95
Used, good, without dynamotor 12.95
Extra 12 volt dynamotors; DM-34 for rec., U-2 ..... 3.95
DM-35 for xmtr U-2 ..... 4.95
Set of 80 xtals in drawer for BC-604 (when bought with BC-604) 12.95

27 to 38.9 MC FM TRANSMITTER BC-684, looks like BC-604 above. 30 watt, 10 channel pushbutton controlled; with covers, all tubes, meter, diagram, less xtals.
U-1 with dynamotor ..... $34.95 Without dynamotor $32.95
U-2 with dynamotor ..... 29.95 Without dynamotor 27.95
Choice of xtal for any channel 1.00
Set of 80 xtals in drawer (specify range 27 to 34.9 MC or 31.9 to 38.9 MC) $16.95

PORTABLE PUSH-BUTTON RECEIVER BC-728, covers 2 mc to 6 mc; four push-buttons, 7 peanut tubes, two vibrators, built-in speaker, self-contained power supply requires one 2 volt wet cell (not furnished). In carrying case. U-2, cases need paint $12.95

*U-1: used, excellent; U-2: used, good

Postage extra. Minimum order $2.00. TERMS: Net Cash, 25% deposit on C. O. D.'s. FREE LIST
Prices subject to change without notice.

ELECTRONIC SUPPLIES

317-R East 2nd St. Tulsa 3, Oklahoma

Everybody agrees ATR AUTO RADIO VIBRATORS are TOPS

ATR AUTO RADIO VIBRATORS

have Ceramic Stack Spacers

New 36 page VIBRATOR GUIDE FREE

A Complete Line of Vibrators . . .

Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, *featuring Ceramic Stack Spacers* for Longer Lasting Life.

Backed by more than 17 years of experience in Vibrator Design, Development, and Manufacturing--

ATR PIONEERED IN THE VIBRATOR FIELD.

New Models

"A" BATTERY ELIMINATORS
For DEMONSTRATING AND TESTING AUTO RADIOS

New Models . . . Designed for Testing D. C. Electrical Apparatus on Regular A. C. Lines. Equipped with Full-Wave Dry Disc Type Rectifier, Assuring Noiseless, Interference-Free Operation and Extreme Long Life and Reliability.

New Models

STANDARD AND HEAVY DUTY INVERTERS

For Inverting D. C. to A. C. . .

Specially Designed for operating A. C. Radios, Television Sets, Amplifiers, Address Systems, and Radio Test Equipment from D. C. Voltages in Vehicles, Ships, Trains, Planes and in D.C. Districts.

✓ NEW MODELS
✓ NEW DESIGNS
✓ NEW LITERATURE
See your jobber or write factory

AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U.S.A.

Mondays at 2000; power 3 kw. (Driver, Ohio) First transmission may run as late as 1300. (McPheeters, La.)

Now that Juliana is Queen of the Netherlands, this station bears the slogan *"Juliana-Zender"* instead of former *"Princess Juliana Zender."* (Worris, N. Y., Driver, Ohio, McPheeters, La.) The station has informed Worris, N. Y., that the series of programs, *"Holland Calling,"* has now ended and that on Mondays at 2000 they carry *"Dutch Students Speak."*

Cyprus—The Near East Arab Broadcasting Station on 6.135. 6.170, and 9.650 have been heard by Kary, Pa., best around 2320; 6.170 was best when logged, but only fair, in clear; 6.135 had some QRM and was slightly weaker than 6.170; 9.650 was weakest of the three, and all suffered heavy static. This particular transmission is scheduled to begin 2255.

Czechoslovakia—At the time this was compiled, no information was at hand concerning Prague's daily "evening" beam to North America, formerly at 2000-2100 on 11.840, but not reported lately. May have moved? (Frequencies to try include 11.84, 15.23, 15.32, 9.55, 6.01.)

Prague now has news 1245 on 9.55, 1445, 1645 on 6.010. (Pearce, England) The 11.840 outlet has been heard recently in New York closing at 1800. (Beck)

Denmark—Copenhagen's latest daily schedule to North America on 9.52 is 2130-2300 with repeat at 2300-0030. (Kary, Pa., Worris, N. Y.) *English* is usually around 2230 and 2345 (varies). Normally has good to excellent level in East but suffers bad QRM. Reports requested to Danish State Radio, Short-Wave Section, Broadcasting House, Copenhagen, Denmark.

Dominican Republic—HI2A. "La Voz de Releccion, La Voz del Pueblo," Santiago, has recently been on 7.217, moved from 6.786; fair signals nightly but with severe ham QRM. (Kary, Pa.)

Ecuador—HC1GQ, 9.190, Quito, Ecuador, "Radio Nariz del Diablo," was heard some time ago as early as 2100 to sign-off 2200, strong but somewhat under-moduiated signal; announced slogan and location, but did not give call; apparently, this station is on only irregularly. (Kary, Pa.)

HC4NL. 9.870, Manta, "La Voz de Democracia," is back on the air, signs off 2232; suffers QRM from WON as well as from multiplex interference. (Kary, Pa.)

Egypt—According to a Swedish DX broadcast, Cairo programs are heard from around 1430 on 6.210 with bad QRM from Warsaw and Bucharest; at 1500 call of "Hona Iskanderiyah!" ("Here Alexandria!") is given; this may mean location or relay from medium-wave outlet.

SUX, 7.860, Cairo, has been heard in Pennsylvania with fair signals afternoon; commentary in Arabic by two men at 1605-1620, followed by Arabic music; apparently left the air 1628. (Kary)

El Salvador—YSLK, San Salvador, is a new station on 9.540, gives schedule of 0900-1000, 1200-1500, 1800-0000; medium-wave outlet is YSLL, 1500 kc. (Fern, Hawaii)

England—BBC's North American beams are now 0600-0800, GWH, 11.80; 0800-0900, GST, 21.55; 0915-1215, GST, 21.55; 1300-1445, GST, 21.55; 1400-1600, GWG, 15.155; 1500-1745, GRF, 12.095; 1615-2215, GRH, 9.825; 1745-2215, GSL, 6.11, and 1615-2215, GSB, 9.51 (especially for West Coast).

Finland—Helsinki's OIX4, 15.190, is being heard with news for America, opening 0715 and closing around 0725; some days signals are good in level. (Ferguson, N. C.) Here in West Virginia signals are also good but modulation is not of the best quality.

France—Paris winter schedules, furnished by Worris, N. Y., include—1705-1830, 9.550 in French to Antilles, Guiana, St. Pierre, and so on; 1830-1835, 9.550 in Spanish to Santiago de Chile; 1915-1930, 9.550 in French to Latin America; 1945-2000, 9.550, 11.70 in *English* to North America; 2100-2115, 9.550, 11.700 in *English* to North America; 2115-2130, 9.550, 11.700, in French to North America; 0000-0015, 6.200, 9.550 in French to North Africa; 0030-0130, 9.550, in French to Tahiti, New Caledonia, New Hebrides. and so on. (This may not be complete schedule.)

French Indo-China—Saigon, 11.78, is heard with news 0900. (McAlister, Calif.)

French Morocco—Hagen, Ala., reports Rabat heard on 6.006 at 0155-0300; comes on with "La Marseillaise," and announces "Ici Radio Moroc;" popular music to 0200 when has news in French; at 0210 has lessons in Arabic; from 0225-0300 has popular and classical music; fades away around 0300 but has good signal at start. This one also heard in Kentucky by Alcock, who reports bad fade. (I have heard a station on this approximate frequency recently, but did not hear identification and perhaps erroneously assumed it was *Radio Noumea,* 6.000, New Caledonia, which is scheduled around 0200-0530 now.—K.R.B.)

French West Africa—Radio Dakar, 11.898, is heard in Newfoundland at 1330-1700. (Peddle) Heard in Ohio at 0200-0230; French news 0215. (Sutton) In a letter to McPheeters, La., station gave frequencies of 11.895 and 1448 kc.

Germany—At times. *Radio Volga,* 7.610, Berlin, Russian-controlled station, has a fair signal around 1600; usually suffers bad ham QRM (harmonics from 75-meter band). (Kary, Pa.) For the most part at least, this station relays Moscow.

The *Danish Brigade Radio,* Germany, verified by card for Cushen, New Zealand, and stated that it "closed on July 27 last because of special reasons."

Munich is heard well in New York at sign-on 0000 on 6.160 (light QRM); fades out around 0230; carries a different program from the outlet on 6.080. (Beck)

Baden-Baden, 6.332, is heard in Ala-

bama at 0000-0145; woman announcer, uses French. (Hagen) Frequency may vary slightly at times.

Greece—Bluman, North Africa, has confirmed to *Radio Australia* that AFN, Athens, on 8.000 is heard *Fridays only* at 1330-1430 and that call is KJOY.

Radio Athens has an excellent level carrier on 9.605 (stronger than BBC's GRY, 9.600!), but the audio is almost not there in the transmission beginning 0000. (Beck, N. Y.)

Haiti—HHCN, 6.407, Port-au-Prince, has been heard (in French) from tuning at 1930 to sign-off 2030. (Dallmeier, N. Y.)

The Haitian station now on 6.200 is HHCP, Cap-Haitien, a 60-watt job moved from 7.288; originally began on 7.600; signs on 0600 but is readable only to about 0645 after which it is obscured by QRM from an unidentified Latin American transmitter; is listed only 0600-0800 and 1700-1900; fair signals at sign-on; announces "Ici la HHCP, Cap-Haitien, Haiti." (Kary, Pa.)

HHYM, 6.000, Port-au-Prince, heard signing on 1810. (Kary, Pa.)

Hawaii—KRHO, Honolulu, relaying programs from the United States, is now scheduled on 9.530, 0600-0915 to China-Philippines; on 15.130, 0215-0345 *(not Mondays)* to China-Philippines, and on 15.250, 0400-0545 to China-Philippines.

Holland—Cushen, New Zealand, says PHI, 21.480, now uses 16-17 kw.; that PHI, 17.770 will increase to 40 kw. early in 1949; that PCJ, 9.590, 15.220, will increase to 100 kw. in August 1949. and that PHI, 11.735, 17.770, will increase to 100 kw. in 1950. He further states that the 21.480 outlet sends a good signal to New Zealand at 0500 with news.

The *"Happy Station Programs"* are now scheduled Sundays at 1030-1200 for East and Near East on 17.77, 15.22, 6.02; 1600-1730 to Africa and South America on 11.73, 9.59, 6.02; 2200-2330 to North America on 11.73, 9.59, 6.02. Tuesdays at 0330-0500 to Pacific, Australia, and New Zealand on 21.48, 17.77, 15.22, 6.02; Wednesdays, 1030-1200 to East and Near East on 17.77, 15.22, 6.02; 1600-1730 to Africa and South America on 11.73, 9.59, 6.02; 2200-2330 to North America on 11.73, 9.59, 6.02. Address is now Postbox 137, Hilversum, Holland (Netherlands). (Sklenar, Nebraska) (Incidentally, some weeks ago on one of the *"Happy Station Programs,"* Eddie Startz made a beautiful musical dedication in memory of one of PCJ's staunchest supporters and a cooperator with this Department, Henry Callahan, whose death occurred in Philadelphia on October 1. Mr. Callahan had furnished many recordings to PCJ, gratis, and assisted in many other ways in helping Mr. Startz build up the PCJ library which was largely lost during World War II.)

Honduras—HRA, "La Voz de Lempira," Tegucigalpa, was erroneously listed recently as on 6.049; actually frequency is 9.049. (Kary, Pa.) *(This*

error was mine, not Kary's!—K.R.B.)

Iceland—TFJ, 12.175, Reykjavik, is still heard in Newfoundland Sundays 1115-1145. (Peddle)

India—Delhi has recently been testing on 15.13, 11.76, 9.68, 9.565 at 1400-1500, requesting reports to All India Radio, Broadcasting House, New Delhi, India. (Radio Australia) The 9.565 outlet has been heard in the United States during tests.

Iran—EPB, 15.100, Teheran, now has news 1340 (announces local time as 2210); news in French 1350 and signs off 1400. (Pearce, England) Is heard well in New York City on this schedule; news in Russian 1330. (Schild)

Iraq—Swedish sources say Baghdad is using 7.062 around 1130 in Kurdish; that signs on at 2230 on 7.092. *Can anyone confirm?* Baghdad has not been reported to me as heard in the United States for a long time.

Israel—Calls of Tel Aviv phone stations used for traffic to New York and elsewhere are now 4XA21, 18.890; 4XA22, 18.350, and 4XA23, 14.702. (Kary, Pa.)

Kol-Yisrael, Tel Aviv, is now on 6.817, scheduled 2245-0015, 0330-0645, 1030-1445; news 0545, 1415. (Bluman, North Africa, via Radio Australia) Still heard in Newfoundland with news 1415. (Peddle)

Italy—Weisberg, N. Y., has received these winter schedules from *Radio Italiana*—to Pacific area, 0600-0630, 15.12, 11.81; to East Africa, 1145-1225, 15.12, 11.81; to Latin America, 1830-2040, 15.12, 11.81; to *North America*, 2045-2155, 15.12, 11.81; *Radio Bari*, 1145-1155, 1,059 kcs.; to South Africa, 1430-1500, 9.63, 11.81; to North Africa, 1500-1530, 9.63, 11.81. And on c. w. at 1300 on IBC-IDO; at 2300 on IDR-IDO; IDO has been changed from 12.500 to 12.760; IBC uses 16.673, and IDR is on 5.455.

Jamaica—ZQI, Kingston, which for a time tested on 6.070, at last report had returned to old frequencies on regular schedule of 1600-1730 on 4.950 and 1900 (or 1930) to 2200 on 3.480.

Japan—JKC, 7.257, Tokyo, carries the *English*-Japanese lessons 0400-0415 daily, relayed from JOAK1. (Cushen, N. Z.)

JKE, 9.605, heard relaying WVTR at 0200-0300 with AFRS programs; JKD, 6.015, and JKE2, 4.860, heard relaying WVTR to 0905 sign-off; WLKS, 6.105, Kure, British-controlled outlet, is heard at 0900 sign-off with good level. (McAlister, Calif.)

Java—According to Major, W. Australia, at 0600 Batavia uses YDC, 15.145 and YDD, 7.270, in parallel beamed to Southwestern Pacific; he says YHN has been heard at 0900 announcing 27.68, 40, and 26.66 meters—but a check failed to reveal either of last two, they may be used later to India-Pakistan.

The approximate frequency of Soerakarta is now 10.620, moved from 11.125; schedule is believed to be 0530-1300 on this frequency and from 0530-0830 on 5.695; slogans are "Radio

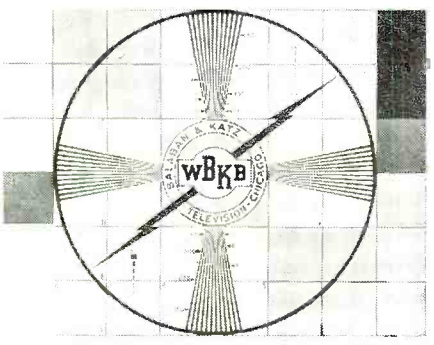
(*Continued on page* 153)

bars. The total effect is to outline the bars, and to make them more sharply defined. Some servicemen are in favor of slight high-frequency over-compensation because they feel that a sharper, crisper image is obtained. However, if this procedure is followed, it should be done cautiously lest excessive over-compensation and "ringing" be produced.

Low-Frequency Response. The eleven black horizontal black bars located at the bottom of the test pattern are for the purpose of checking the low-frequency response. When the system has poor low-frequency response, the reproduced edges of the horizontal bars will be sharply defined, but will change from black to an excessive white, with a streamer shading from this white back to the normal background. The visual effect is one of smearing, with the smearing going from left to right because that is the path of travel of the electron beam. Poor low-frequency response is generally accompanied by excessive phase shift and it is difficult to distinguish between the two. For the serviceman, however, the appearance of the smearing means that the low-end of the system's response curve is at fault and must be corrected.

5. *Contrast and Shading:* To check the over-all contrast of the test pattern, we have the Indian Head at the top of the center portion of the test pattern. The contrast control should be set so that the head appears pleasantly shaded, being neither so dark that the various shades of white and grey are obscured or so light that the entire image has a filmy, washed-out appearance. As a further aid in checking the receiver contrast range, the remaining two oblique wedges in the test pattern have four different tonal ranges. The innermost section of each wedge is black, with each additional wedge possessing a lighter shade of grey. If the transmitter and receiver are both operating normally, then each of the four shading steps should be distinctly separable on the test pattern. If the received pattern does not indicate these four graduations, either the

Fig. 5. Station test pattern of WBKB, Chicago.



transmitter or the receiver is at fault—the fault in this case being non-linear amplitude distortion of the video amplifiers. Where more than one station is operating locally, check with each station to determine whether their patterns show the proper shading. If all stations appear to have a poor shading in their test patterns then it is safe to assume that the trouble lies within the receiver since it is highly improbable that two or more stations, operating independently, would exhibit the same difficulty. However, if only one station presents a poor shading pattern, while the other test patterns are normal, then the defect lies with the transmitter. To the serviceman, the defect is important only when it arises in the receiver. The trouble, when it is here, can be traced to an improperly biased video-frequency amplifier or a gassy tube in this system.

6. *Interlacing:* There is one final test that can be made with this test chart and this is to determine whether the odd numbered lines are falling properly between the even numbered lines. If, for any reason, the vertical sweep oscillator is not operating properly, the lines of one field will not accurately drop into the spaces between the lines of the previous field. Lines of one field may fall close to or even directly over the lines of the previous field, in which case there is a loss in detail due to this partial pairing of lines. In the test pattern, we check the quality of interlace by examining the narrow diagonal lines in the center portion of the chart. Partial interlacing, which means incomplete interlacing, will be evident by the jagged reproduction of these lines. When there is a complete pairing of lines, or a complete absence of interlacing, then the test fails. In this case, however, the pairing is generally

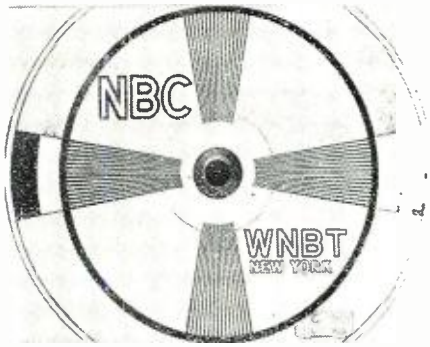


Fig. 6. Station test pattern of WNBT, New York.

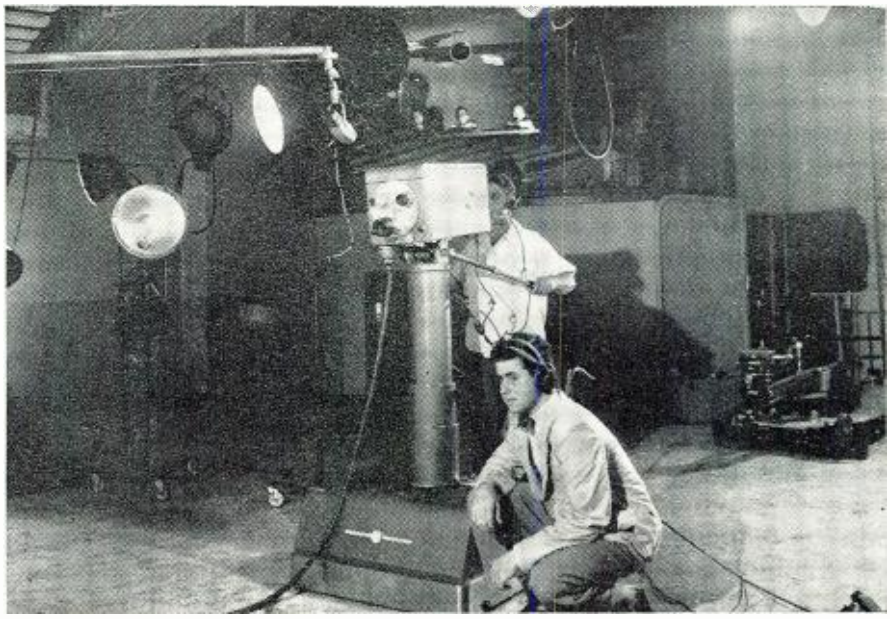
quite easily visible by noting the wide separation between the lines. Since the defect is due to an improperly functioning vertical sweep system, this should be checked.

A distinction should be made here between the reduction in vertical resolution due to incomplete interlacing and the same reduction arising from a limited frequency response. A limited frequency response will not cause the diagonal lines to become jagged, whereas poor interlacing will.

The foregoing discussion is designed to indicate the usefulness of test patterns to television receiver servicemen. More extensive test patterns are employed in the checking of television transmitters because of the greater number of adjustments that must be made in this equipment. A standard transmitter pattern developed by the RMA Committee on Television Transmitters is shown in Fig. 4. Finally there are individual test patterns developed by each station bearing a few of the markings (in one form or another) contained in the *RCA* "Monoscope" pattern and in addition, giving the station call letters. Two such patterns are shown in Figs. 5 and 6.

—30—

A General Electric television camera in action with its crew at the U. S. Navy Special Devices Center at Sands Point, Long Island, where the Navy is performing experiments in mass training of personnel by means of telecast lectures and equipment demonstrations.



Motorcycle Radio

(*Continued from page* 65)

output test requiring the development of at least 7 watts in a 50 ohm dummy load, such as a *Bird* wattmeter. It is housed identically with the receiver and mounts on the right hand side on standard *Harley-Davidson* type racks.

The tube line-up is as follows: 6AK6—harmonic crystal oscillator, using a low drift crystal for frequency stability; 6AK6—buffer doubler; 2E26—straighthrough final amplifier.

The modulator is a single 6V6 transformer coupled to the 2E26. The high level mike and high voltage gain microphone transformer supply sufficient voltage at the 6V6 grid to modulate the 2E26 100% with "close talking."

The standby current of the transmitter may be adjusted from zero to 1½ amperes with a warm-up time of 15 seconds at zero standby drain. Any intermediate drain and warm-up time, as determined by a curve supplied with the equipment, can be obtained by adjustment of a resistor in the filament circuit. Full standby current "ready to transmit" and with receiver operating does not exceed 10 amperes at 6 volts.

All transmitter adjustments are available from the top of the chassis with the dust cover removed, including oscillator tuning, buffer tuning, final amplifier tuning, and antenna matching. These adjustments are not critical and do not vary under severe shock and vibration, nor are they affected by the placement or removal of the dust cover. Coaxial connectors for 52 ohm antenna feed are employed.

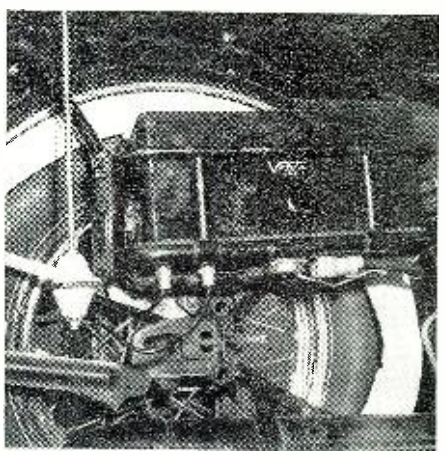
Metering of the following circuits is provided by a single jack and five position switch; (1) crystal oscillator, (2) buffer grid current, (3) final amplifier grid current, (4) final amplifier cathode current, and (5) final amplifier plate voltage.

The power supply is identical in construction with the vibrator supply for the CM-1 receivers with the exception of higher voltage and current. A CM-2 dynamotor supply may also be used interchangeably on the CM-1 transmitters where higher power output is desirable, such as for taxi or police automobile use. This approximately doubles the power ratings of all transmitters.

A single base plate is available for use on a 3-wheel motorcycle or cars, and the two units may be "plugged in" back to back, making a single compact unit 13⅝x9⅞x7½" high.

A complete motorcycle installation consists of a mike, control head, junction box, transmitter and base plate, receiver and base plate, antenna, and interconnecting cables fitted with *Cannon* electric connectors, all contoured and finished so as to blend into and become a part of the motorcycle itself, adding to rather than detracting from the over-all appearance. —30—

Side view of xmtr. showing antenna mount, rack, coaxial plugs, and K junction shell.



Mac's Service Shop

(*Continued from page* 56)

to point through the audio amplifier until we reach a place where the signal voltage rises and falls in step with the volume issuing from the speaker. Then we work backward from this point at which the volume *does* change and forward from that at which it *does not*—just like two baseball players closing in on a runner caught off base—until we have narrowed down the separation of these two points to the smallest possible circuit distance—say the opposite ends of a coupling condenser. Then that condenser *has* to be the cause of the trouble; and incidentally, coupling condensers which have poor connections between leads and foil are one of the most common causes of intermittent sets."

"What if the trouble is ahead of the detector?"

"Use the same 'closing-in' tactics, but your instruments have to indicate r.f. and i.f. voltages. That means you must use an r.f. probe on the v.t.v.m. or scope, or you can employ the signal tracer. Plate, screen, cathode, and a.v.c. bypass condensers; defective windings in r.f., oscillator, or i.f. coils; and defective tubes are some of the most common causes of abrupt changes in the amount of signal voltage delivered to the detector tube."

"I can see how that would work if the set kept cutting in and out quite often, but what are you going to do if it won't cut out when you have it on the bench?"

"The only thing you can do is try to *make* it cut out," Mac said. "I usually start by tapping the tubes, especially the ones with gridcaps, such as the 6A7's, 6A8's, 6Q7's and 75's. Lots of times striking the caps of these tubes smartly on top with a bakelite rod will cause the volume to change with each blow; but you want to make sure that the change is not caused by the jarring of some other defective unit instead of the tube itself. If tapping the cap of a new tube has no such

effect, you can be pretty sure you have found the villain.

"If the tubes seem OK, I next try to find a bad condenser. I feed a strong unmodulated signal into the antenna post from the oscillator, tune this signal in on the receiver so that I hear the characteristic rushing sound, and then gently tap the various bypass and coupling condensers. Notice I say 'gently.' If you go yanking the condensers around roughly, you will have a lot of little intermittent conditions instead of just one. When you tap a condenser that has a poor connection between lead and foil and allow it to vibrate on its leads, you can usually notice a chopping-up of the rushing sound coming from the speaker. A good condenser will give forth nothing except possibly a slight microphonic sound."

"Do you have any other third-degree methods to make these intermittents sing?"

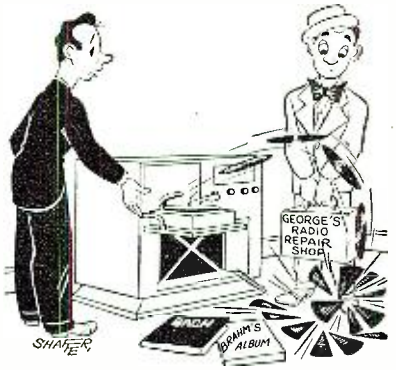
"Yes, most of them are affected by heat; so I use an infrared lamp to warm up suspected parts. These lamps have a small intense heating area that is fine for this job. Also, I try both low and high line voltages on the set, using the tapped isolation transformer for accomplishing this. Many a time I have first struck the trail of an intermittent condition by simply 'wracking' the chassis a little with my hands. Thumping the chassis in various spots with a little rubber hammer such as a doctor uses for testing reflexes is also helpful."

Mac was interrupted by the bellow of the one o'clock whistle at the laundry across the street.

"Well," he said, "the subject of intermittents is far too big for us to cover at one session; so suppose you work on the sets I think will fall under what we have talked about today for the rest of this month; then we will renew the discussion and talk about some other kinds of intermittents and some other methods of tracking down the causes."

"That's oke with me," Barney agreed as he closed his notebook and slid from the bench; "and in return, if there is ever anything you want to know about the bees or the birds or the flowers, just ask old Uncle Barney here!"

—30—



"It positively refuses to play the classics!"

Custom Installations

(*Continued from page 37*)

inherent surface noise of a shellac record. This is valuable in checking the effectiveness of various methods for reducing surface noise, and again may be used to observe the frequency response of the system. The wider the response range, the louder will be the noise level.

While the selection of these records is important, it is of even greater importance to be fully familiar with them and with the results to be expected from them on various classes of equipment.

In the final analysis, the purpose of music, the excuse for its existence, is to provide enjoyment. Philosophically, this may be divided and debated in categories ranging from background music to serious expressions of important concepts. In general, satisfactory background music is not difficult to reproduce. For direct undistracted listening, the problem is much more involved.

Unquestionably the most important factors are that the reproduction be "clean," free from distortion and noise. This might be defined by saying that the reproducing system should not add anything to the signal. At power levels of 0.01 watt, this isn't too difficult. At levels used in average living rooms by serious listeners, it probably means a minimum electrical reserve power of eight watts with very low distortion, good transient response, and a reasonably efficient loudspeaker and cabinet. Obviously the design of such equipment would be appreciably simplified if it were necessary to reproduce only a single frequency. Filters could be inserted such that all other frequencies would be sharply attenuated, and if the system did develop distortion components or noise frequencies, they would not be heard in the output. The wider the bandwidth passed by the equipment, the more critical is the problem of reducing noise and distortion components introduced by the system. Now comes the customer question about whether extremely wide frequency response is desirable. There has been so much controversy on this subject that it is not strange if many people in the industry hesitate over the answer to this question. Still, the answer seems fairly obvious.

A recent article (unquestionably the most intelligently developed review of this general problem to date)[1] quotes Professor Harold Burris-Meyer twice, as follows: "Man has had a long time to throw away instruments of displeasing tone," and, "For too long have we made reproducing devices that *remind* the listeners of music, but do not reproduce it."

There is a straightforward and entirely reasonable rationalization of this problem. Most customers will react favorably to it, and often will find themselves making a distinct effort to understand and enjoy wider range reproduction. In the first place, the structure of the human auditory system imposes certain definite limitations on the range of hearing. Among these is the limitation set by the frequency response characteristics of the ear. It is safe to say that the range of importance is limited to 30 to 15,000 cycles per second. Now, no one will debate very seriously whether the enjoyment of music is largely a matter of education. It is also obvious that one of the most important factors in enjoying music lies in the ability to perceive a variety of frequencies. If these things are true, then it seems quite clear that it is desirable to be able to enjoy as wide a range of frequencies as the ear is capable of hearing. The frequencies above approximately 4500 cycles per second are almost entirely harmonics that contribute nothing to the melodic line or fundamental musical structure, but are perceived as an extremely important facet of the quality of tone. If there were no harmonics observable from musical instruments, a few very simple instruments would suffice to provide all the variations in tone quality it would be possible to hear, or it would require an incredible number to produce a complex tone structure. This means that anyone who has been educated not to like wide range response is missing a great deal of the enjoyment inherent in music. Clearly, this is undesirable. To insist that a limited range is more desirable than wide frequency response is not incomparable to suggesting that vision should be limited to black and white, and such a position is not tenable on any reasonable basis.

It must not be overlooked that phonograph records taken by and large are not very good. This is a strong understatement. The distortion and noise inherent in a large percentage of recordings is such that they are intolerable when played on a full frequency range system operated wide open. On the other hand, records *are* being improved and there is reason to believe that a number of factors (not the least of which is the threat of mag-

Help your customer visualize a corner speaker installation by submitting a professional looking sketch of the projected unit.

netic tape recording) will continue to influence the manufacturers in the direction of striving for still greater improvement. Thus, the reproducing system should be designed to take care of the finest available records and the finest that will be available as progress is made. It should also be capable of control so as to limit the response range in terms of the characteristics of the records. The only other approach would be to limit the equipment in terms of the worst records likely to be played, and this is so apparently foolish that the decision in favor of equipment capable of wide range response seems inevitable.

It is worthwhile to re-emphasize at this point that wide range equipment alone is not enough. It must be equipped with flexible and simple controls and it must be free of inherent noise and distortion. Remember that noise and distortion become increasingly difficult to eliminate as you broaden the response band. Remember that your customer in most instances will tolerate a limited response band much more readily than he will tolerate noise and distortion. Convince him, by demonstration with good records with quiet surfaces and clean recording, that he will be able to enjoy the advantages of wide range high quality equipment with some existing recordings and with an increasing number as improvement continues.

Almost all of this has been concentrated on record reproduction. In basic principle the same conditions apply to radio broadcast reception. On the few live programs broadcast over FM stations and a few AM stations, it is possible to achieve remarkable presence and realism with wide range equipment. This is increasingly true as the quality of broadcast signals is improved.

Along about now it is not unusual for the customer to say, "Well, there appears to be a great deal of truth in what you say. On the other hand, with all this improvement in recordings and radio broadcast methods, isn't it likely that reproducing systems will also be greatly improved? Isn't it foolish to invest a large sum of money in reproducing equipment that may be obsolete in a short time? How about the new long-playing records?" There are two answers for this. One is that improvement is inevitable (we hope) in everything, and it is entirely possible to go through life never buying anything and never enjoying anything because of the possibility that something better will be available next year. The counter to this is that right now we are going through a period in which there is more improvement than in normal times because of discoveries made during the war, etc. In this regard you may assure him with complete truth that very little work done in electronics during the war is applicable to audio reproducing problems. The best answer, and the most important one, is the second. Audio

reproducing equipment has progressed so far beyond the available signals that it will be many years before the shoe is on the other foot, if ever. Given a perfect signal source, a perfect recording, or a perfectly broadcast live program, the realism that can be achieved by high quality audio reproducing equipment available today is so close to perfection that very few observers, if any, would be able sincerely to criticize it. It is possible that equally good equipment may be manufactured at lower prices (though this is unlikely for some time to come).

Certainly it is true that audio amplifiers are available with full frequency response and with inherent distortion so minimized that it becomes difficult to measure it in the laboratory, much less to hear it. Pickups are on the market that reproduce a frequency range covering the entire audio spectrum. Loudspeakers in properly designed enclosures certainly come very close, on a listening basis, to producing a pattern of sound that under ideal room conditions is difficult to distinguish from the original.

None of this means that improvements will not be made, nor that any really good engineer in the industry is completely satisfied with the results obtainable. It does mean that looking for rapid improvements or rapidly lowering costs for high quality equipment is not in accordance with the facts. It does mean that if a customer waits, say two or even five years, it is extremely unlikely that he will wish he hadn't purchased high quality equipment now. The question of tape recording will come up in many instances and the answer, of course, is that this accessory equipment is available now, that it can be added at any future time, and that while it has importance, it is obvious that it will take a very long time to accumulate a sufficient library of music on tape to replace the material available on discs, even assuming that all of the advantage otherwise is with the tape, which it is not. Television? Right now, if the customer wants it, or later as an added entertainment feature. Most serious music listeners will recognize that television, however important as an entertainment medium, is not competitive with music reproduction. It is certainly no more competitive with recorded music than radio, and radio has by no means minimized the sale of phonograph equipment.

Finally, the question of service may arise. It is always an important and worthwhile policy to include in the price a sufficient allowance to permit you to guarantee service for a satisfactory length of time. However, it is important to point out that high quality equipment is usually easier to service than cheap equipment. The parts are laid out more cleanly, the wiring is easier to follow, etc. The customer should be assured that complete service information will be provided with his installation so that any competent radio serviceman would be able to handle whatever troubles might appear.

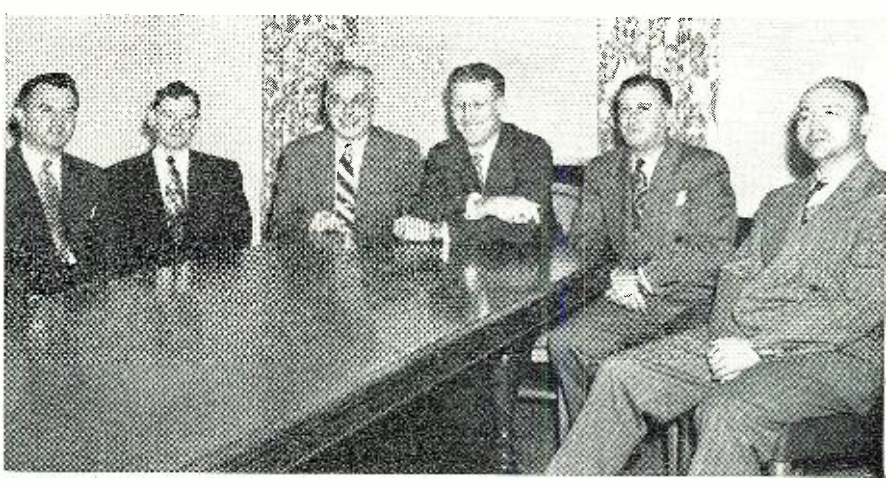
Along with this, it is important to provide for the customer a satisfactory and reasonably complete instruction manual for the operation of the various controls. It is worthwhile to write this yourself, drawing on material supplied by the manufacturers of the various components. Writing such an instruction manual is an excellent method of finding out how much, or how little, you know about the proper operation of a high quality music reproducing system. It is an excellent guide for finding weak spots in your knowledge and aiding you with an incentive to eliminate them.

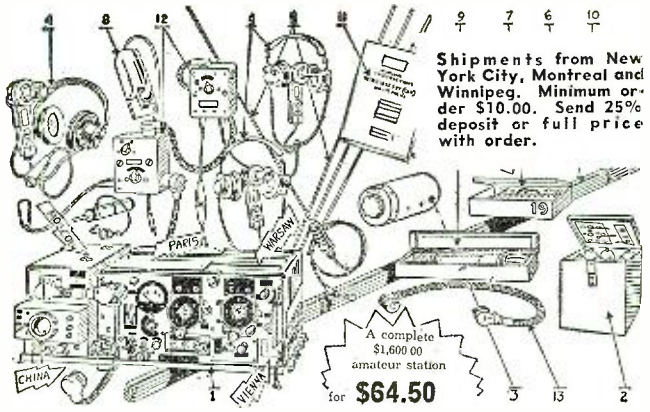
REFERENCES

[1] *LeBel, C. J.; "Psycho-Acoustical Aspects of Listener Preference Tests," AUDIO ENGINEERING, August 1947.*

(To be continued)

The newly elected officers of the National Electronic Distributors Association (NEDA) are: (left to right) Secretary, Lealis L. Hale, Hale & McNeil, Monroe, Louisiana; Second Vice-President, Carl C. Brown, C. C. Brown Company, San Francisco, California; First Vice-President, Arthur C. Stallman, Stallman of Ithaca, Ithaca, New York; President, Louis W. Hatry, Hatry & Young, Inc., Hartford, Connecticut; Treasurer, Aaron Lippman, Aaron Lippman Company, Newark, New Jersey; and Chairman of the Board, W. D. Jenkins, Radio Supply Company, Norfolk, Virginia.





Shipments from New York City, Montreal and Winnipeg. Minimum order $10.00. Send 25% deposit or full price with order.

The famous No. 19 ARMY TANK RADIO above

Components sold separately

1. No. 19 set with Dynamotor Supply $39.50
2. 15 spare tubes..... 7.50
3. Aerial variometer (tunes any length) 2.00
4. Dynamic Earphones & Microphone 2.50
5. V.H.F. Antenna (235 mcs.) with base 1.00
6. 12 ft. whip antenna with base 2.50
7. Spare parts kit (fuses, brushes) 2.00
8. Telegraph key (platinum contacts) 1.50
9. Battery Hydrometer 1.00
10. Instruc. and wiring diagrams. .50
11. Junction and control boxes... .75
12. 12 ft. Connector cable..... 1.50
13. 6 ft. battery cable..... 1.25

We were fortunate in purchasing forty carloads of Canadian Surplus Army stock of bulk maintenance spare parts for above radio. Parts include tons of fully standard replacement parts for most radios. A few outstanding buys listed below. Write for bulletin on other parts.

SWITCH. 4 pole 3 pos. (center off) heavy duty C.H.....$0.65

Mallory Vibrator 12v. 4 prong (standard, O.K. on G.V.)..... .50

32 mfd. 500v. Electrolytic Cond... .75

Vibrator transformer—250v. 80 ma. (12v.) 1.25

.1 mfd. 500v. oil fub..... .15

MARK III. Dynamotor power supply (part of #1 in illustration above) 12 or 24 volt input. Delivers 500v. at 50 ma., also 275v. at 60 ma. Also includes vibrator supply 275v. at 60 ma. with changeover (vib. to dynamotor) relay **$10.00**

A.C. power supply fits in place of Mk II or Mk III power supply in same cabinet. for converting above radio to 110v. 60 cy. operation.....**$40.00**

This station comes complete with Superhet Receiver and V.F.O. (807 output) Transmitter (2-8 Megs.), 3 Station Intercom. and 235 mcs. Transceiver. Includes battery operated 12/24v. dynamotor supply, microphone and headphones, aerials, spare tubes, junction box, cables, misc. hardware, etc. Ready for operation. Includes instructions for setting up this station with diagram. With full operating spares, 17 tubes in set plus 15 new spares and many extra parts. BRAND NEW. Factory Packaged. (Amateur license is necessary to operate as an amateur station.)

SPARE TUBES (Jan.)

6B8G	$0.90	6K7G	$0.55
6K8G	.70	EF50	.25
6H6	.50	E1148	.25
6V6G	.70	OZ4A	.45

A PRECISION MULTI-METER

Built to our special specs. from No. 19 set parts. Incorporates sensitivity and ranges that you would expect in a meter of double this price. (Sangamo, Weston. 2000~ per v.) Hi-ohms: 0-1 meg. Lo-ohms: 0-1000 ohms Volts DC: 0-10, 100, 750 Mills: 0.-.5 ma.....**$12.60**

HOOKUP WIRE

(1,000,000 ft. in stock)

Finest quality #18 stranded, glass (flame resistant) insulated over rubber. in 200 ft. rolls. 15 different color codes. (Quantity users, samples on request.) Lists at several times this special price. .....½c ft.

12V Lighting Plant Generator

A precision built, new, Eclipse Aircraft Generator drive with any gas engine to supply above radio or as lighting plant. (500 watts.) Pulley, automatic cutout and control box, ammeter, and instructions included **$24.50**

FACTORY PRODUCTS LIMITED
50-431 Main St., Winnipeg, Canada

Shipments from Warehouses in: Montreal, Winnipeg, New York

Radio Surplus Parts and Equipment

BARGAIN SERVICE FOR BUYERS AND SELLERS!

(Commission Basis)

- We stock NO parts ourselves—
- But we KNOW where to BUY any part on the surplus market
- At the LOWEST offered price!
- Even those "hard to locate" items are on our files. (Write us for "special" AN Connectors)
- ASK FOR OUR PRICE
- No obligation to buy
- No sale—no charge
- Send $1.00 (to cover mailing costs) for our Bargain Bulletin Service (mailed every few days)

SURPLUS DIRECTORY SERVICE
366 Madison Avenue
New York 17, N. Y.

Covers all stocks of every major United States and Canadian dealer. Other Surplus Stores—please note: Put this company on your mailing list.

THIS SERVICE REALLY SAVES YOUR TIME & MONEY

Manufacturers, Distributors, Exporters, Amateurs, Servicemen:

Just try us once, and see for yourself. We sell ONE or a CARLOAD.

HERE'S HOW IT WORKS:

Let's suppose you want to buy a transformer which you locate at $4.95. We probably know who offers the same transformer for $2.95. When you describe your wants to us, we send you by return mail, absolutely free of charge, a full description, quantity available, and lowest price. When you order from us, we then buy it for you, and add our nominal commission.

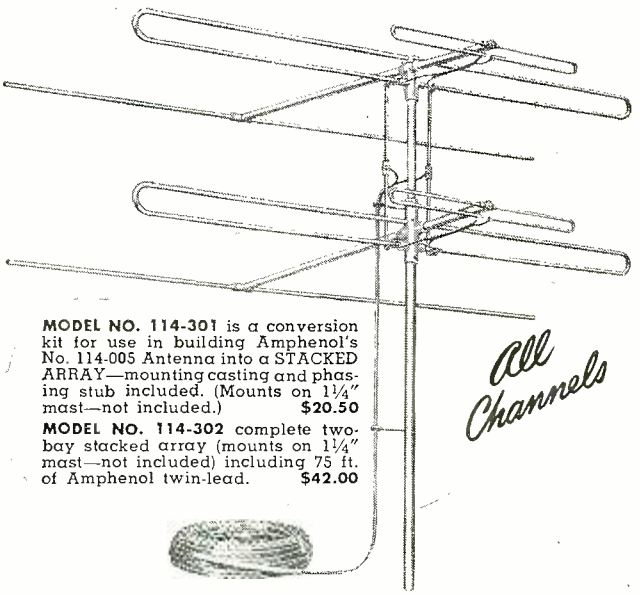
---

db GAIN + + +

more *signal strength* for greater distance and the *best picture*

with AMPHENOL

STACKED ARRAY



MODEL NO. 114-301 is a conversion kit for use in building Amphenol's No. 114-005 Antenna into a STACKED ARRAY—mounting casting and phasing stub included. (Mounts on 1¼" mast—not included.) **$20.50**

MODEL NO. 114-302 complete two-bay stacked array (mounts on 1¼" mast—not included) including 75 ft. of Amphenol twin-lead. **$42.00**

All Channels

Stacked Array multiplies the universally acknowledged features of the Amphenol All-Channel TV Antenna (No. 114-005). Stack to provide reception at greater distances—Stack for picture brilliance and clarity—Stack for controlled TV reception. Provide the *TV Receiver* with the *Best Antenna* to Produce the *Best Picture*. Amphenol's Stacked Array is your assurance of top TV picture quality.

Performance Charts Available

If you are not now receiving the monthly AMPHENOL ENGINEERING NEWS — you will want to request the September issue which included pattern and gain charts for the Stacked Array. We will be glad to mail it and to place your name on our list to receive future issues—write Dept. 13D.

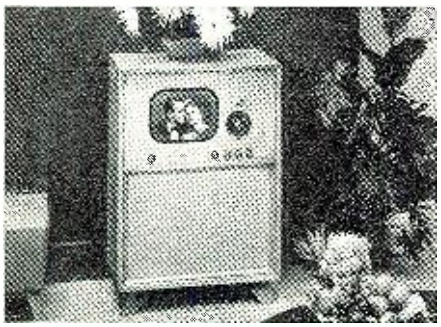
AMERICAN PHENOLIC CORPORATION
1830 SOUTH 54TH AVENUE, CHICAGO 50, ILLINOIS
COAXIAL CABLES AND CONNECTORS · INDUSTRIAL CONNECTORS, FITTINGS AND CONDUIT · ANTENNAS · RADIO COMPONENTS · PLASTIC FOR ELECTRONICS

NEW RECEIVERS for Winter Market

SMALL TV CONSOLE

A boon to apartment dwellers and persons living in cramped quarters has been offered by *Allen B. DuMont Laboratories, Inc.,* of New York.

Known as the "Sutton," the new model RA-103 television receiver is



styled in functional modern design and finished in blonde hardwood. The set offers large-screen television (7½" x 10") producing a 72 square inch direct-view picture with FM and television on all channels.

The "Sutton" features DuMont's exclusive patented "Inputuner" and tuning eye for quick, accurate tuning. The unit incorporates a 10 inch PM dynamic speaker.

The cabinet measures 28⅜" by 38" by 20¼". The set uses 25 tubes plus 3 rectifiers.

For further details write *Allen B. DuMont Laboratories, Inc.,* 515 Madison Avenue, New York 22, New York.

"FRONT ROW" TV

Bendix Radio, Division of Bendix Aviation Corporation, recently introduced its "Front Row" television receiver to the public.

The new set features push-button tuning coupled with automatic picture

control to make possible instantaneous program selection regardless of channel. Only two control knobs, in addition to the push-buttons, appear on the front panel. The service controls are concealed by a panel above the push-buttons which snaps out for ready adjustment. FM sound is used, and a three-button tone control permits further adjustment to the tastes of the listener.

The Model 235M1, "The Fiesta," is compactly housed in a modern mahogany cabinet which retains its furniture appearance with doors over the controls and picture screen. Use of the Sheraton table base in solid mahogany brings a new "cabinette" style to television, standing at full console height. A similar ensemble in blonde mahogany is scheduled for early production.

The unit offers a 53 square inch screen. Automatic circuits provide bright, flicker-free pictures. The chassis uses only 180 watts. The set uses 21 tubes plus two rectifiers and two crystal detectors.

A built-in antenna is provided but provision for installing an outside antenna, where necessary, has been made.

Bendix Radio, Division of Bendix Aviation Corporation, Baltimore 4, Maryland, will supply additional details on request.

FACSIMILE RECEIVER

Stewart-Warner Corporation has presented the first public showing of its home receiver for radio facsimile reception.

The device produces printed type-matter or photographs on a continuous paper roll eight inches wide. The new set, which combines facsimile reception with FM and AM radio reception, will go into production as soon as orders are obtained for sufficient sets to warrant setting up production lines.

Manufacture of the set is under license of the John V. L. Hogan patents.

Inquiries regarding the new facsimile receiver should be addressed to *Stewart-Warner Corporation,* 1826 Diversey Parkway, Chicago 14, Illinois.

G.E.'S LP RECORD PLAYER

A phonograph attachment for playing the new Microgroove long-playing records has been announced by *General Electric Company.*

Designed to plug into the phonograph jack of two of the company's radio-phonograph combinations (the Models 118 and 119), the new unit may also be installed in other phonograph units. Because the attachment uses the company's "Electronic Reproducer" it will be necessary, however, to install a preamplifier in phonographs not so equipped.

The new player will take 10 and 12 inch records. An on-off switch, located at the front of the streamlined rosewood plastic cabinet, automatically switches from this unit to the standard player in the radio-phonograph combination to which it is attached.

Further information on the new record player may be secured from *General Electric Company,* Electronics Park, Syracuse, New York.

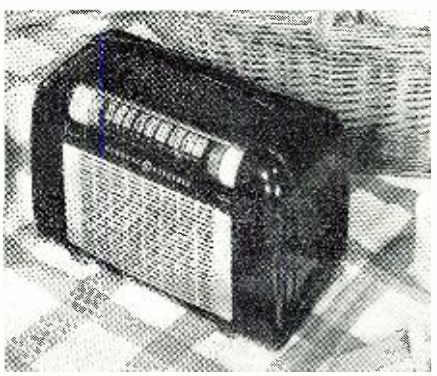
SELF-CHARGING PORTABLE

General Electric Company has recently added the Model 160 to its line of portable radios.

The new receiver weighs about 17 pounds and is housed in a streamlined maroon plastic cabinet with brass speaker grille. The unit features a 2-volt rechargeable storage battery and a built-in charger.

Other features of the portable include a built-in "Beam-A-Scope" antenna and a 5¼ inch Alnico 5 dynapower speaker. The set has 5 tubes.

The Model 160 will play from 12 to 15 hours when the storage battery is fully charged. The battery can be re-



charged by plugging the set into ordinary a.c. house power. A built-in indicator shows when charging is needed. When the set is used in remote areas beyond power company lines, the battery can be recharged from a 6-volt auto battery by means of a special charging cable.

For full details on the Model 160, write *General Electric Company,* Electronics Park, Syracuse, New York.

FM-AM TUNER

An instrument type FM-AM tuner, the Model RJ-20, has been announced by *Browning Laboratories, Inc.,* of Winchester, Massachusetts.

Two tuners, independent except for the audio amplifier, are incorporated on a single chassis to achieve the desired result. The FM section is of the superhcterodyne type using the *Armstrong* system with dual limiters. A standard de-emphasis circuit removes high frequency pre-emphasis applied at the transmitter. Sensitivity of the FM section is such that 20 db. of quieting is produced with as little as 6½ microvolts of signal. The 32 db. of quieting occurs with 10 microvolts and full 15 kc. audio response is maintained.

The AM section is a superheterodyne circuit using a tuned r.f. stage. The i.f. transformers used are variable in bandwidth from 8 kc. to 18 kc. A panel control permits selection of bandwidth.

Audio signals from either channel are fed through two cascaded triode

selection of services, rocket tuning, adjustable antenna signal maximizer, chromatic tone selector, and automatic stop record changer. Two full-length

doors open to reveal the dial panel, speaker, and drawer-type changer.

For further information on the Model 1407PF, write *Stromberg-Carlson Company,* Rochester, New York.

TEMPLETONE VIDEO

The *Templetone Radio Mfg. Corp.* of New London, Conn., has recently entered the television field with the Model TV-1776.

This table model receiver features a built-in filtered magnifier lens which provides a picture measuring over 50 square inches; four simple controls on the front panel for all normal operation; a 7" picture tube; hand-rubbed cabinet; and television coverage for all channels available in any FCC designated service area.

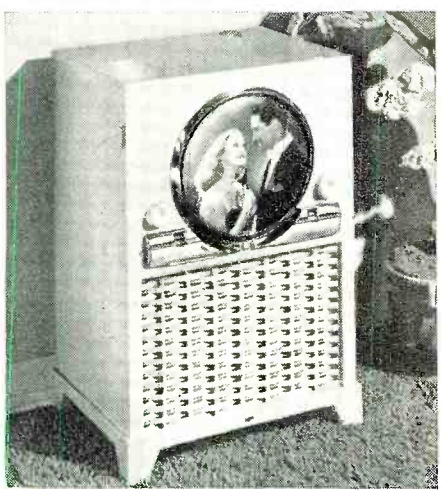
The new set measures 23½ inches wide, 13¼ inches high, and 17 inches deep.

The company will provide full information on the Model TV-1776 upon request. Write *Templetone Radio Mfg. Corp.,* New London, Conn.

NEW ZENITH VIDEO

Zenith Radio Corporation has announced a new and "revolutionary" line of television receivers to the trade.

Included among the new receivers



recently introduced is the Model 28T960E, an FM-television console featuring a "Big B" size "Giant Circle" luminized screen with from 1000 to 1500 more volts for clearer, sharper, larger, and brighter pictures, according to the company.

The receiver is pretuned and covers all 12 low-band channels. Only a simple adjustment is needed to adapt the set for receiving u.h.f. above 500 mc. A "Bulls Eye" tuning control is used to automatically lock in all tuning factors for the audio and video circuits. One twist of the knob is said to bring in the station perfectly tuned both in picture and in sound.

Gated automatic gain control maintains picture brightness and contrast, focus, and audio volume at constant level when tuning from one station to another. A contrast selector has been included to permit the user to make adjustments to meet his preference.

The set uses 24 tubes plus 3 rectifiers and the "Giant Circle" screen. A safety back panel includes a cut-off switch which opens the circuit when the panel is removed. The set is housed in a modern, simply-styled cabinet of African Afara veneer. The screen frame and control panel is accented by a tarnish-proof "Black Gold" luster finish. The receiver measures 34 7/16 inches high, 22 13/16 inches wide and 18 11/16 inches deep.

Zenith Radio Corporation, 6001 W. Dickens Avenue, Chicago 39, Illinois, will supply additional details on this line upon request. —30—

Spot Radio News

(*Continued from page 18*)

up and delivery trucks; trucking, hauling and freight handling; contractors for buildings, roads, and services; newspapers; public utilities; and government agencies and officials.

STATE COMMUNICATION FACILITIES were also probed at the hearings. And here again the proposals were criticized. Reporting on this problem for the California State Communications Advisory Board, William E. Whiting, a radio engineer, said that the proposed listing of public safety services on a 20-kc. channel basis, instead of a 40-kc. basis, as originally planned, deprives these services of half of the space originally proposed as compensation for those in the 72-76 mc. band relinquished to TV. He said that as a matter of practical experience, it has been found that with present equipment it is impractical to operate with less than 80 kc. separation in one area.

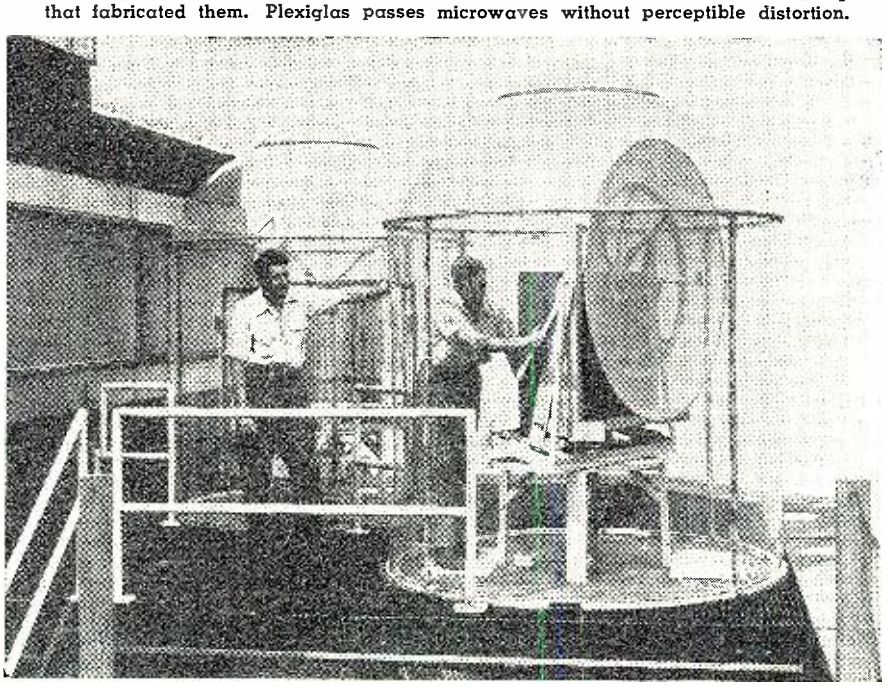
He pointed out that only about one-third of the 154 channels available for public safety are actually usable. For example, in Southern California there are some forty-seven incorporated cities and towns in Los Angeles County alone. These cities are contiguous without natural barriers and each has a requirement for a communication system. Whiting stated that in view of this situation, Los Angeles, which is now using twelve channels, will require fifteen upon the completion of two-way installations on motorcycle equipment. He said that it is impossible to share these channels with any other agencies inasmuch as the traffic load in Los Angeles is approximately 5000 messages per 24 hour period.

THE NEWSPAPER CASE, presented by William K. Van Allen for the American Newspaper Publishers Association, was replete with intriguing information.

Citing the use of radio by a small newspaper, Allen said that, in the instance of the *Douglas Budget,* Douglas, Wyoming, serving 2200 people in a mountainous area, radio has been the only means of covering hundreds of miles and providing an accurate and necessary news service.

Allen then offered an example of relay press use during a disaster, such as the '47 Maine forest fire. The *Boston Herald-Traveler,* which had received its license in January of the year, sent a mobile unit to Maine for the entire week. Because telephone lines were down, its mobile unit was the only facility available at the scene for transmission of news. So outstanding was this service, said Allen, that the Governor of Maine designated the *Herald-Traveler* and its station

To insure maximum steadiness of television reception in the New York metropolitan area, engineers of the New York Telephone Company and the National Broadcasting Company have enclosed the microwave antennas mounted on the Empire State and RCA buildings in special Plexiglas housings. The primary purpose of the new housings is to shield the parabolic antennas from high winds. If exposed, the big discs would vibrate in the wind and picture distortion would result. The structures also guard the costly apparatus against moisture, dirt, and unwary birds. The installation shown in the picture is made on the 87th story of the Empire State Building. The housing is made of ½ inch Plexiglas. Heavy members of the same acrylic plastic are used as framing. Reinforcing caps atop the domes are designed to withstand the full force of a direct hit by falling ice, and the housings are anchored to withstand winds of hurricane force. The housings were designed by network and telephone company engineers working with Ranger-Tennere Inc. of New York, the company that fabricated them. Plexiglas passes microwaves without perceptible distortion.



WHDH, as the official means of communication during the fire.

An incident, which illustrated the news speed offered by radio, was also presented by Allen. In New Bedford, Massachusetts, during January '48, an auto in which two men were apparently sleeping was found in a remote section of Westport, about fourteen miles from New Bedford and nearly that far from any normal means of communication. The police were notified and went to the scene to check. The *New Bedford Standard Times* which had a last edition deadline of 3:30 learned of the investigation about 3 p.m. A reporter was dispatched to the scene in a radio-equipped car and by 3:25 was able to radio his office that the two men were dead of monoxide gas forced into the car when the exhaust of their auto become clogged with snow. Without radio, said Allen, this story could never have appeared that day.

Commenting on why more newspapers have not sought to use the relay press service, Allen said that many papers had assumed that the service was much more expensive than it really is, while other papers had experimented with radiotelephone service supplied by the telephone company rather than with the relay service, and still others have been waiting until the service was put on a permanent basis before applying for a license. He said that forty-eight papers have now indicated that they'll use relay press, many having already mailed in their applications to the Commission.

Reporting on the suggested extended use of the telephone system circuits instead of relay press, Allen said that in many localities the service is not available, the lines are too filled in other areas, there are too many busy line delays, the service lacks privacy and last, but not least, the service is sometimes not available when the newspapers need it most.

THE INVALUABLE SERVICE afforded by radio in gas utility operation was cited in a report by the mobile radio committee of the American Gas Association. In the natural gas transmission operations, for instance, two-way communication has made it possible to dispatch crews already in the field and near trouble areas in a fraction of time. At a United Gas Pipeline Company field, last winter, an entire section of wells froze up in ten minutes, cutting off one-half of the total gas load at that time. With the use of radio circuits, restoration of service was possible in an hour, instead of a minimum of three hours which would have been involved with prior antiquated contacts.

Covering the need for radio circuits along the pipeline routes, the report stated that even when the utility goes to the expense of installing its own private telephone or telegraph lines along the pipeline, there is no guarantee against the failure of these facilities. It is unfortunate that such

failure is most likely to occur at the very time that communication is most essential to prevent or correct emergencies, the report continued, since the same vagaries of weather which interrupt wire communications are apt to place a strain on gas transmission.

Setting forth the need for adequate channels, the report said that two-way mobile radio "is the fastest, most dependable and best adapted means of communication to insure prevention of emergencies, to effect speedy repairs, to safeguard the public, and to conduct gas utility operations."

BROADCASTERS also presented a very comprehensive review of how the proposed revisions in the allocations would affect present operations.

The testimony of Frederick T. Budelman of *Link Radio* was particularly pertinent, with a request being made that there should be no deletion of provision for remote pickup broadcast service in the 152-162 mc. band. He said that during the past two years, portable and mobile radio equipment for remote pickup service, operating in the 25-28 and 152-162 mc. bands, has been developed and widely used by both large and small stations, and is now providing a service never before possible. It has been used not only to bring to the radio audience special events that could not otherwise have been satisfactorily covered, he continued, but it has been of inestimable value to the public in carrying news of fires, floods, and other emergencies where minutes have meant saving of lives and property.

Budelman reported that while the 25-28 mc. band has been used, the narrow bandwidths available and higher levels of man-made noise existing on this band have somewhat limited its usefulness in comparison with the higher frequencies. And he pointed out, the 20 or 25 kc. channels available between 25 and 28 mc. make it necessary to either limit the audio range and distortion to levels not satisfactory for other than voice communications, or reduce the signal-to-noise ratio to a level inconsistent with normal broadcast standards. Accordingly, he said, these frequencies have found their greatest usage in cue circuits rather than program channels.

Commenting on the higher band channel, Budelman said that the low noise levels and favorable propagation of the 150-mc. bands have made them ideal for program circuits. It seems therefore unfair, he said, after . . . "forcing this service to move from its previous assignments in the 30-40 mc. band during the past three years and encouraging the development and purchase of equipment in the 152-162 mc. band, that the Commission should now invalidate the efforts and expense of manufacturers and users in making this shift. The prospects of such rapid reversals in policy cannot help but discourage development of programs on newly assigned bands for fear of another change in a few years."

The assignment of channels in the 450-460 mc. region will undoubtedly be of great benefit to broadcasters, he said, particularly for very-short-range mobile applications, or for portable use where semi-fixed line-of-sight paths are possible. He cited as an excellent example use of the latter in sound channels to accompany video microwave links for TV remote pickups. It is quite certain however, he said, from tests already run that reliable mobile coverage with broadcast quality over any appreciable area is very doubtful on these higher frequencies; on-the-spot coverage of special events and emergencies leaves no time to wrestle with propagation problems on 450 to 460 mc.

Testimony of many, many others, approving and criticizing the proposed allocations, was also presented during these hearings, one of the longest sessions in FCC history. The copy will take months and months to analyze, and it may be the Spring of '49 before a decision on the delicate channel problem will be made.

BROADCAST INDUSTRY officialdom toasted the FCC during their recent visit to New York City to witness a *CBS* color TV demonstration. Prexys, vp's, chairmen of the board, managing directors, and even the Mayor of New York City appeared at the event, held at the Roosevelt Hotel during a luncheon of the Radio Executives Club.

Seated at the long table were: Elden Park, vice-president and station manager of WINS; Elliott Sanger, general manager, WQXR; James Lawrence Fly, former chairman of the FCC and now in private law practice; Jack Poppele, vice-president of WOR and president of the Television Broadcasters Association; Commander Mortimer W. Lowei, vice-president of *Allen B. DuMont Labs;* Robert Kintner, executive vice-president of *ABC;* Joseph H. Ream, executive vice-president of *CBS;* Edgar Kobak, president of the *Mutual Broadcasting System;* Miss Frieda Hennock, FCC Commissioner; Niles Trammell, president of *NBC;* FCC Commissioner Rosel H. Hyde; Edward J. Noble, chairman of the board, *ABC;* William O'Dwyer, Mayor of the City of New York; Carl Haverlin, president of *BMI* and prexy of the club which gave the luncheon; Wayne Coy, FCC chairman; Brig. General David Sarnoff, chairman of the board of *NBC* and president of *RCA;* FCC Commissioner Edward M. Webster; Frank Stanton, president *CBS;* Mark Woods, president *ABC;* Dr. Allen B. DuMont, president of *Allen B. DuMont Labs* and WABD; Dorothy Thackrey, president and general manager of WLIB; Theodore Striebert, president of WOR; Charles Denny, former FCC chairman and now vice-president and general manager of *NBC;* Robert L. Swezey, vice-president and general manager of the *Mutual Broadcasting System;* Herbert Pettey, managing director, WMGM; Theodore Cott, vice-president and program director of

WNEW, and Alec Templeton, who entertained with a musical satire on the FCC and allocations.

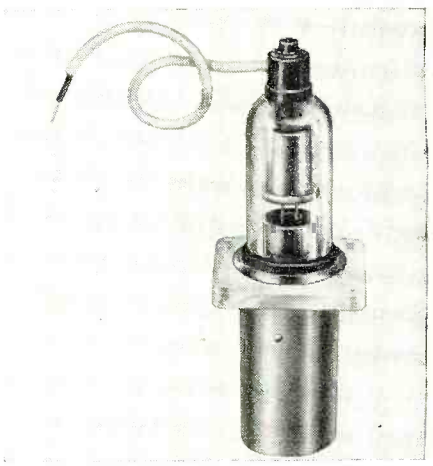
FCC Chairman Coy predicted, in a brief luncheon talk, that within the next few years there would be close to 1000 TV stations, reaching a large percentage of the people of the nation. And most of the industry's great at the luncheon appeared to agree that sight-and-sound service will become quite commonplace throughout the land and in perhaps 25,000,000 homes within the next five or six years. TV is certainly hitting the bell of progress.....L. W.

What's New in Radio

(*Continued from page 82*)

cuits. To obtain still higher voltage, additional cascade units can be added.

These coils are provided with diagrams giving dimensions, instructions,



and all pertinent data. They are also available with a tested 1B3 type tube complete with plate cap.

Additional information and price may be secured by writing *Spellman Television Co., Inc.,* 130 West 24th Street, New York 11, New York.

CONSOLE DEMONSTRATOR

The Receiver Division of *General Electric Company* has recently introduced a new console demonstrator which is designed to aid distributors in the sale of the company's Alnico V loudspeakers, variable reluctance cartridges, pickups and preamplifiers through actual selective demonstrations.

The console, built to take four speakers, a 5¼", 6½", 8", and 12", is sold less the component parts. Speakers as well as the pickup arm, preamplifier, and turntable must be supplied by the distributors from stock.

One seven-position switch on the side of the unit does all the necessary selecting for any demonstration. Finished in three colors and natural wood, the unit has an over-all width of 33¼", an over-all height of 57" and weighs 57 pounds. The unit is completely wired for the installation of the components and includes leads for the external speakers and amplifier.

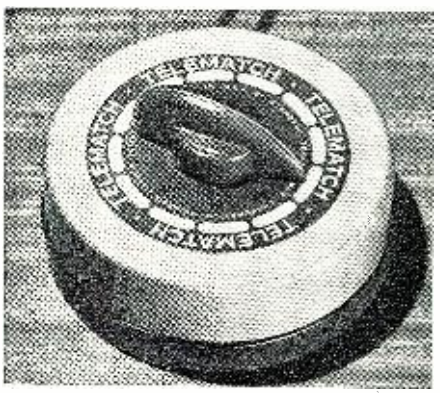
For additional details on the con-

sole demonstrator, write direct to the Receiver Division, *General Electric Company,* Electronics Park, Syracuse, New York.

STANCOR "TELEMATCH"

The elimination of the electrical mismatch existing between antenna and receiver in nearly all television receiver installations is claimed for the new "Telematch" now being manufactured by *Standard Transformer Corporation* of Chicago.

Correcting this mismatch enables



the full broadcast signal picked up by the antenna to be delivered, with minimum loss, to the receiver for greatly improved reception, according to the manufacturer. It further permits, under certain conditions, the use of an inexpensive, easily-installed indoor antenna to provide satisfactory reception.

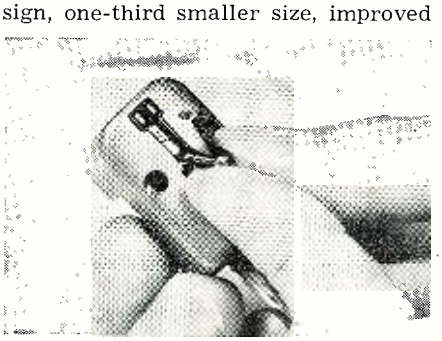
The "Telematch" is quickly installed by attaching two cable lugs to the receiver antenna input terminals. No tubes or electricity are used. The unit may be mounted behind the receiver or used on top of the cabinet. The "Telematch" is finished in brown and hammertone gold with plastic control knob.

Further details on the "Telematch" are now available from *Standard Transformer Corporation,* 3580 Elston Avenue, Chicago 18, Illinois.

NEW GE UNIT

General Electric Company has announced a new variable reluctance cartridge with a replaceable stylus.

The new unit features a notched design, one-third smaller size, improved



shape, and more universal adaptability to the various tone arms. The cartridge also provides more clearance for record changers and higher lateral compliance for more faithful tracking.

The stylus may be replaced by the customer, in four easy steps, a feature which is expected to result in more sales for the dealer.

The cartridge provides negligible needle scratch and needle talk, minimum record wear, wide frequency response, freedom from resonance peaks, and realistic reproduction.

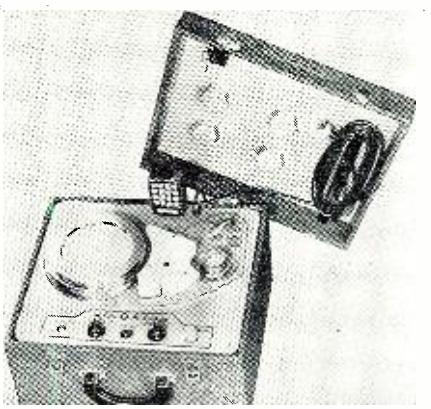
For complete information on the new variable reluctance cartridge write direct to *General Electric Company,* Electronics Park, Syracuse, N. Y.

PORTABLE WIRE RECORDER

Air King Products Co., Inc. of Brooklyn has just introduced a portable wire recorder, the Model A-725, which includes amplifier and speaker in a complete unit.

The new unit features immediate playback, recording from microphone, radio, phonograph, or telephone; automatic shut-off at end of play or rewind of wire; crystal microphone for hand, table, or stand with plug-in mike cord; permanent recording as required; plug for cable to record from radio or phonograph; and safety lock to prevent accidental erasures.

Designed to sell in the moderate price class, the new Model A-725 uses four tubes plus a selenium rectifier. The recorder is housed in a carrying



case of blue-grey leatherette trimmed with bright nickel hardware. It weighs 21½ pounds and the case measures 13¾" by 12" by 9".

For further information on the new portable wire recorder write *Air King Products Co., Inc.,* 170 53rd Street, Brooklyn 32, New York.

CINAXIAL SPEAKERS

Cinaudagraph Speakers of Kansas City, Kansas, has announced two new 15" Cinaxial speakers designed especially for television, FM, and the new Microgroove records.

The lighter weight model has a 12 ounce magnet in the low frequency speaker and has a rated power handling capacity of 15 watts.

The heavier unit uses a 21½ ounce magnet in the woofer and is rated at 18 watts. Both use especially designed 5" high frequency speakers equipped with 3.16 ounce Alnico magnet.

For further details on the Model CIN-15B (the light weight unit) and the Model CIN-15C write *Cinaudagraph Speakers,* 1401 Fairfax Trafficway, Kansas City 15, Kansas. —30—

International Short-Wave

(*Continued from page* 134)

Gelora Pemoeda Indonesia" and "Radio Neesantara." (Fern, Hawaii, via NNRC)

In verifying YDE, 11.770, for Boice, Conn., Batavia called attention to its broadcast in *English* at 0600 over YDC, 15.145 (appears to be that low most of the time although station lists it 15.150), and 7.270 which they listed as YDB3. A program schedule of the foreign transmissions was promised as soon as it is received from the printer.

In verifying for Gaynor, Calif., Batavia station officials said they have temporarily discontinued transmission beamed to the United States (formerly was at 0930-1000 on several frequencies), but that in approximately 9 months (should be in May 1949) they will resume these broadcasts on a 100 kw. transmitter.

Kenya Colony—The *new* Mombassa transmitter signs on at 2259 with a few bars of "Strike Up the Band;" call is "Your Forces Broadcasting Service, East Africa, radiating from Mombassa on 41.54 meters, 7.22 megacycles;" has BBC news relay 2300, 1100, 1300; closes down 1400 with Ted Lewis' "Goodnight." (Bluman, North Africa, who reports this station to *Radio Australia,* says frequency is actually 7.190.)

Luxembourg—Radio Luxembourg gives schedule as 0600-0830 on 15.350, 1130-1800 on 6.090. (Worris, N. Y.)

Madagascar—Tananarive has been testing a *new* transmitter on approximately 7.375. (Sweden DX broadcast) *Does anyone have further details?* Dilg, Calif., reports both the 6.064 and 9.694 outlets are readable lately around 0930.

Malaya—British Far Eastern Broadcasting Service, Singapore, expects to have *new, powerful* transmitters ready within 18 months. (Cushen, N. Z.) (I understand these will be 100 kw.—K.R.B.)

Radio Malaya, 4.820, Singapore, is heard at 0900 with news (at least some days is relayed from BBC), usually has a good signal in California. (McAlister)

Mexico—XBHX, Mexico City, "Banco Nacional de Mexico," is now on 13.995, fair signals daily to 1830 or 1900 sign-off. (Kary, Pa.)

XEBT, 9.625, Mexico City, normally has news nightly at 1935-1945. (NNRC) A "deadline" report from Ferguson, N. C., states that this series of newscasts in *English,* from the Mexico City *Daily Herald* as given by Allen B. McLean, terminated as of October 30, but that it was announced they might be resumed around January 1, 1949.

Stark, Texas, reports X9BGC testing on 5.869 about 5 minutes after the hour and after the half hour. This is the Mexican-American Hoof and Mouth Disease Control Commission.

Monaco—Radio Monte Carlo, 6.034.5 (measured), signs off 1716 after news in French (1700-1711); program res-

ume in French follows news; signals extremely good, channel clear. (Kary, Pa.) Now signs on half-hour earlier, that is at 0100. (Beck, N. Y.)

Mozambique—Laubscher, South Africa, airmails me that Lourenco Marques' "morning" session of musical programs with *English* announcements is at 0000-0300 over CR7BE, 9.715 on *weekdays only (off Sundays);* other Mozambique schedules include weekdays CR7BE, 9.715, 0700-1000; CB7AB, 3.493, CR7BV, 4.915, 1000-1600; Sundays, CR7BE, 9.715, 0200-1000; CR7AB, 3.493, CRTBV, 4.915, 1000-1600. Stark, Texas, reports hearing CR7BE (which he places as low as 9.707) on both schedules. I hear this one with good level here in West Virginia opening 0000, with popular music and *commercial announcements (English);* gives frequent time checks; usually fades out here around 0100. According to Fern, Hawaii, CR7BE is on 9.710 and has replaced CR7BJ, 9.582.

New Caledonia—Radio Moumea, 6.000, FK8AA, fair and quite clear at 0500 in Pennsylvania, with popular Continental music to 0515 sign-off. (Kary) (I believe sign-on is 0200.—K.R.B.)

New Zealand—Wellington's available frequencies are ZL1, 6.080; ZL2, 9.540; ZL3, 11.780; ZL4, 15.280; ZL5, 17.770; ZL6, 25.800; power 7½ kw. ZL2, 9.540, is audible in Ohio at 0615-0630 sign-off. (Sutton) The only *regular daily* transmission so far reported is at 0200-0400 on 11.78 and 15.28; former is usually good to excellent while the 15.28 channel is poor to inaudible now in Eastern North America. An experimental transmission has been heard by Beck, N. Y., around 0120-0215 on 9.54 and 11.78, best on 11.78; at that time Wellington relays a local BCB outlet with a program primarily of popular music; may not be complete schedule of test.

Nicaragua—YNZZ, 6.464 (measured), Managua, has fair signal nightly; some CWQRM; appears to have program of U. S. swing music around 2030-2100; announces "Radio Mundial en la capital de Nicaragua;" no mention of call; uses 4-note chime prior to identification. (Kary, Pa.)

YNAS, 6.300, Managua, "Ondas del Xolothan," signs off 2200 with "La Marcha Patria de Nicaragua;" signals quite strong but suffers bad QRM from c.w. station WNU on same channel. (Kary, Pa.)

YNDG, *Radio Colonial,* 7.660, Leon, announces in *English* about every half hour. Schedule given by station is Monday-Saturday 0600-2300 and Sunday 0500-2100; transmitter is *Hallicrafters* HT-4E, 400 watts; antennas are two half-waves in phase connected to transmitter, 40 feet above ground, running E-W; also radiates with 2 other antennas about 5 feet away from the other one, by induction—one type "Y" antenna and the other a 4-half-wave in-phase directional. Stated when broadcasts were started, 100 watts was used (1938 to 1946); letter-verie was in *English.* (McPheeters, La.)

Norway—Oslo's 100 kw. transmitter is now on 11.735 in the nightly North American transmission (for a while was on 15.170). The 8 kw. transmitters are on 9.610 and 6.185 now for that beam at 2000-2100; also heard 0130-0230 on 15.17, 1.85, 9.61 with equally good strength; the transmission ending at 1705 (Home Service) is now heard on 11.85 and 9.610. (Beck, N. Y.)

Norwegian winter schedules from Swedish sources are 0130-0230, 7.24, 9.54; 0800-0900, 9.61, 7.24, 6.13; 1400-1500, 11.85, 15.17, 9.61; and 2000-2100, 7.21, 9.61, 6.185. (Worris, N. Y.) This may not be complete as I am hearing Oslo on 15.17 with powerful signal around 0600-0700 or later.

Pakistan—Frequency of Radio Pakistan, Karachi, is still in doubt, but Major, W. Australia, sends latest report on it being recently on (assigned) 6.075; is low-powered and so far has not been reported to me as heard in the U. S.; at last report was scheduled 0700-1230, 2100-2300, 0200-0330; *English* at 0730, 0745, 0830, 1030, 0300, 2130.

Panama—Hort, 6.060, *"Radio Balboa,"* Panama City, is good to fair nightly, but with sideband interference from HJFA; requests reception reports to Ecuador numero 9, Panama City. (Kary, Pa.)

HPH was heard testing some time ago on 10.670. (Weisburg, N. Y.)

HOLA, 9.505, Colon, has *English* up to 1800. (Weisburg, N. Y.) Also announces *English* for 2200. (Hankins, Pa.)

Paraguay—ZPA5, 11.948, Encarnacion, is heard in Newfoundland at 1800-1930. Is officially listed on 11.945.

Peru—Kary, Pa., reports OAX4K, *Radio Central,* Lima, put in a rare appearance one night some time ago on 9.510 at 1825, was squeezed in between HOLA (Panama) and BBC's 9.525 outlet; fairly strong signals but had "buzz-saw" modulation.

Philippines—Manila (relaying "Voice of America") is now scheduled on 11.890 at 0400-0600 to China; 0600-0700 to USSR-Korea; 0700-0800 to China; 0800-0915 to East Indies, and 0915-1015 to China. On 15.330 is scheduled 0215-0345 (*not Mondays*) to South East Asia.

(*Continued on page* 156)

KZRC, 6.135, Cebu City, has news 0900. (Cushen, N. Z.) Heard in California around 0800 announcing "KZRC, Radio Cebu;" interval signal is 3-note chime on half hour. (Stein)

KZMB, 6.000, is operated by the Manila Broadcasting Company, owner of KZRH (9.640), transmits at 1600-1100 and relays medium-wave 950 kc. (Fern, Hawaii, via NNRC) KZMB has been heard in California at 0900-1000 with good level. (Rosenauer)

Poland—Warsaw's 6.215 is fair to 1600 when news in Polish is read by a man and woman, alternately; slight sideband QRM from U. S. aircraft on 6.210 is noted. (Kary, Pa.) Now has *English* session at 1530 instead of 1430. (Pearce, England)

Portugal—Emissora Nacional, Lisbon, is still on 15.100 with identification at 1515 after program of light music and song recordings. (Pearce, England) Is heard in Newfoundland at 1545-1630. (Peddle)

Portuguese Guinea—Bissau's CQM4, 7.939, is heard in Newfoundland at 1700-1800. (Peddle) Sutton, Ohio, reports more recently this one has been heard signing off at 1730 with Portuguese National Anthem.

Roumania—According to a recent Swedish DX broadcast, Bucharest begins a transmission at 0700 on 11.900.

Bucharest, 9.250, is heard in Newfoundland at 1500-1530 in *English.* (Peddle)

South Africa—A verification from ZRB, 9.110, Pretoria, gave schedule 2355-1000 Mondays through Fridays and 2355-1030 on Saturdays *(is off Sundays);* it was stated they expect to use 6.210 in the near future (probably by now). (Hagen, Ala.)

Spain—Radio Nacional de Espana, Madrid, has a daily transmission of news in Spanish 0830-0850 on 15.630 "for all Spanish-speaking stations;" it is believed that quite a number of Latin American stations probably record this broadcast for use later in the day; signal fair, subject to bad fade at times, and some teletype QRM; assigned channel is 15.615. (Kary, Pa.)

Pearce, England, has heard Madrid on approximately 19.650 with news in Spanish by man and woman announcers at 0830; signed off with "Viva Franco, arriba Espana," at 0850; apparently *not* Sundays. (This is probably the same period heard by Kary on 15.630.—K.R.B.)

RNE, Madrid, has a spurious emission on 9.290, can be recognized by poor quality of modulation. (Kary, Pa.)

Sweden—A new program for the United States, called *"Sweden Today,"* is now scheduled from Stockholm at 0815 on 11.705, 15.155. (Sweden DX broadcast)

This winter, the 1900-2000 transmission from Stockholm is over SBO, 6.065, and SBU, 9.535. (Worris, N. Y.)

Switzerland—During the winter, Berne is operating on HER3, 6.165; HEI3, 7.21; HER4, 9.535; HEI5, 11.715; HEU5, 11.815; HER5, 11.868; HED7, 15.12; HER6, 15.305; HER7, 17.784.

TWO NEW HAM CLUBS ORGANIZED

THE National Amateur Radio Council was formed recently and incorporated under the laws of the State of Indiana. The new organization publishes a monthly bulletin, and conducts regular polls among its members to determine their views on subjects affecting amateur radio.

A recent poll among the members resulted in the following majority recommendations.

1. Return of the 1.75 mc. band, either in full or in part, if possible.
2. Specific frequency assignments for SSSC operation.
3. A more difficult technical exam for class A privileges.
4. Opening of part of the 7 mc. band to phone operation.
5. Some bands being opened to 50/50 phone-c.w. operation.
6. Increasing the 3850-4000 kc. phone allocation.
7. Elimination of provision requiring new operators to operate one year on c.w. before being permitted phone privileges below 30 mc.
8. Opposition to the increase of code requirement to 16 w.p.m. as a requisite for a class A ticket.

Inquiries for further information about this organization may be addressed to the Acting Secretary, Bud Robinson, W9CCB, 604 N. New Street, Champaign, Illinois.

A SECOND organization, the Society of American Radio Amateurs, has been formed with the avowed purpose of furthering the amateur art, promoting fraternalism, and protecting the amateur frequencies against encroachment, the encouragement of "new blood" and other such activities considered beneficial to amateur radio.

In a letter to the FCC on September 27, the organization went on record as being opposed to any increase in phone allocations at this time. It was also recommended that efforts be made to restore the 1.75 mc. band or such part as can be made available.

The group suggests that the following frequencies be set aside for SSSC use: 3850-3875 kc.; 14,285-14,300 kc., and 28,500-28,525 kc.

SARA also recommends that no phone allocations be made in the 7-7.3 mc. band; that all newly licensed amateurs be required to operate solely with a Type A-1 emission during the first year of their license period, with a further period of one year as a class B licensee before becoming eligible for a class A examination.

They further suggest that a code speed of 20 w.p.m. be required for the class A examination in the future, including renewals.

They ask that a new type of license for a term of six months to one year be created to stimulate the interest of youth in ham radio. The code test for this license is suggested as 5 to 8 w.p.m. This type of license would not be renewable. The frequency bands for this type of license should be restricted to 3700-3800 and 7200-7300 kc. with crystal control mandatory.

Further details on this organization may be obtained by writing to Secretary J. N. Boland, W4CC, P.O. Box 462, Benjamin Franklin Station, Washington 4, D.C. —30—

Schedules are to Europe on HER3, HEI3, weekdays 0040-0150, 0610-0715, 1200-1700, and Sundays 0055-0140, 0245-1700; to Australia, New Zealand, Far East on HEI5, HER5, HER6, daily *except* Sundays and Wednesdays, 0215-0415; to Far East on HER7, Monday, Tuesday, Thursday, Friday, 0730-0915; to Africa, Saturdays on HER6 and HER7, 0930-1010, and on HER7 at 1010-1050; on HER6 and HER7 at 1050-1130; to England on HEI3, daily 1414-1515; to South Africa daily on HER6, 1530-1615; to Spain and Portugal daily on HER5, 1630-1715; to North America daily on HEU5 at 1730-1815; to Latin America daily at 1830-2000 on HER4, HER5, HED7; to North America daily on HER3, HER4, HEU5, 2030-2230. (Worris, N. Y.)

Tangier Zone—Radio Internacional, Tangier, International Zone, is now on 6.124 from 6.210; signals much stronger, but with severe QRM from Latin Americans; leaves the air 1900 with "La Paloma;" on the hour sounds 16-note chime, and clock chimes the hours (EST *plus* five hours); announcements in Spanish by a man and in French by a woman. (Kary, Pa.)

EA9AA, *"Radio Africa,"* Tangier, on 7.080, is heard in England from sign-on 1400 to sign-off around 1657; gives calls in French and Spanish, but programs are all Spanish; verifies by letter in French, sends souvenir card. (Pearce)

Trinidad—Radio Trinidad, 9.625, has fair signal in Kentucky from 0545 tune-in to 0630 when fades badly; BBC news relay 0600. (Alcock)

Turkey—TAP, 9.465, has news daily during winter 1245; on Mondays and Thursdays has *English* session (for Britain) 1630, and on Sundays at 1630 has weekly Mailbag Program. (Pearce, England) Signals improving here in West Virginia.

United States—Kary, Pa., has received this letter from the *Crosley Broadcasting Corporation,* Cincinnati, Ohio, which explains the unmodulated carrier heard on 6.080: "For your information, W8XAL is an unmodulated one-kilowatt transmitter identified once an hour by an automatic keying machine. It is owned and operated by the *Crosley Broadcasting Corporation* for the Bureau of Standards in Washington, the purpose being a long-time study of propagation conditions. W8XAL operates 24 hours a day with the exception of the time when WLWO, one of our international transmitters, uses the frequency. The antenna used on W8XAL is a vertical copper pipe radiating a non-directional signal. We are sorry to learn that this service is causing interference to foreign stations. Apparently, your location is just the right distance to receive a very heavy signal, although, as stated above, it is only a one-kilowatt transmitter." This unmodulated carrier has been widely reported to me.

U.S.S.R.—Moscow has been noted again evenings on 13.610, poorly modulated; news 2200, apparently from European Service. (Kary, Pa.)

According to information received

by Worris, N. Y., from the American Embassy, Moscow, *Radio Moscow* currently has *three separate* Home Services operating (1) 2200-1545; (2) 0645-2200 (possibly longer), and (3) 1030 to some time after 1100. Wavelengths are (in meters) 1961, 1724, 1500, 420.8, 19.56, 25.62, 41.27, 31.09, 31.65, 25.26, 25.21, 25.08, 25.55, 25.36 for No. 1 Home Service; 1293, 360, 315.8, 30.61, 25.1 for No. 2 Home Service, and 360.6 and 31.41 (from 1100) for No. 3 Home Service. The American Embassy stated it regretted that it has access to no information concerning other language broadcasts or the location or power of *Radio Moscow's* transmitters. (Information cited was translated from the daily program schedule of *Radio Moscow* as published in the weekly newspaper, *Radio Programmy.)*

Moscow's North American schedule daily is announced as 0745-0815, 11.96, 11.72, 9.60, 9.54, 7.36, 6.29, 6.15; 1820-1930 and 2100-2215 on 15.23, 11.88, 11.72, 9.60, 7.36, 7.29. (Ferguson, N. C., Jeffrey, Indiana)

Vatican—Pearce, England, says that HVJ's 31-m. outlet recently has been on approximately 9.640 instead of listed 9.66; heard on Sundays with *English* 1000 and daily with *English* 1315.

* * *

Last Minute Tips

Ferguson, North Carolina, flashes: "On a number of evenings I have heard a station with what sounds like a Near East broadcast coming on the air 2315 on approximately 9.515 (close to GSB, 9.51), and running to 2345." (I checked this channel and found this station which I believe is the "wandering" *Radio Omdurman,* Anglo-Egyptian Sudan.—K.R.B.)

According to *Radio Australia,* the Forces' Broadcasting Services, Middle East Headquarters, by now should be broadcasting from Malta (moved from Jerusalem, Palestine, where call-sign was JCKW); power 7.5 kw. Transmissions will be beamed S and E to cover Cyprus, Canal Zone, Cyrenaica, and Tripolitania. Major Leslie Knight will be Officer in Charge FBS H.Q., Malta. Tom Moffatt will be Director of Programs; he was well-known from JCKW as sporting commentator. By this time should be testing in the 25-meter band. (NOTE: However, most sources say this station is locating on Cyprus instead of on Malta, and using its old 7.22 frequency, with schedule of 2230-0030, 0330-1500 (Sundays 2230-1500).—K.R.B.)

At the time this was being compiled, I received word from Ferguson, N. C., that Helsinki, Finland, had announced they are now testing over their *new, powerful* transmitter on 15.190 with antenna beamed on North America, 0345-0600, 0715-0730; asked for reception reports to Finnish Broadcasting Company, Helsinki, Finland. A check found them with powerful signals from 0715, but on date checked they continued to test at intervals to 0800.

Radio Australia's beam to British Isles-Europe at 1500-1630 is now on VLB2, 9.650, VLA8, 11.760, VLC, 15.200; all excellent in New York. (Beck)

YSUA, 6.250, San Salvador, El Salvador, is on daily 1230-0000. (McPheeters, La.)

A "Radiodifusora Nacional de Venezuela" outlet is heard evenings now on 13.340 paralleling YVKO, 5.020, relaying programs of medium-wave YVKA; does not announce 13-megacycle out-

John Brandt, W8WAB, Columbus, Ohio, member of the Columbus Amateur Radio Association, operates the receiver as Section Emergency Coordinator for Ohio, D. E. Cartwright, W8UPB (shown standing center), explains details of his dual 110 volt a.c. or 6 volt d.c. power supply to local Emergency Coordinator Ellis Miller, W8ARP, vice-president of the Central Ohio Radio Club of Delaware. In the background D. C. Waxler, W8CSY, secretary of the organization, examines the transmitting equipment. The group recently conducted an unannounced simulated emergency test to demonstrate the organization's efficiency.

let; modulation on latter is above 100 per-cent, and speech is badly distorted; may possibly be using facilities of phone station YVQ, Caracas, listed 13.345. (Kary, Pa.)

Guatemala's *new* program in *English*, *"Guatemala Marches On,"* consisting of Guatemalan music and talks on Guatemala and its history, is presented each Thursday 2330-0000 or later; there is a 15-minute prelude of marimba music 2315; they ask that reports be sent to "La Voz de Guatemala," Guatemala City, Guatemala, Central America; carried on TGWA, 9.760, TGWB, 6.440. (Beck, N. Y.) Widely reported. (A later report from Beck says schedule more recently seems extended to 0030—probably Mondays through Fridays, at least—and seems to have special broadcast in *English* now at 0000-0030 most nights.—K.R.B.)

"Radio Republiek Indonesia," Bukit Tinggi, Sumatra, has moved from 10.570 to about 10.600. (Dilg, Calif.)

YVKC, Caracas, Venezuela, may have put its new 50 kw. into operation on 9.640 for at press time we received a report from Walt Morgan, Pennsylvania, that signals are now greatly improved.

ISWC (London) reports *Radio Hyderabad*, India, operates on 6.170 at 0730-1230 and on 3.335 at 2100-2310, 2330-0330, and 0630-1300. *Has anyone in North America heard this one?*

Herman Bluman, North Africa, says that the transmitter on 7.960 which was first believed to be Afghanistan is now finally identified as being in Shiraz, Iran. *"Radio Africa,"* is operated on 14.278 and 7.080 at 0800-?, and 1400-1700. (Swedish DX broadcast) *"Radio Africa"* is at Tangier.

A correspondent residing near Athens, Greece, has informed Foerster, Ill., that *Radio Athens* publishes excerpts of letters from their foreign audience along with writer's name and address.

An airletter from Dorothy Sanderson, Australia, lists XGOY, 15.17, Chungking, heard 0445 with news, commentary; ZBW-3, 9.525, Hong Kong, carries BBC news 0600; XMTA, 12.21, Nanking, heard 0545; JVW2, 9.505, Tokyo, 0400 with *English* lesson; Hanoi's *"Radio France,"* 6.190, Indo-China, news in French and music 0700; Rome on 6.085 in *English* and Italian around 1600; *Radio Monte Carlo*, 6.035, at 1600 with news in French, excellent level; VUM2, 9.59, Madras, India, at 0600 with news.

Flashes sent airmail from Bengt Nilsson, Sweden, include—VP4RD, 9.625, Port-of-Spain, Trinidad, has changed schedule to 0500-1300 and 1500-2200 Sundays and 0500-0800, 1030-1300, 1500-2200 on weekdays; HCJB 17.890, Quito, Ecuador, is heard in Sweden with tests on Tuesdays-Fridays around 1500-1600; Rabat, Morocco, has been heard on *new* frequency of 6.005 to sign-off at 1830 (in French); *Radio Pakistan* in Karachi is being heard on 6.210, news 1030, through QRM; call is PAK; KJOY, 8.000, Athens, Greece, is owned by U. S. Corps of Enginеers, on the air only on

Fridays 1330-1430; transmitter is *Collins* 30-K, power 300 watts; HLKA, 7.935, Seoul, Korea, heard in Sweden with good level from 1600; a station calling itself "Your Forces' Broadcasting Service" has been logged on 18.850 at 0535-0555; a *new* Italian station is heard on 18.350 at 1330.

Moscow's Home Service has been heard at 0100 on 9.480. (Sutton) (Some nights at least, I have heard this much earlier, around 2200.—K.R.B.)

Listeners in East who note Oriental music early evenings on stations in the 49-50 meter bands should not assume they are necessarily hearing China or India; recently such a Chinese program was heard by Kary, Pa., from COCW, 6.320, Havana, Cuba, and I recently noted Indian recordings being dedicated by ZFY, 5.984, Georgetown, British Guiana, to members of its Indian colony.

Fort-de-France, Martinique, has been heard on 19.570 calling Paris and Bordeaux at 0810, excellent signal. The U. S. War Dept. station in Honolulu, Hawaii, has been heard testing with voice, suppressed modulation, on 16.145 at 2135 to Washington, D. C.; suffered from its own multiplex transmissions. TFM, Reykjavik, Iceland, has been heard testing on 15.740 at 0815 to WGA7, New York; signals fair, used suppressed modulation, then to double sideband inverted speech, but using only the lower sideband. PGGF, the liner *Nieuw Amsterdam* (Holland-American Lines) has been heard at sea calling on 17.600 to GCN4, London, in standard speech prior to inverting at 0930. Paramaribo, Surinam, has been heard calling Amsterdam, Holland, on 17.680 in standard speech 1630, excellent level. WRA10, Tangier, is newly heard channel, 20.560, in the Tel-Aviv-New York circuit; this station relays WD9U to Tel Aviv, and after all traffic is cleared, can be heard conversing with Tel Aviv (4XA22); schedule irregular. HDS, 20.970, Quito, Ecuador, phone station, has been heard calling WOA2, New York, 1710 in standard speech; after making contact, went over to inverted speech. LSM5, 21.070, Hurlingham, Argentina, is call of Buenos Aires phone station working nightly to Rome with traffic in standard speech; no inverted speech noted; signals quite strong in Pennsylvania. WAR, Washington, D. C., key station of U. S. Army, was heard testing for some hours recently on 8.060, in standard speech with unusually good modulation; has also been heard as "This is Radio Washington testing" on 10.260, in poorly modulated speech around 1000, suffering from its own multiplex transmissions on same frequency; *Radio Balboa,* Canal Zone, another U. S. Army station. was heard answering on same frequency. (Kary, Pa.)

* * *

Acknowledgement

Many thanks for your fine cooperation and support of this Department during 1948. Keep up the good job, and may 1949 bring you the very best of DX, prosperity, and happiness! . K.R.B.

Valuing Your Business

(*Continued from page* 40)

value of tangible assets to fix the price the buyer will pay and reimburse the seller for his ownership efforts and investment.

Although an intangible, not to be valued on the books of a going concern, goodwill becomes a commodity when a business is sold. There are two methods of valuing goodwill. The first takes into consideration three factors: net profit, capital investment, and the "number of years' purchase." This phrase was adopted from old English decisions and the American courts when they first began to value goodwill.

The "number of years' purchase" figure is a variable, running from two to ten years, depending upon circumstances, the length of time the concern has been operating, the trend of profits, and general economic conditions. A business only two years old, even though it showed a satisfactory profit, is not likely to have goodwill that will justify a big asking price. A business showing decreasing profits or losses is in a similar position. When times are bad, a seller may have to reduce the "number of years' purchase" figure to close the deal. Goodwill is worth most when the business has been showing satisfactory profits over a period of five or more years, and when the sale is made in good times.

Accountants differ widely as to the "number of years' purchase" figure to use as the multiplier in calculating what a business is worth. There is no fixed figure in any industry or commercial field, but we would say that a dealer in this field with a successful business should use at least five years as the multiplier. This would be the rockbottom calculation when setting a value on a business. If bartering to sell, the seller may "horse-trade" from a higher level but he should have some idea about fair value for his business and use this as a basis for barter. The same counsel is for the buyer. He should have some idea of fair value to give for a business and dicker accordingly.

However, the "number of years' purchase" is only one factor, the multiplier. What is the multiplicand, the number to be multiplied? The net profit for so many years? No, this does not represent a fair value for goodwill, although many seem to think so. The profits must *exceed* the current return on outside investments. Only this excess is considered. If the net profits show only four per-cent return on capital invested, the purchaser is not likely to pay much for the goodwill and it doesn't mean much to the owner because either could invest in outside securities without risk and get as big a return.

In these times, the calculation found most equitable is to average the net profit for the past three years, deduct

Year	Net profit	Capital investment	5% Return on capital investment
1945	$ 2,500	$20,000	$1,000
1946	4,000	25,000	1,250
1947	3,500	30,000	1,500
Total	$10,000	$75,000	$3,750

Table 1. Method for determining "number of years' purchase" figure discussed in text.

five per-cent of the capital investment (a reasonable return on safe outside investments today), and multiply the result by five or more years, representing the "number of years' purchase." If the capital investment has changed during the prior three years, take the average annual capital investment as shown by the books for this period.

To simplify understanding, we offer an explanation in Table 1.

The average net profit for the three years is $3333, the average return on the average capital investment is five per-cent of $25,000, or $1250. The difference between $3333 and $1250 is $2083, which multiplied by five years' purchase is $10,415, the sum to be added to the tangible properties. If a seller figures his goodwill worth more, he can increase the "number of years' purchase" figure, but courts have rendered favorable decisions where the five-year period has been used in the calculation.

In the event that market value has increased tangible value substantially over book value, the seller should replace the average capital investment with the one revised figure. For example, after setting up a "Value of Business" balance sheet, if the capital investment shows $50,000, the return on this investment at five per-cent would be $2500 against the average net profit, $3333, the difference $833. This excess multiplied by five gives $4165, the value of goodwill, *less* than the former figure because an increase in the market value of the assets had increased capital investment, or net worth, and a purchaser who had to pay $50,000 for the physical assets of a business would be getting only $833 more a year for his investment than he would get if he made outside investments at five per-cent.

In normal times, the books will usually reflect a fairly accurate value for net worth if the dealer has made the proper adjustments for depreciation, bad debts, etc., but in abnormal times, such as these, adjustments. upward or downward, must be made to arrive at equitable figures, adjustments to reflect market values that are seldom made on the books unless the owner, for one reason or another, wants to find out what his business is worth.

The second method for computing the value of a business is simpler, but some accountants contend that it is not as accurate. On the other hand, it does have its proponents. We would suggest that you make the computation both ways and check one against the other before determining the value you would set on your business. Using this method the earnings are averaged

Average earnings of business for past 5 years		$ 7,500
Business is worth 10 times earnings or		75,000
Business property	$28,000	
Merchandise	15,000	
Fixtures and equipment	10,000	
Truck	2,000	
Cash	3,000	
Total assets	$58,000	58,000
Value of goodwill		$17,000

Table 2. One method for computing the current value of your radio service business.

for the past five years, then multiplied by ten, then the assets deducted, the remainder is the value of goodwill. See Table 2.

The final answer to "What's my business worth?" may be the price you can get for it through shrewd bargaining ability. It is a big advantage, however, to have a sound basis upon which to start barter, and even though a dealer has no intention of selling, it is worth appraising a business to determine its value in the event that contingencies arise. —30—

Single Turn Loop

(*Continued from page* 59)

The arrangement of Fig. 2 permits the loop to be matched accurately to the receiver input. The antenna tap is run up and down the coil experimentally until the optimum adjustment is found. Ordinarily it will be fairly close to the ground end of the coil. The transmitter output tube V_1 will not load the tank appreciably during reception even if it is a cathode type tube and the heater is allowed to run, because of the fact that it is a pentode or beam tetrode and no screen voltage is applied during reception.

It will be noticed that due to the selectivity of the L_1, C_1 circuit, the receiver sensitivity "peaks up" near the transmitter operating frequency. However, the sensitivity will not fall off appreciably within about 30 kc. of the frequency to which L_1, C_1 is tuned. Because of the widespread practice of working stations on or about the same frequency, this characteristic should not be objectionable. Considering the high effective gain provided on reception by the arrangement on or near the transmitter frequency, the lack of sensitivity at frequencies well removed from the transmitter frequency is a small price to pay. Signals still can be heard 100 kc. or so removed from the resonant frequency of L_1, C_1, but the receiver will not be nearly as "hot" as at the resonant frequency.

If it happens that the receiver sensitivity does not peak up at the same frequency as the transmitter frequency, it indicates that the receiver input impedance is much higher than that of the 70 ohm coaxial line, and the mismatch is causing an excessive reactive component to appear at the relay end of the line, thus detuning the tank circuit L_1, C_1 on reception. Should this condition be observed, it can be remedied by connecting a suitable value of inductance across the relay end of the coaxial line. The exact value of inductance is not critical, and may readily be found by experiment. One value of inductance will serve for the whole band if "optimized" at the center of the band. This coil need not have extremely high "*Q*," and may be closewound with No. 26 or 28 enamelled wire on a ½ or ¾-inch diameter form.

It is recommended that the regular side cowl or other standard "forward" antenna be used for standard broadcast reception, with a switch to throw the auto set input from the antenna to the converter. This is desirable in any case where a rear mounted antenna is used for amateur work, because the performance of the average auto radio will deteriorate considerably when a comparatively long piece of coaxial line is employed. Often the antenna trimmer on the auto set will not peak up, because of the excessive shunt capacity of the coaxial line to the rear of the car. With the selective coupling arrangement of Fig. 2 a separate antenna for standard broadcast is particularly desirable unless one is satisfied with reception of local stations only.

The antenna changeover relay is at a low impedance point and the contacts do not carry the antenna current on "transmit." Therefore, most any 6-volt relay having a set of s.p.d.t. contacts is suitable. If a multiple pole relay is used, the other contacts may be used for the transmitter control circuits and receiver muting. The logical place for the relay is right on the transmitter chassis, close to L_1.

Opening and closing the rear trunk door on the car will have an effect upon the resonant frequency of the loop-tank circuit. Therefore, provision should be made for reading the plate current to the final r.f. amplifier when the trunk is closed. With a little practice, one learns just how far to detune the tank condenser from resonance with the trunk partially open (just enough to reach in and tune the condenser) in order to achieve exact resonance when the trunk is closed.

Comparison of Loop and Whip Performance

While accurate comparisons are difficult on sky wave transmissons, a check showed a 75-meter loop system patterned after that described here to be about 3 "S" points better on *F2* layer (nighttime) transmission over an air line distance of 90 miles than a typical, top-loaded, 8-foot, vertical whip and coupling system fed from a transmitter delivering the same output power. This represents a power gain of more than 30 times, and made the difference between a barely readable signal and a good "solid" signal when received at a home station using a typical, horizontal, resonant doublet for reception. The superiority of the loop for sky wave communication was more apparent at closer distances, but was still pronounced at the greatest distance worked (about 285 miles).

For distances closer than 200 miles when *F2* layer is controlling, or for distances closer than 100 miles when the *E* layer is controlling, the azimuthal directivity of the loop is insignificant. At greater distances (as well as for ground wave work at any distance) best results are obtained from the loop in a line roughly parallel with the car.

As for what can be expected with a 75-meter mobile phone rig when using a single turn loop of the type described. it is possible to work out to about 200 miles via the *F2* layer with 20 to 30 watts input to the final stage *when conditions are good, when there is no QRM,* and when the other end of the circuit is a fixed station with a good receiving antenna. While it sometimes is possible to work farther to a fixed station, or to work another mobile station 100 to 200 miles away, such contacts will not be frequent.

Using the Antenna On 10

If provision is made for disconnecting the radiating element at the tie down point on the rain gutter, and the antenna is of the flexible whip type (rather than aluminum tubing), the antenna may be used as a regular quarter-wave whip for 10-meter operation. The disconnect device should be designed to have very low contact resistance in order to minimize losses on 75. If the whip is about 8 feet long and the lead from the base to the 10 meter transmitter not over 2 feet long, the reactance presented by the antenna (due to the over-all length exceeding ¼ wave length) may be tuned out by means of a 100 $\mu\mu$fd. midget variable condenser in series with the lead in. —30—

PAD KEEPS IRON CLEAN

A PAD of folded cotton rag, pinned to the front of the work apron, makes a convenient and effective cleaning device for a soldering iron. A quick swipe of the tip across the pad and the metal becomes bright and shiny. This arrangement is especially useful when working on tight wiring and it is necessary to pick up a drop of solder and carry it to the joint. Unless the tip is perfectly clean the solder will tend to fall off . . . . . R.H.

Within the Industry

(*Continued from page 28*)

sales promotion manager of the Receiver Division of *General Electric Company* and has been associated with the radio industry for more than 20 years.

* * *

JOHN F. BIGELOW has been appointed director of service training for the radio division of *The Magnavox Company* of Fort Wayne, Indiana.

Prior to joining the company, Mr. Bigelow was manager of the publications and training section of the *Farnsworth Television & Radio Corporation's* service department. He had been with *Farnsworth* since 1943 and was engaged in television research and engineering for that company during the war.

At present he is an FM and television instructor for the *Warren Radio Company,* and he recently completed a textbook on television design and maintenance which is to be published shortly.

* * *

LESLIE F. MUTER, president of *The Muter Company,* and Thomas A. White, president of the *Jensen Manufacturing Company,* have released a joint statement which reveals that *The Muter Company* has just acquired all of the common stock of the *Jensen Manufacturing Company.*

Both principals said that no consolidation of operations was currently anticipated and no changes in management were contemplated. The new board of directors of *Jensen Manufacturing Company* will be Thomas A. White, Leslie F. Muter, Hugh S. Knowles, Karl E. Rollefson, and A. A. Dailey.

The Muter Company manufactures components for radio and television receivers while the *Jensen Manufacturing Company* makes acoustic equipment, principally loudspeakers for radio, television, and other uses. Both companies are located in Chicago.

* * *

LEONARD G. TAGGART is the new director of purchasing for *Sylvania Electric Products, Inc.*

Mr. Taggart, who was formerly manager of purchasing for the company's Radio Tube Division, will establish a purchasing policy and coordinate purchasing activities of the Radio Tube, Lamp, Electronics, Fixture, Tungsten, and Chemicals Divisions, and the *Wabash Corporation.*

He started with the company in 1933 in the Engineering Specifications De-

partment, later becoming an assistant in the Production Planning Department of the Radio Tube Division, Production Planning Manager, and Manager of Purchasing.

He served in the Army from 1940 until 1946. He will make his headquarters at 500 Fifth Avenue, New York, New York.

* * *

DR. WILLIAM W. EATON has been named to the *Central Research Organization* of *Olin Industries, Inc.*

Dr. Eaton's appointment follows the recent formation of the new research organization which is designed to assure responsibility for the long range research activities of *Olin Industries, Inc.*

In his new position, Dr. Eaton will maintain his headquarters in the New Haven, Conn. offices of the company. In addition to the principal function of exploring new fields for possible future products, the *Central Research Organization* is also devoted to making basic research and studies in the field of scientific development. —30—

Synthetic Reverberation

(*Continued from page 69*)

ation desired. If the feedback is increased beyond a certain point a sustained oscillation will take place, which should be avoided.

The circuit conversion of Fig. 3 was designed so that as few changes as

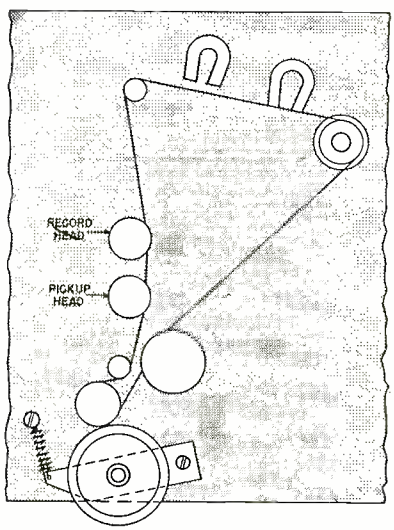


Fig. 5.

possible would be necessary in the recording amplifier. A more ideal mixing circuit is shown in Fig. 4 and may be used as a guide for those who would like to build a special unit for synthetic reverberation only.

REFERENCES

[1] *Wolf, S. K.; "The Synthetic Production and Control of Acoustic Phenomena by a Magnetic Recording System," Proceedings of the Institute of Radio Engineers, July, 1941.*

[2] *Hust, Lloyd B.; "Build Your Own Magnetic Tape Recorder," Radio News, February, 1948.*

—30—

Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO & TELEVISION NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

SOLDERING BOOKLET

A new approach to increased profits has been suggested to servicemen in the booklet "Keep Your Iron In The Fire" which *International Resistance Co.* is offering free of charge.

Published for servicemen, the booklet covers eight ways whereby more time can be devoted to actual soldering. This is based on the concept that the soldering iron is the basic tool of the radio industry and the more irons the serviceman keeps in operation the more sets he repairs with a subsequent increase in sales volume.

The booklet also points out that there is a definite relationship between the number of hours the soldering iron is in operation and the serviceman's income. The pamphlet contains no advertising and any serviceman can secure a free copy of the publication by writing *International Resistance Co.*, 401 N. Broad Street, Philadelphia 8, Pa.

BINDING POSTS

The Superior Electric Company of Bristol, Conn. is now offering a new pamphlet describing its 5-Way Binding Post.

The booklet outlines the five uses for which the binding posts are adaptable; permanent clamping, spade lug connection, plug-in for banana plugs, looping and clamping, and clip lead. In addition, electrical equipment illustrating these various applications is shown.

The binding posts have been rated at 30 amperes current capacity and 1000 volts working voltage. The posts are available in either red or black phenolic plastic for quick color reference and terminal or polarity discrimination.

Copies of the pamphlet, with prices and details, are available on request from *The Superior Electric Company*, 411 Hannon Avenue, Bristol, Conn.

IRC "PRECISTORS"

A new bulletin covering the company's line of "Precistors" is now available from *International Resistance Co.* of Philadelphia.

The data sheet provides application data, and specifications on the DCF and DCH units. The former has an over-all body size (including caps) of $1\frac{5}{16}$" long by $\frac{9}{32}$" in diameter, while the DCH units measure $2\frac{1}{16}$" long and $\frac{9}{32}$" in diameter.

The Deposited Carbon Resistors have been designed for close-tolerance applications and to overcome inherent inadequacies of conventional type resistors in many advanced electronic circuits. They are particularly suited for television circuits and similar applications.

For a copy of Bulletin B-4 giving complete data on the "Precistors," write to *International Resistance Co.*, 401 N. Broad Street, Philadelphia 8, Pa.

RMA BOOKLET

The Radio Manufacturers Association has recently announced the availability of a new publication "Classroom Radio Receivers" which was prepared by the RMA in cooperation with the Office of Education.

The report outlines the four factors which must be considered by any group contemplating the purchase of radio equipment for classroom use; first, the educational objectives of classroom audio activities; second, the specific broadcast programs that are or will be available for classroom use; third, the method of transmission (FM, AM, or short-wave) offering the desired programs; and finally, the type of classroom radio receivers needed to tune these programs.

The report amplifies each of these points and indicates possible solutions for the problem.

Single copies of the report "Classroom Radio Receivers" are available from Radio Manufacturers Association, 1317 F Street, N.W., Washington 4, D. C., or from the Radio Section, U. S. Office of Education, Washington 25, D. C. Prices on quantity orders will be supplied on request.

NEMA STANDARDS INDEX

The *National Electrical Manufacturers Association* has just issued an index covering a listing of standards on available products in the electrical, electronic, and radio fields.

Each of the standards are listed, numbered, and discussed briefly as to text and coverage. A price list, as well as ordering data, is also included with the index.

Requests for copies of the Standards Index should be addressed to *National Electrical Manufacturers Association*, 155 East 44th Street, New York 17, New York.

ALLIED-SHELDON CATALOGUE

Allied Electric Products, Inc. and its associated company, *Sheldon Electric Company, Inc.* have just issued a new, combined 24-page catalogue covering their complete lines.

Included in the catalogue are the *Sheldon* line of R-40 lamps; multi-purpose fluorescent starters for a.c., d.c., low temperature, adverse current and

ballast conditions; spring-action solderless contacts; cube taps, Continental and English type plug caps; and rectifier bulbs.

For a copy of Catalogue No. 150, write to *Allied Electric Products, Inc.*, 68-98 Coit Street, Irvington 11, New Jersey.

CONDENSED CATALOGUE

Alpha Metals, Inc. has issued a condensed catalogue of its products which is now available free of charge upon request.

This four-page publication features a comprehensive solder selection guide which lists the sixteen metals that are most frequently soldered. The pertinent information given about them includes their order of solderability together with recommendations for the best flux core solder or solder and flux suitable to soldering operations, and also for the flux type most desirable when an external flux is used. Other tables list the physical characteristics of the various solders which are manufactured by the company.

A copy of Catalogue No. 201 is available on request from *Alpha Metals, Inc.*, 363 Hudson Avenue, Brooklyn 1, New York.

B-A 1949 CATALOGUE

Burstein-Applebee Company of Kansas City, Missouri has recently released its catalogue No. 491 covering the 1949 line of radio and electronic equipment.

Included in this 130-page catalogue are radio receivers, television sets and accessories, record changers and equipment, all types of recording and playback equipment, intercoms, amplifiers, speakers, microphones, test equipment, tubes, replacement parts, antennas, ham equipment, tools, text books, as well as many other items needed by servicemen, hams, hobbyists, and industry.

A copy of the new Catalogue No. 491 for 1949 is available on request from *Burstein-Applebee Company*, 1012-14 McGee, Street, Kansas City 6, Missouri. Please be sure and specify Catalogue No. 491.

—30—

Bertram L. Lewis of the Rochester Technicians Guild presents a plaque to Howard W. Sams on behalf of Radio Technicians Guilds of America for "Outstanding Service and Cooperation in the Field of Radio Maintenance."

RADIO & TELEVISION NEWS·1948

INDEX TO VOLUMES 39-40

AUDIO

—30—

"TOWN MEETINGS" SET

TWO additional meetings in the current series of Town Meetings of Radio Technicians have been scheduled for Atlanta, Georgia and Los Angeles.

The conference in Atlanta is being held January 31 and February 1 and 2 at the Municipal Auditorium in that city. The meeting in the Roger Young Auditorium, Los Angeles will take place February 28 and March 1 and 2.

The Town Meetings are part of a national program designed to help the radio repairman in major television centers equip himself for television. The meetings have a double purpose, i.e., to make available to the repairman information which will permit him to manage his business more expertly and second to give him the latest and most authoritative information on television.

The meetings are sponsored by the Radio Parts Industry Coordinating Committee made up of members from the RMA, EP & EM, the Sales Managers Club, and the WCEMA. —30—

Classified

Rate 20c per word. Minimum 10 words

RADIO ENGINEERING

RADIO Engineering Broadcasting, Aviation and Police Radio, Servicing, Marine Operating and Electronics taught thoroughly. Expenses low. Write for catalog. Valparaiso Technical Institute. Dept. N., Valparaiso, Ind.

PANELS, dials, made to order. Gilpin, Box 638, R4, Mt. Clemens, Mich.

SALE

HEWLETT—Packard Audio Signal Generator Laboratory Standard Model 200c, 20-20,000 c.p.s. Factory price $150. My price $115. New original packing, $85 used-like new. Will send C.O.D. plus freight. BC 221 with Modulation and Calibration Book $75. Write William Grimm, 6546 Laurel Canyon, North Hollywood, Calif.

NEW cartoned tubes 39c each. 1A5gt, 1L4, 1R5, 1S5, 1T4, 3S4, 3V4, 5Y3gt, 6AJ5, 6AK5, 6AQ5, 6AQ6, 6AT6, 6BA6, 6BE6, 6BH6, 6BJ6, 6C5gt, 6J5gt, 6K6gt, 6SA7gt, 6SK7gt, 6SQ7gt, 6V6gt, 6X4, 7E5, 12AT6, 12BA6, 12BE6, 12A8gt, 12SL7gt, 25L6gt, 31, 32L7gt, 35B5, 35W4, 47, 50B5, 70L7gt, 80, 89, 117L7gt, 117P7gt, 117Z3. Write for bargain flyer. Henshaw Radio Supply, 3619 Troost, Kansas City 3, Mo.

RIDERS Manuals 6 through 14, like new, $100. H. Blackman, Lake Telemark, Rockaway, N. J.

FM, TV SERVICING speeded and smoothed. VHF alignment wand and instructions 60c. Hawkins Radio Company, 621 E. 31st St., Kansas City 3, Mo.

GRILL Cloth, Celanese, light and dark pieces. 1000 square inches for $1 bill. Write for list of lowest priced national brand parts in nation. Bursma Radio, Route 5, Grand Rapids, Mich.

LOWEST Prices. Radio Tubes, parts. Bargain lists, 3c. Potter, 1314 McGee, Kansas City 6, Mo

WRITE Dept. RN18 for our free wholesale list of Radio parts & accessories. R. C. Radio Parts & Distributing Co., 731 Central Ave., Kansas City 6, Kans.

HEARING Aids. Zeniths, others. All used but working. Make miniature transmitters or receivers. Complete with cords, ear piece, $20 ea. Shelby Instrument, 321 W. 7th, Long Beach, Calif.

LONG playing record Turntables, 33⅓ and 78 R.P.M., take 12" record. volume control, pickup input. Modify these high quality precision made, units for use with your record player. Regularly $49.50. Our price $4.99. Ask for bargain list Amplifier and Radio Parts. Mogull's, 68 W. 48th St., New York, (RN) New York 19. N. Y.

SOUND problems? Custom built amplifiers for recording, hifi phono, small modulators and experimental, write for details. For sale 725A Magnetrons $18.50; 723A/B Klystrons $5.50, postpaid. C. R. Mueller, 460 Utah St., San Francisco, Calif.

RECORD Changer parts for leading makes of changers. We invite mail orders! Ship everywhere. Friends, Wholesale Distributors, 9 N. 7th St., Philadelphia 6, Pa.

NEED 25B8 tubes? Complete replacement instructions, no socket changes, $1.00 postpaid. Witzel, 181 Cobb Terrace, Rochester 10, N. Y.

HALLICRAFTERS ARR7 (same as SX-28A). New condition. AC powered. $98. John Kirby, Box 264, Route 17, Indianapolis, Ind.

MOTOROLA 30-40MC. FM. 25W. Mobile Trans. & Rec. and 50W. Home Station Trans. & Rec. $298. John Kirby, Box 264, Route 17, Indianapolis, Ind.

PORTABLE Suitcase size Radio shop. Build it and be ready for ready cash. Carry it in your car and double your income. Write Grand Federal, Argentine Branch, Box 57N, Kansas City 3, Kan.

12B8 & 25B8 TUBES. Adapter unit using 2 miniature tubes (6AT6 & 6BA6 for 12B8, and 12AT6 & 12BA6 for 25B8). Takes less space than original tube, nothing else to buy, just plug in and it works. Money-back guarantee. 12B8 or 25B8 unit complete: $2.49 each. 10 units for $22.50. Send 25% deposit, balance C.O.D. Write for free parts catalog. Commercial Radio, 36 Brattle St., Boston, Mass.

SURPLUS Bargains, 274N Transmitters, Receivers, Dynamotors. Jan tubes, Amateur parts. Many other items. Write. Albert Arnold, Box 706, Amarillo, Tex.

GENERAL Radio 830.405 Lowpass Filters. Impedance 600 ohms, down 35DB at 9000, 20 at 7000, 5 at 5000, 1 at 3000. Limited quantity $5.00 each. John R. Lewis, 451 Park Ave., Collingswood, N. J.

AUTO Radio aerials, leads, connectors, vibrators, condensers, and speakers. Write for wholesale list parts and accessories. Auto Radio Engineering Service, 540 West Larned St., Detroit 26, Mich.

HAMS! Federal Radio Telegraph Transmitter BC 325. 600 Watts C.W. Phone bandswitching 1500 to 18000 KC. Air cooled, temperature controlled oscillator, modulation C.R. indicator, 813's final. 6 foot rack, $400. Must sell. Write, Walter Spiletic, 706 Hancock St., Brooklyn 33. N. Y.

TEST equipment, used. Dumont 5" 208 Scope. Hickock S-44 VTVM, Weston set analyzer, RCP multi-tester. For details, write Box 4096, New Orleans, La.

HIGH Voltage capacitors, quantities, nationally known brands; 1 M.F. 25,000 volts. Below surplus prices, inquire Box 474, c/o Radio & Television News, 185 N. Wabash Ave., Chicago 1, Ill.

VACUUM tube voltmeter, 6v input B supply, Selsyns, FM and TV servicing aid. Call letter plates with your call. Hawkins Radio Co., 621 E. 31st St., Kansas City 3, Mo.

AMPLIFIER Corporation's Model ACA-100 GE, Garrard RC 60 changer in mahogany cabinet, Jensen HNP 51 in blond 21,000 cubic inch cabinet. Excellent condition, cost $435. Best offer over $225. Leen's, Hyannis, Cape Cod, Mass.

COAXIAL Cable, identical characteristics as RG-58-U. Send dime for 3 foot sample. Satisfaction guaranteed. Harry H. Van Dick, Box 236, Little Falls, N. J.

INVENTORY Closeouts Surplus Electronics: J48 Telegraph keys 79c; CD-307 Headset Ext. Cords 69c; MR-9F Control Boxes, $7.95; Stupakoff 4½" Feed-thru Insulators 14c; New BC-221 Frequency Meters $74.50; MC-124 Flex. tuning shafts 64" at $3.00. 74" at $3.50, 118" at $4.50; MC-136 rt. angle drives 95c; 72" Loop Transmission cable for MN-26 $3.50; MP-37 Mast Bases $2.95. Write for listing of other closeouts; $5.00 min. order. 25% deposit, bal. C.O.D. Acousticraft Corp., 2144 S. Kedzie Ave., Chicago, Ill.

WANTED

TWO cases CS-128-A for SCR-300-A. Albert C. Steiner, Milford, Pa.

G. I. FLYER motor model 818 double field two speed: also Blue Flyer model E, contact W. Dacosta, Sound Dept., WOR, New York 18, N. Y.

WANTED: APR-5A, APR-4 Receivers and Tuning Units, Antennas, Radar Scanners, VHF-SHF Gear, Laboratory and Test Equipment of all types. Also quantity stocks of all types of surplus materials for marketing. Engineering Associates, Farhills Branch Box 29N, Dayton 9, Ohio.

SITUATIONS WANTED

SELECTED group of men, graduates of well-known trade school, desire employment in Radio Field. Will travel anywhere. Qualified in radio servicing, installation, test instruments, circuit operation, etc. Contact Placement Dept., Eastern Technical School, 888 Purchase Street, New Bedford, Mass.

CORRESPONDENCE COURSE

USED Correspondence Courses and Educational Books bought, sold, rented. Catalog free. Educational Exchange, Summerville, Ga.

USED Correspondence courses and books bought, sold, rented and exchanged. Catalog free. Lee Mountain, Pisgah, Alabama.

AMATEUR radio licenses. Complete code and theory preparation for passing amateur radio examinations. Home study courses. American Radio Institute, 101 West 63rd St., New York 23, N Y

HAM License! Got yours yet? If you find Morse Code difficult, write for Free Code Memorizing lesson, Dept. R, Otto Luther, New Preston, Conn.

HELP WANTED

INSTRUCTORS in Electronics and Radio. Prefer former Navy Radio Technician instructors willing to locate in the Detroit, Mich., area. Write to Box 452, % Radio & Television News, 185 N. Wabash, Chicago, Ill.

WANTED: Salesmen to sell Nationally Advertised Brand Radio Tubes to Dealers and Servicemen at liberal discounts. Good commissions paid. Box 475, % Radio & Television News, 185 N. Wabash Ave., Chicago 1, Ill.

MISCELLANEOUS

INDISPENSABLE to enthusiasts who wish to keep abreast with world radio advances. Britain's leading radio monthly, Practical Wireless, provides full reports and analyses of latest British-European developments. Read by amateurs and servicing experts throughout U. S. for authoritative constructional data, television features, advice and discussion columns, International Radio Trade development, etc. For annual subscription (12 issues mailed direct to your address from London) send only $2.00 to George Newnes Ltd., (PW/37), 342 Madison Ave., New York 17, N. Y.

RECORDING Studio. Complete with grand piano, office furniture, W.E. 25B speech input console, Presto 28-N dual recording table and 88-A amplifier, 3 mics (2-W.E. 639B and 1 RCA velocity), Altec 604 speaker, Browning FM-AM tuner, dual playback turntables with Pickering and G.E. pickups, and much miscellaneous equipment. Total floor space including office, control room and studio, approximately 950 sq. ft. Choice downtown location in large midwest city. Will be sold complete with one year lease. Write Box 472, c/o Radio & Television News, 185 N. Wabash Ave., Chicago 1, Ill.

REPAIR damaged finishes on radio cabinets, etc., such as: Gouges, scratches, mars, etc., with our complete finishing kit with instructions only, $7.95, prepaid in U. S. if money accompanies order. Mohawk Furniture Finishing Prods., 36 John St., Amsterdam, N. Y.

EXPERIMENTERS, beginners. "Radiobuilder" 12 issues. $1.00. Sample free. Laboratories, Eye-h, San Carlos, Calif.

ANTENNAS—Television made to your specifications. We also specialize in designing high gain arrays for fringe areas. Dealers in new T.V. areas. You need our "built to specs" arrays for superior performance. Center Television Co., 867 Broad St., Central Falls, R. I.

YOU can have 26 years radio experience at your fingertips. I've repaired over 45,000 radios. Have perfected simple, easy system anyone can follow step by step. No calculations, no formulas. Total price $2.00 postpaid or C.O.D. Money-back guarantee. Ross Radio, 14615-A Grandriver, Detroit 27, Mich.

SELL: Proceedings IRE volumes 13 through 18 complete in binders. Excellent condition. Best offer. Hubert Woods, 2625 Carlton Place, Riverside, Calif.

FREE Samples of QSL, SWL cards. WIHJI, Box 32, Manchester, N. H.

WE purchase Indianhead pennies. Complete all-coin catalogue, 10c. Roscoe Fairview, 277 Broadway, New York 7, N. Y.

RECEIVE mails, magazines, samples. Your name in numerous mailing lists, 10c. Rufus Greenwood, 273 Broadway, New York 7, N. Y.

RADIO Diagrams AM, 30c; SW & FM, 60c; Television $1.00. State manufacturer and model number. Kramer's Radio Service, 36 Columbus Ave., New York 23, N. Y.

PHONOGRAPH Records, 20c. Catalogue free. Paramount, N-313 East Market, Wilkes-Barre, Pa.

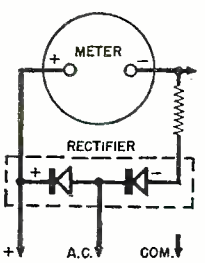
RADIOMEN, Servicemen, Beginners. Make more money, easily, quickly. $250 weekly possible. We show you how. Information free. Merit Products, 216-32R 132 Ave., Springfield Gardens 13, N. Y.

PATENT ATTORNEYS

LANCASTER, Allwine & 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.

ERRATA

In the article "Low-Cost Multimeter" appearing on page 100 of the November issue, there are two errors which should be corrected. The internal resistance of the Bradshaw Model 30 multitester should have been given as 50 ohms instead of the 500 ohms mentioned in the article. There is an error in the rectifier circuit in the circuit diagram. This correction should be made according to the appended diagram.



* * *

PHOTO CREDITS

Page	Credit
35, 36 (top)	Jensen Manufacturing Co.
37 (top), 140	The Minnesota Electronics Corporation
38, 96, 136 (top)	Radio Corporation of America
39 (bottom)	Radio Manufacturers Assn.
41	Western Electric Co.
44	Philco Corporation
45	Hudson-Ross Co.
54	Admiral Corporation
60	Tele-Tone Corporation
63	Radio Australia
96 (upper right)	Acme
104	Bendix Radio
108	Webster-Chicago Corporation
120	Hopwood, Laufman, Fomund & Cross
130, 136 (bottom)	General Electric Company
135	Station WBKB
142	National Electronic Distributors Assn.
148	Harry W. Smith, Inc.
158	Columbus Amateur Radio Assn.
167	Howard W. Sams & Co., Inc.

INDEX OF Advertisers

JAN. 1949

Technical BOOKS

"RADIO INDUSTRY RED BOOK" compiled by the Staff of Howard W. Sams & Co., Inc. Published by *Howard W. Sams & Co., Inc.,* Indianapolis. 446 pages. Price $3.95.

While a book of this type presents a real problem to the reviewer, there is no difficulty involved in evaluating this book in terms of the industry.

Since most radio servicemen are confronted daily with the problem of providing correct replacement parts for receivers on their test benches, this helping hand, in the form of a complete and authoritative handbook, should call forth loud huzzahs from the servicing fraternity.

The first edition of the "Red Book" covers receivers manufactured during the years 1938 through 1948. In preparing this manual seventeen companies cooperated with the Sams Staff in presenting up-to-date replacement parts information. Data has been supplied by *Aerovox, Astatic, Burgess, Clarostat, Cornell-Dubilier, Eveready, IRC, Jensen, Meissner, Merit, Quam-Nichols, Radiart, Solar, Sprague, Stancor, Sylvania,* and *Thordarson.*

The material is handled in this manner. The receiver manufacturer and model number appears in a column on the left hand page. Then information on the tube complement and dial light, capacitors, transformers, batteries, i.f. coils, phono cartridges, speakers, controls, and vibrators follows in orderly progression across the double page. The compilers have done an admirable job of supplying a lot of usable data in an easy-to-use yet compact form.

* * *

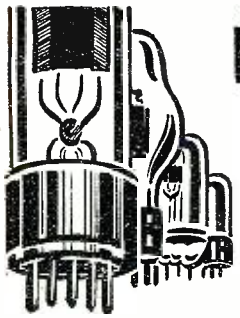
"MOST-OFTEN-NEEDED 1948 TELEVISION SERVICING INFORMATION" by M. N. Beitman. Published by *Supreme Publications,* Chicago. 144 pages. Price $3.00.

This servicing manual covers twelve of the most popular television receivers on the market today.

Each section covers circuit functions, a functional block diagram, a brief discussion of each section, alignment data, test equipment needed, response characteristics, a step-by-step alignment procedure, a troubleshooting chart, and a diagram of the receiver.

Included in the text is information about the *Admiral* Chassis 30A1; the *Belmont* Models 22A21 and 22AX22; the *DuMont* Model RA-103; the *Farnsworth* Model GV-260; the *General Electric* Model 803; *Hallicrafters* Models T-54 and 505; *Motorola* Model VT71, Chassis TS-4D; *Philco Corporation* Models 48-700, 48-1000, 48-1001, and 48-1050; *RCA* Model 8TS30; *Sonora* Model 700; and *Stromberg-Carlson* Model TV-12, Series 10-11.

The video serviceman should find this handbook of great assistance in handling the repair and adjustment of television receivers. —30—



TUBES

- TRANSMITTING
- RECEIVING
- INDUSTRIAL
- SPECIAL PURPOSE

Guaranteed by WELLS

Brand new, standard make tubes by the thousands are ready for immediate delivery at the lowest prices in our history. Check this list for exceptional values in magnetrons, cathode ray tubes, voltage regulators, transmitting tubes and also neon, pilot and flashlight bulbs. Be sure to order enough for future needs directly from this ad or through your local parts jobber.

Type	Price
01A	$0.50
1B22	5.55
1R4/1294	.85
2J22	14.85
2J31	14.85
2J32	14.85
2J38	18.95
2J48	16.55
2J158	9.95
5J23	14.85
5J29	14.95
2C26	.55
2C26A	.70
2C34	.46
2C44	1.25
2E22	1.35
2X2/879	.75
3C24/24G	.49
3AP1/906P1	2.75
3BP1	2.75
3CP1	2.75
3E29/829B	3.95
3FP7	2.95
3HP7	2.95
5AP1	3.75
5BP1	2.85
5BP4	3.95
5GP1	6.55
5HP4	5.95
12HP7	10.95
6A6	.90
6B7	.99
6C21	19.95
6H6	.52
6J5	.52
6SL7	.65
6U5/6G5	.70
7A7	.70
7C4/1203	.45
7H7	.75
7Q7	.70
10	.52
10Y	.55
12A6	.35
12C8	.35
12SH7	.45
REL21	3.65
FG17	2.95
30/VT67 } For Walkie	.95
33/VT33 } Talkies	.95
34	.35
RK34	.45
39/44	.34
41/VT51	.55
VT52/45SPEC	.55
46	.85
76	.55

Type	Price
77	$ .55
78	.55
83	.85
83V	.95
100R	3.45
EF50/VT250	.65
VR78	.68
VR90	.70
VR92	.65
VR105	.70
VR150	.70
VT127 ENGLISH	.35
VT127A TRIODE	2.55
211	.65
217C	5.95
218	4.45
282B	4.35
250R	7.85
304TH	6.55
304TL	.90
305A	12.45
305B	6.75
316A	.55
350A	2.75
350B	2.55
371A	2.55
371B	2.55
388A	6.45
417A	19.85
GL434	2.95
446A	1.55
446B	1.55
GL471A	2.95
481	4.50
WL530	24.95
WL531	19.95
532A	3.55
GL559	3.75
WL681	19.95
700B	9.95
700C	9.95
700D	9.95
702A	2.95
707B	23.25
708A	6.55
710A	2.15
714AY	9.95
715B	7.95
717A	.90
721A	3.95
721B	3.95
724B	4.25
725A	19.95
726A	19.95
726C	19.95
801A	.80
803	7.75

Type	Price
805	$5.75
807	1.20
810	7.95
813	7.85
814	3.75
826	.49
828	4.55
829B	3.95
830B	3.75
832	2.75
832A	3.50
837	1.25
838	3.25
841	.55
843	.55
860	2.55
861	34.50
864	.55
865	2.55
869	24.95
869B	28.95
872A	2.45
874	2.15
878	2.15
884	1.50
885	.85
930	1.10
954	.55
955	.55
956	.55
957	.55
1005	.45
2050	.75
1148	.40
1201/7ES	.95
1616	1.25

Type	Price
1619	$0.55
1624	1.25
1625	.45
1626	.45
1629	.45
1641/RK60	.65
2051	.95
7193	.35
8011	2.55
8012	4.35
8020	3.25
9001	.70
9002	.65
9003	.55
9004	.55
9006	.55
CEQ72	1.55
FG105	10.95
KU610	7.45
RK20A	4.95
12X825 2 AMP TUNGAR	2.95
RK34	.45
GL471A	.95
EF50	.70
HY615	1.25
704A	1.55
705A	2.15
707A	19.95

Neon Bulbs for Radio Use

NE-15 Price Ea	$0.06
NE-48	.24
NE-16	.24
NE-51	.06

Pilot and Flashlight Bulbs

STOCK NO.	MAZDA NO.	VOLTS	WATTS	BULB	BASE	EA. PRICE
350-40	64	6-8	E 3 CP	G-6	DC Bay	$0.07
350-50	1820	28	.1 Amp	T-3½	Min Bay	.12
350-31	57	12-16	1.5 CP	G4½	Min Bay	.08
350-42	Spec.	12	6 Watts	S-6	Cand Scr	.13
350-20	1446	12	.2 Amp	G-3½	Min Scr	.07
350-14	49	2	.06	T-3¼	Min Bay	.06
350-15	3S6	120	3 Watts	S-6	Can Bay	.11
348-22	PR-10	6	.5 Amp	B-3½	Min Flang	.05
350-18	1477	24	.17 Amp	T-3	Min Scr	.16
LB-101	323	3 (AIRCRAFT)		T-1½	953	.22
350-19	Proj. Bulb	120	500 W	T-20	Med Pf	1.45
LB-103	44 (Ruby)	6-8	.25 Amp	T-3½	Min Bay	.04
LB-102	1195	12-16	.50 CP	RP-11	DC Bay	.14
LB-104	313	28	.17 Amp	T-3½	Min Bay	.11
LB-105	1816	13	.33 Amp	T-3½	Min Bay	.12
LB-106	12A	12	.09 Amp 11	T-2	Tel Base	.18
LB-107	24-A2 W E	24	.75 Amp 105	T-2	Tel Base	.18
LB-108	S 14 ARGON	105	2½ Watt	Med	Screw	.22

Cut Out This Page for Ready Reference

Distributors: Our standard jobber arrangement applies. Order directly from this ad.

Manufacturers: Write for quantity prices.

WELLS SALES, INC.

320 N. LA SALLE ST., DEPT. R-1, CHICAGO 10, ILL.

The "TOP" Name In Automobile Aerials Now Brings You The "TOPS" In TV and FM ANTENNAS

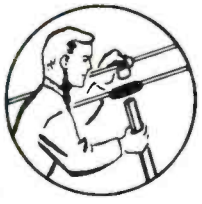
Radiart "Simpli-Flex"

STANDARD OF COMPARISON — RADIART

TELEVISION and FM ANTENNAS

True to Radiart tradition . . . these new Television and FM antennas are the finest available! They are laboratory engineered and designed to deliver peak performance, always! Their top quality construction will produce the finest television picture possible. For just a little more . . . YOU can deliver the best . . . it pays!

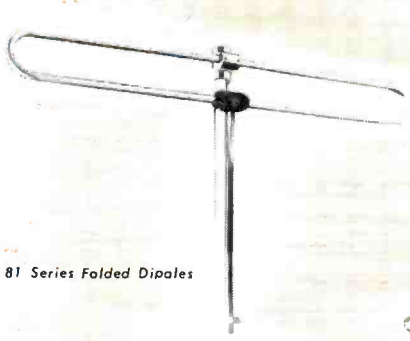
"SIMPLI-FLEX" means just what it says! SIMple to install . . . FLEXible for any requirement! Its design allows it to be built up from the basic dipole to multiple stacked all-channel arrays by the addition of reflector kits and additional arrays as required when more stations get on the air.



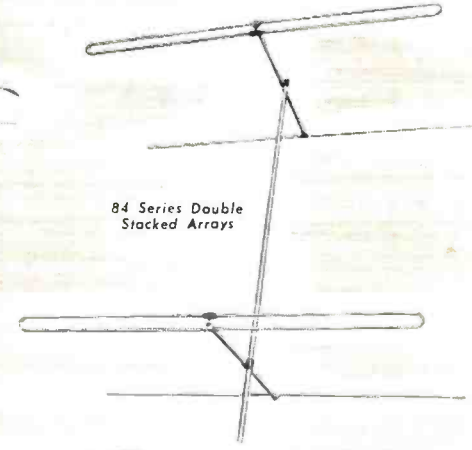
No "assembly puzzles" with Radiart's "SIMPLI-FLEX" design. No degree in engineering or truck-load of tools needed — absolutely no loose hardware. One minute assembly, one man installation!

High strength, well engineered design of more than ample safety factor, with simple, sturdy all aluminum castings, elements, and heat-treated support masts for PERMANENT installations.

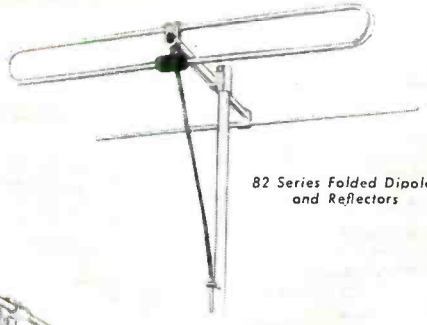
"WEATHER - SHIELD" polystyrene terminal block encloses lead-in connections and protects from all weather conditions! Keeps electrical performance at maximum.



81 Series Folded Dipoles

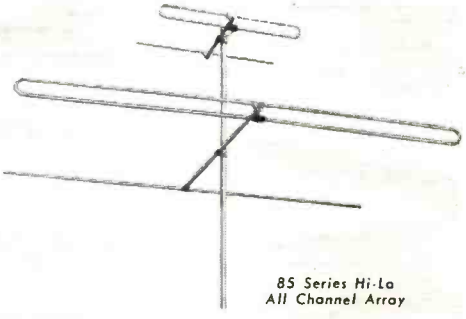


84 Series Double Stacked Arrays



82 Series Folded Dipoles and Reflectors

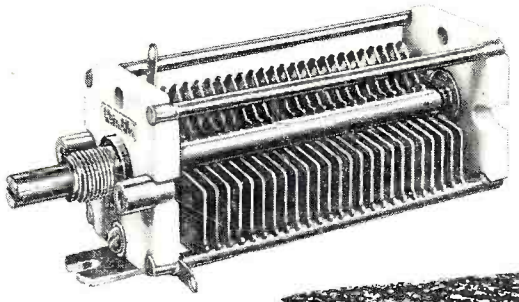
83 Series Turnstile Dipole — Non-directional FM Antenna



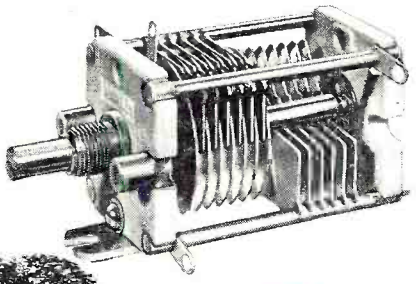
85 Series Hi-Lo All Channel Array

THE RADIART CORPORATION CLEVELAND 2 OHIO

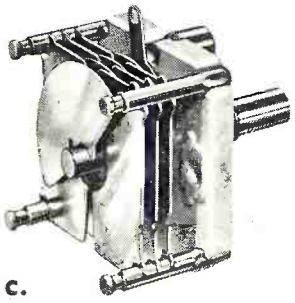
Manufacturers of the Famous "Red Seal" Vibrators



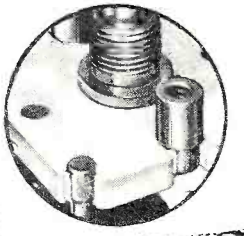
a.



b.

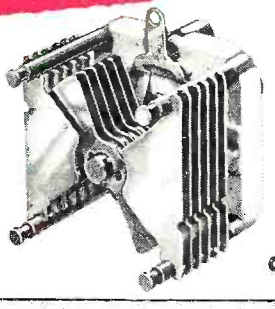


c.



CERAMIC SOLDERED . . .

FOR STABILITY AND STRENGTH



d.

Announcing the new JOHNSON 167 VARIABLES

BETTER FOR UHF - VHF - LF

With the introduction of this new line of air variables, JOHNSON brings you many important design advantages never before available.

Outstanding of these is the use of perfected ceramic soldering which assures absolute — and permanent — rigidity and strength, absolute — and permanent — maintenance of capacities!

There are no eyelets, nuts or screws to work loose, causing stator wobble and fluctuations in capacity. JOHNSON ceramic soldering leaves a bond which is stronger than the rugged steatite end plates themselves. There's nothing to come loose, because the stator terminals, mounting posts and rotor bearings are ceramic soldered!

Silent operation on the highest frequencies is assured with a split sleeve tension bearing that also prevents fluctuations in capacity.

These new variables are ideal for peak efficiency even under the severest conditions, such as portable — mobile operation. They are available in .030" and .080" spacings.

Two sets of stator contacts are provided for connecting components to either side of condenser without appreciably increasing inductance of the circuit. New bright alloy plating is used. It has high corrosion resistance, is easily soldered and possesses lower electrical resistance than other common platings.

These variables are available for all types of communications equipment having tuned circuits operating as high as 500 mc.

Features

1. Ceramic soldered for stability and strength
2. Soldered plate construction, heavy .020" plates, new bright alloy plating
3. Beryllium copper contact spring, silver plated
4. Split sleeve rotor bearings — no wobble to shaft
5. Steatite end plates
6. Long creepage paths
7. Low minimum capacity — maximum tuning range
8. Small size — end plate only 1⅜" square

Other capacities and spacings available on special order.

a. SINGLE SECTION VARIABLES

.030" Spacing

Cat. No.	Cap. Per Section Max.	Min.	Length Behind Panel
167-101	11	2.8	15/16
167-102	27	3.5	1-9/64
167-103	51	4.6	1-7/16
167-104	75	5.7	1-¾
167-151	99	6.8	2-7/32
167-152	202	11.6	3-33/64

Also Available In .080" Spacing

b. DUAL SECTION VARIABLES

.030" Spacing

Cat. No.	Cap. Per Section Max.	Min.	Length Behind Panel
167-501	27	3.5	1-13/16
167-502	51	4.6	2-27/64
167-503	99	6.8	3-⅝

Also Available In .080" Spacing

c. DIFFERENTIAL VARIABLES

.030" Spacing

Cat. No.	Cap. Per Section Max.	Min.	Length Behind Panel
167-301	11	2.8	15/16
167-302	27	3.5	1-9/64
167-303	51	4.6	1-7/16

Also Available In .080" Spacing

d. BUTTERFLY VARIABLES

.030" Spacing

Cat. No.	Cap. Per Section Max.	Min.	Length Behind Panel
167-201	10.5	2.8	1-3/64
167-202	26	4.3	1-7/16
167-203	51	6.5	1-15/16

Also Available In .080" Spacing

Write For NEW JOHNSON 167 VARIABLE CATALOG

JOHNSON • • • *a famous name in Radio!*

E. F. JOHNSON CO., WASECA, MINNESOTA