

OCTOBER 1948

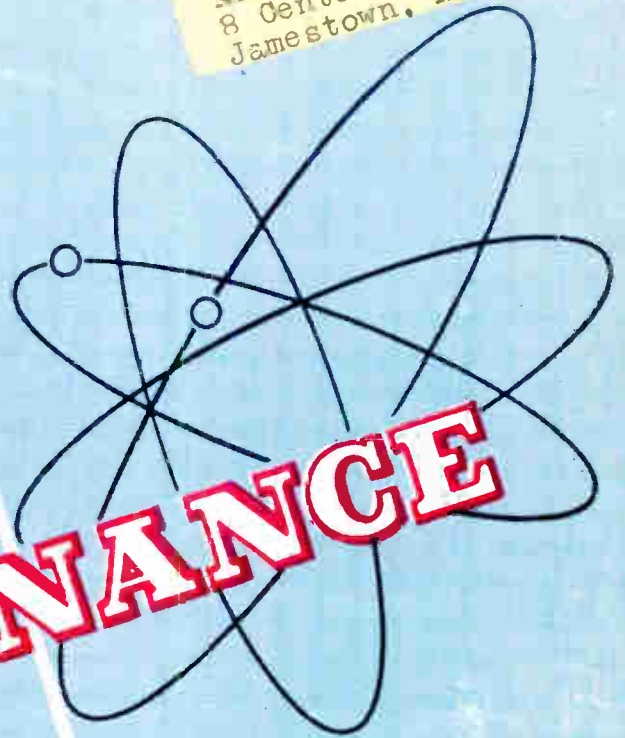
40 CENTS

EVERYTHING IN TELEVISION · RADIO · ELECTRONICS  
FOR THE RADIO SERVICE - TECHNICIAN

Frank Austin  
Austin Radio Service  
8 Center Street  
Jamestown, New York

# RADIO

# MAINTENANCE



NEW TV SIGNAL  
GENERATOR

TELE-PAD AND  
TEL-ADJUST

COIN OPERATED  
RADIOS

YEARLY SUBSCRIPTION \$3.00

BOLAND & BOYCE INC., PUBLISHERS MONTCLAIR, N. J.

World Radio History

DESIGNED FOR THE BETTER SERVICE SHOP...



RCA WO-55A General-Purpose Oscilloscope

## RCA's NEW OSCILLOSCOPE FOR TV, FM, and AM ... seventh unit of a revolutionary new line of matched test units.

The RCA WO-55A Oscilloscope is the latest addition to RCA's comprehensive line of matched test units specifically designed for modern TV, FM, and AM servicing. New engineering features make the WO-55A unusually versatile in its range of applications.

**Compact—Lightweight:** The use of RCA miniature tubes... plus a new, short-neck, 3-inch cathode ray tube... makes the WO-55A equally useful in shop or field.

**Voltage Measurements:** The voltage at any point on a waveform can be read directly on the graph screen. A built-in voltage source is provided for convenient calibration in r.m.s. or peak-to-peak values.

**Advanced Design:** The linearity of the sawtooth sweep is unusually good. The

sweep generator employs a vacuum-tube circuit which provides excellent stability at the higher sweep frequencies.

A line-frequency sinusoidal sweep is also available. It gives a linear frequency presentation upon the screen when a sinusoidal sweep generator is used for visual alignment.

Push-pull deflection is used in both vertical and horizontal channels, and full-screen deflection is obtained without overloading the amplifier.

The retractable light shield facilitates observation of waveforms under conditions of high ambient illumination.

See your RCA Test Equipment Distributor today for full technical details on the WO-55A, or write RCA, Commercial Engineering, Section JX59 Harrison, N. J.



Complete TV/FM/AM Service set-up  
with RCA matched test units

The new RCA WS-16A all-steel laboratory-type test rack accommodates a choice of any six matched RCA test units to meet individual service requirements. In addition to its display value and businesslike appearance, this rack facilitates use of the test instruments and speeds up service work. Plenty of chassis room below for on-the-spot testing... or any unit can be readily withdrawn for field use. Six units in illustrated rack provide complete TV/FM/AM servicing facilities.

See it at your RCA Test Equipment Distributor's



**RADIO CORPORATION of AMERICA**

**TEST AND MEASURING EQUIPMENT**

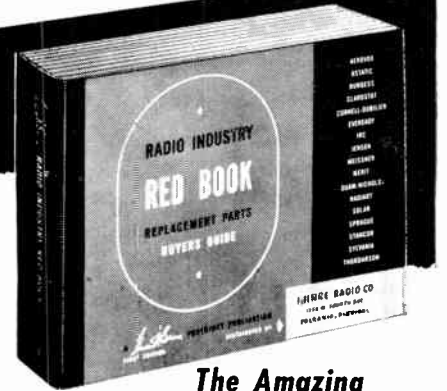
World Radio History

**HARRISON, N. J.**



# Thousands Switch to PHOTOFACT for Quicker, Easier, More Profitable Servicing!

Thousands of Radio Service Technicians are *right!* They've found the way to quicker, easier, more profitable servicing. Join these thousands of successful money-making Servicemen who have switched to PHOTOFACT Service Data. Learn for yourself how this accurate, easy-to-use, practical data saves you time, makes your work easier, helps you earn more. PHOTOFACT gives you 100% useful service data—every photograph, every diagram, every bit of information helps you do a *complete job*. You owe it to yourself to switch to PHOTOFACT. There'll be a big difference in the time you save and the bigger profits you'll earn every single working day.



## The Amazing Radio Industry **RED BOOK** Replacement Parts Buyer's Guide

NOW—stop wasteful hunting through dozens of incomplete parts manuals. The RED BOOK tells you 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 Coils (including Peak Frequencies), Speakers, Vibrators, Phonocartridges. *Plus*—Tube and Dial Light data for each receiver, and Battery replacement data. Get *all the right answers* in the RED BOOK. 440 pages, 8½ x 11; sewed binding. **ONLY \$3.95**



Your Price  
Each Volume,  
In DeLuxe Binder **\$18.39**

### PHOTOFACT VOLUMES The Preferred Service Data

Bring your file of post-war receiver Service Data right up to July, 1948! Here's the most accurate and complete radio data ever compiled—preferred and used daily by thousands of Radio Service Technicians. Includes: Exclusive Standard Notation Schematics; photo views keyed to parts lists and alignment data; complete parts listings and proper replacements; alignment, stage gain, circuit voltage and resistance analysis; coil resistances; record changer service data, etc. Order Volume 4 today—keep your Photofact library up-to-date—it's the *only* Radio Service Data that meets your *actual needs!*

- Vol. 4.** Covers models from Jan. 1, 1948 to July 1, 1948
- Vol. 3.** Covers models from July 1, 1947 to Jan. 1, 1948
- Vol. 2.** Covers models from Jan. 1, 1947 to July 1, 1947
- Vol. 1.** Covers all post-war models up to Jan. 1, 1947



#### 1947 Record Changer Manual

Nothing like it! Complete, accurate data on over 40 post-war models. Exclusive exploded views, photos from all angles. Gives full change cycle data, information on adjustments, service hints and kinks, complete parts lists. **PLUS**—for the first time—complete data on leading Wire, Ribbon, Tape and Paper Disc Recorders! 400 pages; hard cover; opens flat. Order now! **ONLY \$4.95**



#### Receiver 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, completely indexed. **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**



#### Subscribe Regularly to PHOTOFACT Folder Sets

Here's the most accurate and complete Radio Data ever compiled—issued regularly two sets per month. Keeps you right up-to-the-minute on all current receiver production. Packed with extra help—full PHOTOFACT data on Automatic Record Changers—communications receivers—amplifiers—*plus* new PHOTOFACT Television Folders—exclusive, uniform coverage of popular Television Models, data proved best by actual service clinic experience. Subscribe at your Jobber today, for regular monthly issues. **PER SET, ONLY \$1.50**

#### FREE Cumulative Index

Send for the FREE Cumulative Index to PHOTOFACT Folders covering *all* post-war receivers up to the present. You'll want this valuable reference guide to the Radio Service Data preferred and used by thousands. Helps you find the Folders you want quickly. Get this Index at your Jobber or write for it today.



### BOOST YOUR EARNING POWER!

Mail This Order Form

to HOWARD W. SAMS & CO., INC.  
2924 E. Washington St., Indianapolis 7, Indiana

My (check) (money order) for \$.....enclosed.

- Send the RED BOOK. \$3.95 per copy.
- Send PHOTOFACT Volumes in DeLuxe Binder:
  - Vol 4.  Vol. 3.  Vol. 2.  Vol. 1 (\$18.39 each).
  - Automatic Record Changer Manual, \$3.95.
  - Tube Placement Guide, \$1.25.
  - Dial Cord Stringing Guide, \$1.00.
  - Send FREE Photofact Cumulative Index.

Name.....

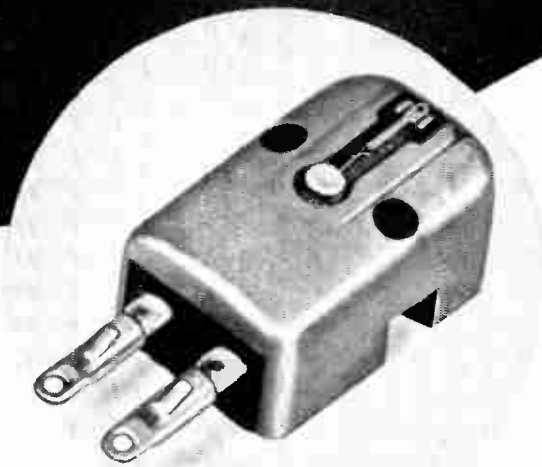
Address.....

City.....State.....

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

# It's here!

## The NEW General Electric Variable Reluctance Cartridge for Long Playing Records



- Specifically designed for the new long playing records...high compliance...low mass stylus assembly
- Equipped with 1 mil tip radius sapphire stylus
- Can be used with standard G-E preamplifiers

Place your order today!

*General Electric Company, Electronics Park,  
Syracuse, New York*

*You can put your confidence in —*

**GENERAL**  **ELECTRIC**

68-G10

# RADIO

# MAINTENANCE

INCLUDING  
ELECTRONIC  
MAINTENANCE



Volume 4

OCTOBER 1948

Number 10

## CONTENTS

I.F. Amplifiers and Limiters for FM In FM these sections are of special importance	J. Richard Johnson	8
New Television Signal Generator Here is the Hickok 610	J. B. Ledbetter	10
Tele-Pad and Tel-Adjust Aids for TV installation near transmitters	Alden Capen	12
Triode Frequency Converter Circuits Examination of a basic circuit	D. N. Parker	14
Coin-Operated Radios How one radio service outfit added a profitable sideline	Walter I. Fischman	15
The Industry Presents		16
Over the Bench		18
Electronically Speaking		22
Review of Trade Literature		24

**WILLIAM F. BOYCE**  
Publisher

**JOSEPH J. ROCHE**  
Editor

**VICTOR M. TURNER**  
Art Director

**STUART J. OSTEN**  
Midwestern Advertising  
Manager

**MARVIN H. ALBERT**  
Associate Editor

**THOMAS A. BYRNES**  
Director of Field Services  
and Quality Control

**MORTON SCHERAGA**  
Contributing Editor

**AL JOHNSTON**  
Circulation Manager

Midwestern Office  
228 No. La Salle St.  
Chicago 1, Ill.  
Dearborn 3587

Eastern Office  
460 Bloomfield Avenue  
Montclair, N. J.  
Montclair 2-7101

West Coast  
Swain Associates  
439 So. Wilton Place  
Los Angeles 5, Calif.  
Dunkirk 8-2248

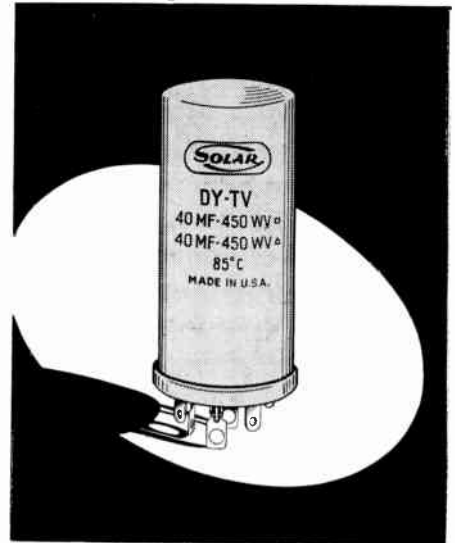
Copyright 1948, Boland & Boyce, Inc.

Radio Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S., Mexico, South and Central America, and U. S. possessions, \$3.00 for 1 year, \$5.00 for two years, single copies 40 cents; in Canada, \$3.50 for 1 year, \$6.00 for 2 years, single copies 45 cents; in British Empire, \$4.00 for 1 year, \$7.00 for 2 years, single copies 60 cents; all other foreign countries, \$5.00 for 1 year.

Entered as second class matter July 13, 1946, at Post Office, East Stroudsburg, Pa., under the Act of March 3, 1879.

Change of address: Four weeks' notice required for change of address. When ordering a change, please furnish an address stencil impression from a recent issue if you can. Address changes cannot be made without the old stencil as well as the new one.

# First again



# for radio men!

*This year—the same as every year  
—Solar is first to give television  
service men the most needed devel-  
opments in electrolytic capacitors.*

Keeping pace with the fast-moving television industry, SOLAR'S new Type DY-TV series dry electrolytic capacitors assure dependable operation under the severest demands of modern television... permit high temperature operation with no sacrifice in long life or electrical characteristics. Investigate SOLAR and you'll buy SOLAR next time—every time! Write today for catalog.

SOLAR CAPACITOR SALES CORP.  
NORTH BERGEN, NEW JERSEY



## TELEVISION ELECTROLYTICS



# RIGHT . . . . FOR SERVICING HOME RECEIVERS

## The New Replacement Line of Chicago Transformers & Reactors

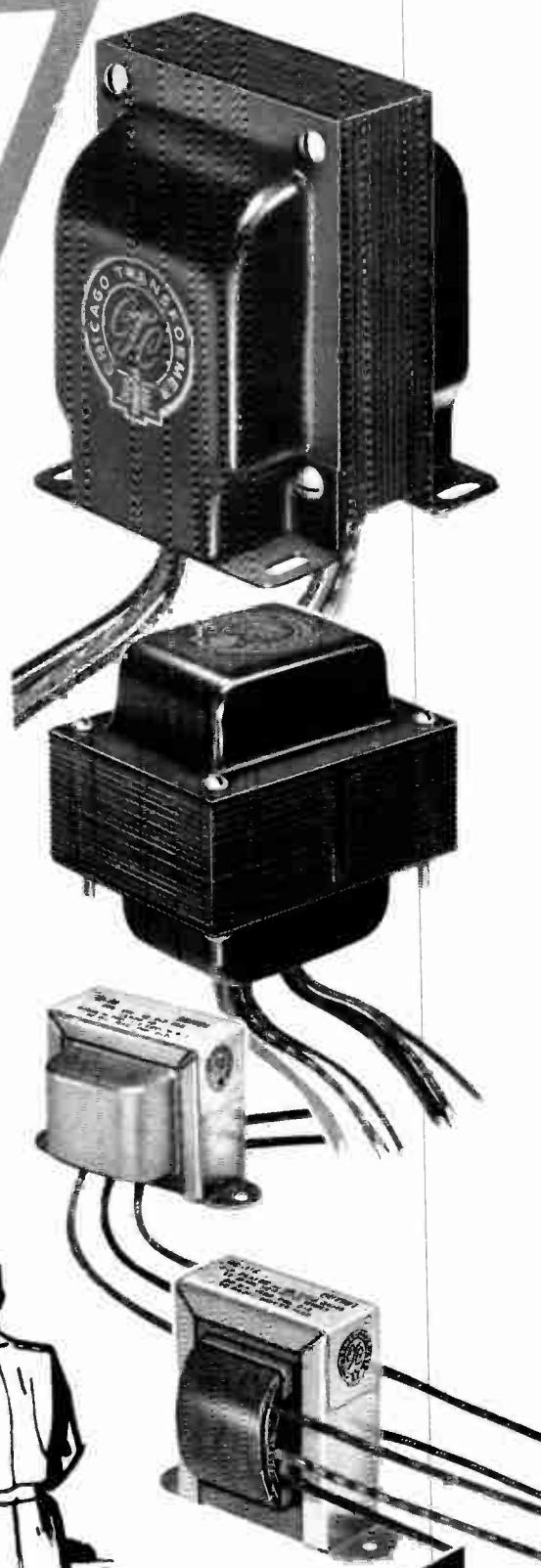
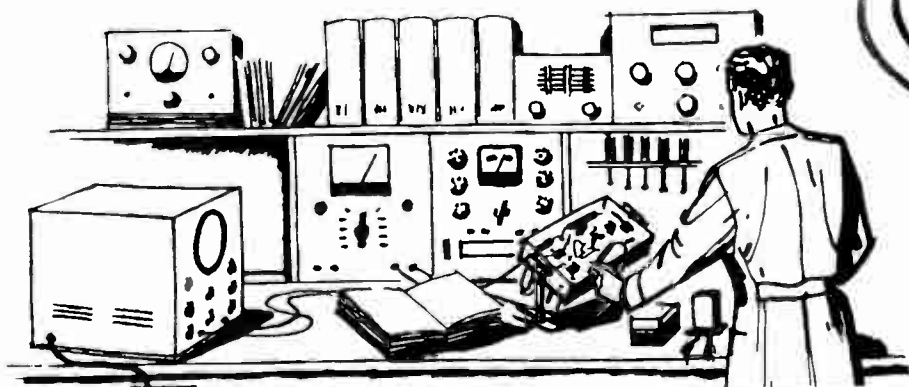
Now available in principal cities, this new replacement transformer line fits a wide range of the service man's most frequent power and audio requirements and fills, as well, the needs of the amateur and experimenter for efficient, standard-type ratings at low cost.

Here's transformer design and construction you can rely upon to give accurate, dependable performance. Every unit is backed by Chicago Transformer's reputation for quality . . . established in over 20 years of designing and producing original equipment transformers for the nation's leading set manufacturers.

RMA color-coded leads, tinned lead ends, and compact, standard-dimension mountings make for easy installation at the service bench. Included in the line are power transformers and chokes, filament, driver, speaker matching, interstage, and output transformers in a range of carefully chosen, practical ratings.

Ask for *Chicago Replacement Transformers* the next time you call or visit your parts jobber.

*In the meantime, WRITE FOR CATALOG*



# CHICAGO TRANSFORMER

DIVISION OF ESSEX WIRE CORPORATION

3501 ADDISON STREET • CHICAGO 18, ILLINOIS



TRADE MARK REG.

**DANGER  
HIGH  
VOLTAGE**

# SAFE..SIMPLE

**HIGH VOLTAGE TV Tests to 30,000 VOLTS**

WITH THE NEW

## PRECISION SERIES TV

**Super High Voltage Safety Test Probes**



- ★ Extended high dielectric anti-leakage paths.
- ★ Multi-channelled 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 via high compression contact springs.
- ★ Special helical film-type cartridge multiplier, developed specifically for very high potentials.
- ★ Custom molded polystyrene probe head, bakelite handle and barrier. Specially machined and tooled lucite internal components.
- ★ "Application Engineered" to meet the exacting requirements demanded by its intended field of usage.

NOW . . . the TV high voltage test problem solved with safety and operational confidence. A super high voltage test probe, "Application Engineered" for the job . . . tested on the job . . . approved for the job. Custom designed for YOUR safety FIRST, and providing the accuracy, dependability and reliability you expect from products bearing the "Precision" name.

★ Convenient (Tool-less) means for rapid removal and interchange of the special cartridge style high voltage tubular multiplier permits a single TV probe to be employed with more than one, high sensitivity, multi-range test set, via purchase of the appropriate cartridge.

Series TV High Voltage Test Probes are now on display at all leading radio parts distributors and are available as follows:

- |  |   |   |
|--|---|---|
| <p>★ <b>Series TVP</b><br/>High Voltage Test Probe LESS multiplier cartridge.<br/><br/>Net Price \$12.35</p> | <p>★ <b>Series TV-1</b><br/>Model TVP with cartridge for Precision Series EV-10VTVM.<br/><br/>Net Price \$15.45</p> | <p>★ <b>Series TV-2</b><br/>Model TVP with cartridge for Precision (or any) 20,000 ohms per volt test sets having a built-in 6000 volt DC range.<br/><br/>Net Price \$15.45</p> |
|--|---|---|

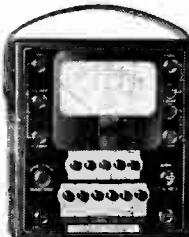
★ Stock value and special value multiplier cartridges are available to match most popular high sensitivity test sets.

Series TV High Voltage Test Probes provide direct kilovoltmeter facilities with your present high sensitivity test set, and vacuum tube voltmeter such as the "Precision" instruments illustrated below.

◆ See them on display at all leading radio equipment distributors along with the complete Precision line of modern electronic test instruments for all phases of AM-FM-TV service and maintenance. ◆



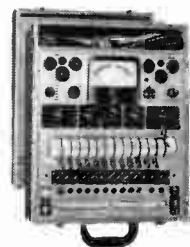
**Model 85**  
Laboratory Type 20,000 ohms per volt AC-DC test set. Full rotary range and function selection. 34 self-contained ranges to 6000 volts, 60 meg-ohms, 12 amperes, + 70 DB. 4½" full vision meter.  
Net Price \$38.75



**Model 858-L**  
20,000 ohms per volt Multi-Master, High Speed, Wide Range, push button operated AC-DC V-O-M. 54 ranges to 6000 volts, 600 meg-ohms, 12 amperes, + 70 DB. Full vision 4½" meter.  
Net Price \$54.10



**Model EV-10 MCP**  
Multi-range, high sensitivity, zero-center VTVM plus complete AC-DC V-O-M facilities to 6000 volts, 2000 megohms, 12 amperes, + 70 DB with extra large 7" meter.  
Net Price \$89.95



**Model 10-54-P**  
Combination Electronic Tube Tester, and 20,000 ohms per volt AC-DC V-O-M. Self-contained rotary selective ranges to 6000 volts, 12 amperes, 60 meg-ohms, + 70 DB. 4½" full vision meter.  
Net Price \$134.40

## PRECISION APPARATUS COMPANY, INC.

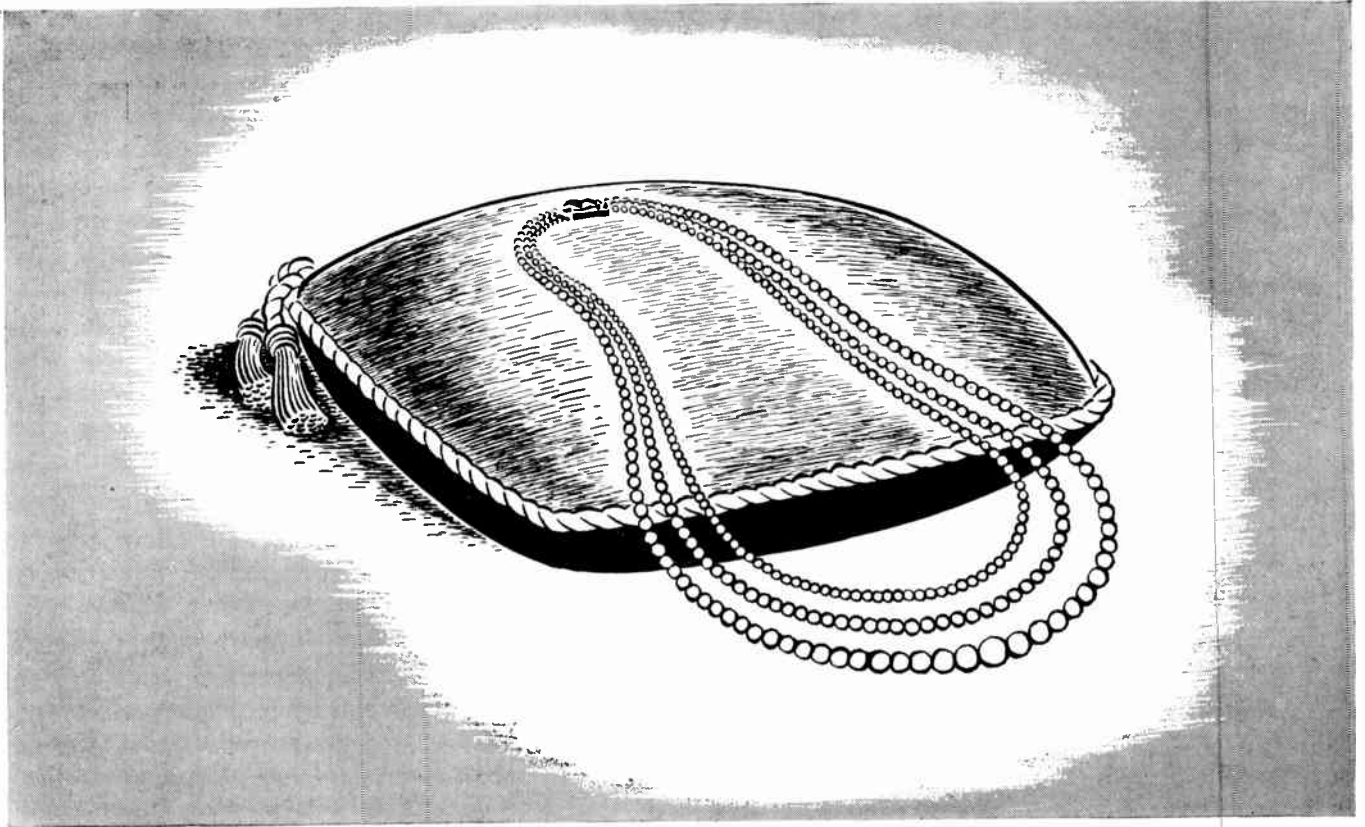
92-27 HORACE HARDING BOULEVARD

ELMHURST 5, NEW YORK

Export Division: 458 BROADWAY, NEW YORK CITY, U.S.A.

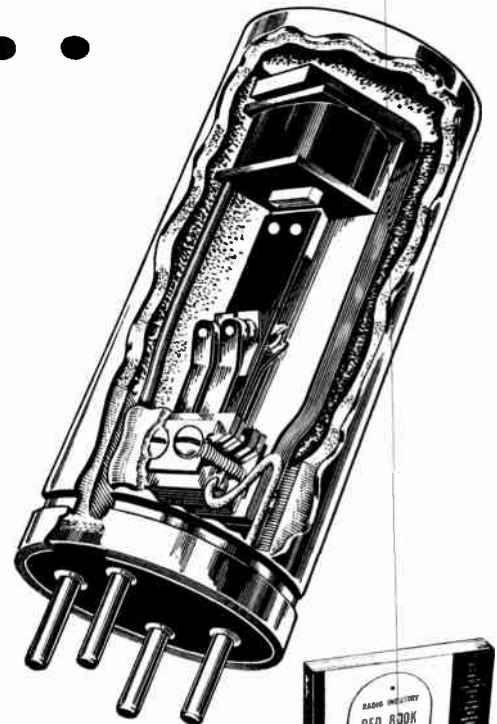
Cables: MORHANEX





# Quality . . . . .

The intangible beauty in a string of pearls that makes them more outstanding is the quality they naturally possess. And so it is in vibrators. The RADIART VIBRATOR is the peak of quality, not by mere chance, but because efforts have been made to make them, always, top quality! The RADIART VIBRATOR is a product of finest materials . . . expertly manufactured . . . and built up to a standard . . . not down to a price! That is why, Radiart means quality — that is why Radiart leads the field in sales . . . preferred everywhere by servicemen who choose to serve their customers needs best.



THE ONLY VIBRATOR LINE LISTED IN SAMS' RED BOOK



## The Radiart Corp.

CLEVELAND 2, OHIO  
EXPORT-SCHEEL INTERNATIONAL, 4237 N. LINCOLN AVE., CHICAGO 18, ILL.



# ONE OF THESE 5 WILL BEST FILL YOUR V.O.M. REQUIREMENTS



**MODEL 630.** Outstanding Features: (1) The new Triplett Molded Selector Switch with contacts fully enclosed . . . (2) Has Unit Construction with Resistor Shunts, Rectifier Batteries in molded base . . . (3) Provides direct connections without cabling . . . no chance for shorts . . . (4) Big easily read 5½" Red • Dot Lifetime Guaranteed Meter.

#### TECH DATA

D.C. VOLTS: 0.3-12-60-300-1200-6000, at 20,000 Ohms/Volt  
 A.C. VOLTS: 0.3-12-60-300-1200-6000, at 5,000 Ohms/Volt  
 D.C. MICROAMPERES: 0-60, at 250 Millivolts  
 D.C. MILLIAMPERES: 0-1-2-12-120, at 250 Millivolts  
 D.C. AMPERES: 0-12, at 250 Millivolts  
 OHMS: 0-1000-10,000, 4.4 Ohms at center scale on 1000 scale; 44 Ohms center scale on 10,000 range.  
 MEGOHMS: 0-1-100 (4400-440,000 at center scale).  
 DECIBELS: -30 to -4, -16, -30, -44, -56, -70.  
 OUTPUT: Condenser in series with A.C. Volt ranges.

**MODEL 630.** . . . . U.S.A. Dealer Net Price . . . . \$37.50  
 Leather Carrying Case, \$5.75. . . Adapter Probe for TV and High Voltage Extra.

**MODEL 666-HH.** This is a pocket-size tester that is a marvel of compactness and provides a complete miniature laboratory for D.C. and A.C. voltages, Direct Current and Resistance analyses. Equally at home in the laboratory, on the work bench or in the field . . . its versatility has labeled it the tester with a thousand uses . . . housed in molded case . . .

#### TECH DATA

D.C. VOLTS: 0-10-50-250-1000-5000, at 1,000 Ohms/Volt  
 A.C. VOLTS: 0-10-50-250-1000-5000, at 1,000 Ohms/Volt  
 D.C. MILLIAMPERES: 0-10-100-500, at 250 Millivolts  
 OHMS: 0-2,000-400,000, (12-2400 at center scale)

**MODEL 666-HH.** . . . U.S.A. Dealer Net Price . . . \$22.00  
 Leather Carrying Case, \$4.75.

**MODEL 625-NA.** This is the widest range laboratory-type instrument with long 5.6" mirrored scale to reduce parallax. Special film resistors provide greater stability on all ranges. Completely insulated molded case. Built by Triplett over a long period of time, it has thoroughly proved itself in laboratories all over the world.

#### TECH DATA

SIX D.C. VOLTS: 0-1-25-5-25-125-500-2500, at 20,000 Ohms/Volt  
 SIX D.C. VOLTS: 0-2.5-10-50-250-1000-5000, at 10,000 Ohms/Volt  
 SIX A.C. VOLTS: 0-2.5-10-50-250-1000-5000, at 10,000 Ohms/Volt  
 D.C. MICROAMPERES: 0-50, at 250 Millivolts  
 D.C. MILLIAMPERES: 0-1-10-100-1000, at 250 Millivolts  
 D.C. AMPERES: 0-10, at 250 Millivolts

OHMS: 0-2000-200,000, (12-1200 at center scale)  
 MEGOHMS: 0-40, (240,000 at center scale)  
 SIX DECIBELS RANGES: -30 +3.0, +15, +29, +43, +55, +69.  
 (Reference level "0" DB at 1.73 V. on 500-Ohm line.)  
 Six Output on A.C. Volts ranges.

**MODEL 625-NA.** . . . U.S.A. Dealer Net Price . . . \$45.00  
 Carrying Case, \$5.50. Accessories available on special order for extending ranges.

**MODEL 2405-A.** This instrument combines ultra sensitivity with a large 5¾" scale meter and is housed in a rugged metal case. . . It is furnished with hinged cover so that it can be used for service bench work or for portable field service. Gives A.C. Amperes readings to 10 Amps.

#### TECH DATA

D.C. VOLTS: 0-10-50-250-500-1000, at 20,000 Ohms/Volt  
 D.C. AMPERES: 0-10, at 250 Millivolts  
 D.C. MILLIAMPERES: 0-1-10-50-250, at 250 Millivolts  
 D.C. MICROAMPERES: 0-50, at 250 Millivolts  
 A.C. VOLTS: 0-10-50-250-500-1000 at 1000 Ohms/Volt  
 A.C. AMPERES: 0-0.5-1-5-10, at 1 Volt-Ampere  
 OHM-MEGOHMS: 0-4000-40,000 ohms—0-4-40 megohms (self-contained batteries)  
 OUTPUT: Condenser in series with A.C. Volt ranges  
 DECIBELS: -10 to +15, +29, +43, +49, +55. (Reference level "0" DB at 1.73 V. on 500-ohm line.)  
 CONDENSER TEST: Capacity check of paper condensers is possible by following data in instruction book.

**MODEL 2405-A.** . . . U.S.A. Dealer Net Price . . . \$59.75

**MODEL 2451.** Electronic Volt-Ohm-Mil-Ammeter . . . is easy to use in complicated testing . . . A must in F.M. and TV work in any sensitive circuit where low current drain is a factor . . .

#### TECH DATA

D.C.-A.C.-A.F. VOLTS: 0-2.5-10-50-250-500-1000  
 R.F. VOLTS: 0-2.5-10-50  
 D.C. MILLIAMPERES: 0-2.5-10-50-250-500-1000  
 OHMS: 0-1K-10K-100K  
 MEGOHMS: 0-1-10-100  
 INPUT IMPEDANCE: 11 Megohms on D.C. Volts.  
 4.8 Megohms on A.C.-R.F. Volts

**MODEL 2451.** . . . . U.S.A. Dealer Net Price . . . . \$76.50  
 External high-voltage probe available on special order. See the Triplett V.O.M. line at your local Radio Parts Distributor or write

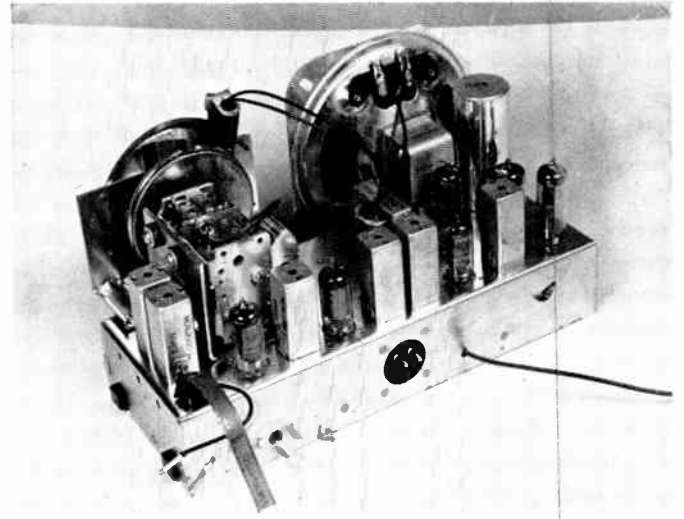
**TRIPLETT ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO, U.S.A.**

In Canada: Triplett Instruments of Canada, Georgetown, Ontario

*Precision first...to Last*



# I. F. AMPLIFIERS AND LIMITERS FOR FM RECEIVERS



by J. Richard Johnson

In FM receivers the i.f. amplifier and limiter sections are of special importance.

**A** KNOWLEDGE of the operation of the i.f. and limiter sections of the FM receiver is of primary importance to the service technician. It is in these sections that most of the amplification and the selection of the received signal occur. In addition, much of the improve-

ment of FM reception over AM reception results from proper operation of the limiter. Although the pass band width in kilocycles is greater in FM i.f. sections than in AM i.f. sections, the adjustments in alignment are even more critical in the FM receiver.

## I.F. Amplifier Requirements

Actually, the *relative* desired pass band width of the i.f. section of an FM receiver is not very great. It corresponds roughly to the band width of the i.f. section of a high fidelity AM broadcast receiver as shown in Fig. 1. As far as coil and amplifier design are concerned, band width must be considered on a percentage basis. A 200 kc. band width is allowed for FM reception. This band width is about 1.9% of the standard total FM i.f. of 10.7 Mc. This percentage corresponds to about a 9 kc. band width at the AM i.f. of 455 kc. A 9 kc. band width is about what might be expected of a high fidelity AM receiver.

Like the high fidelity AM i.f. section, the FM i.f. section must provide good "skirt" selectivity to prevent interference from adjacent r.f. channels, while simultaneously covering the complete 200 kc. band width. Fig. 2 compares the ideal characteristics and shows the interference possibilities of each type of i.f. section.

## The I.F. Signal

To avoid confusion, it is important that we distinguish between the intermediate frequency (which is a fixed value) and the frequency of the i.f. signal (which varies during modulation or frequency changes of the oscillator in the tuner section). Accordingly, we will refer to the standard, fixed intermediate frequency as *the i.f.* This frequency either follows the RMA standard value of 10.7 Mc. or has a value near it. When

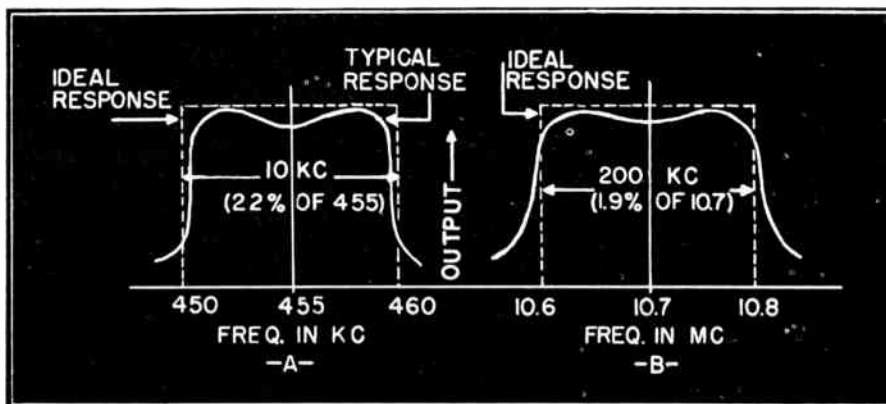


Fig. 1. Comparison of the response of a typical FM i.f. section with the response of a typical high fidelity AM receiver. (A) The high fidelity AM receiver. (B) The FM receiver. An ideal response curve in each case would be rectangular, as shown by the dotted lines.

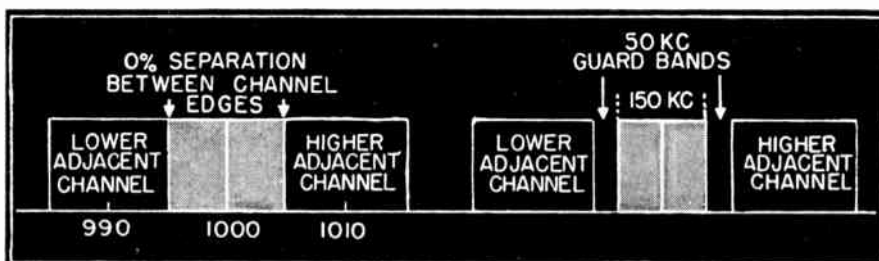


Fig. 2. Comparison between the problems of adjacent channel selectivity required for AM (A) and FM (B) receivers. If even the full 5000 cycle modulation frequency range is desired in the AM receiver, there must be no adjacent channel stations or they must be very weak. There is no "guard band" between the edges of the side bands. In the FM receiver (B), design is made slightly easier by the fact that a 200 kc. band width is allowed, although the FM stations do not normally have a deviation greater than  $\pm 75$  kc. A guard band of 50 kc. between channels is thus assured.



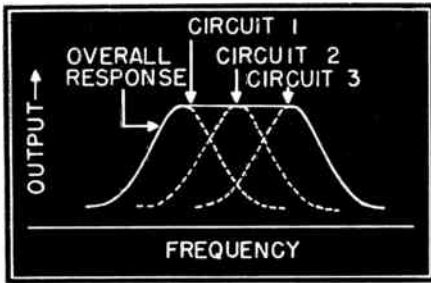


Fig. 3. How the individual circuit response curves combine to produce the desired overall response curve in a stagger tuned system.

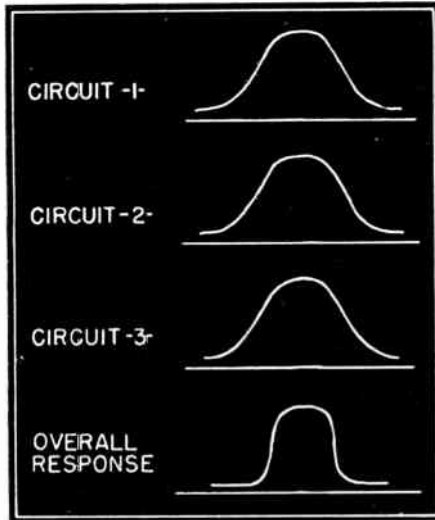


Fig. 4. In some receivers, resistance loaded and overcoupled stages, all tuned to the same intermediate frequency, are used. In this case, the individual response curves are relatively broad but combine to improve the skirt selectivity as shown here.

we refer to the beat signal amplified by the i.f. amplifier and produced by mixing of the oscillator and the incoming signals, we will use the term *i.f. signal*.

One of the important differences between AM and FM receivers is the interrelation among the oscillator frequency, the resonant frequency of the i.f. section (which should be the i.f.) and the resonant frequency of the detector section. In AM receivers the i.f. section can be peaked up to a frequency considerably different from the designated i.f. without serious distortion. If the difference is great, the tuning dial can be readjusted and stations are received normally, except that their position on the dial is different and tracking may be impaired.

In FM receivers, however, the discriminator or other detector is very carefully balanced at one particular frequency which should be the i.f. If the i.f. signal center frequency

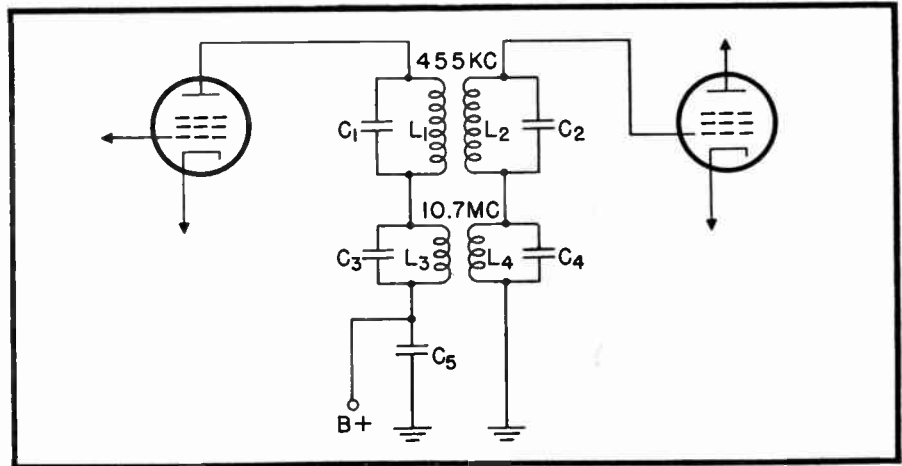


Fig. 5. Schematic diagram of the type of i-f transformer frequently found in combination AM-FM receivers.

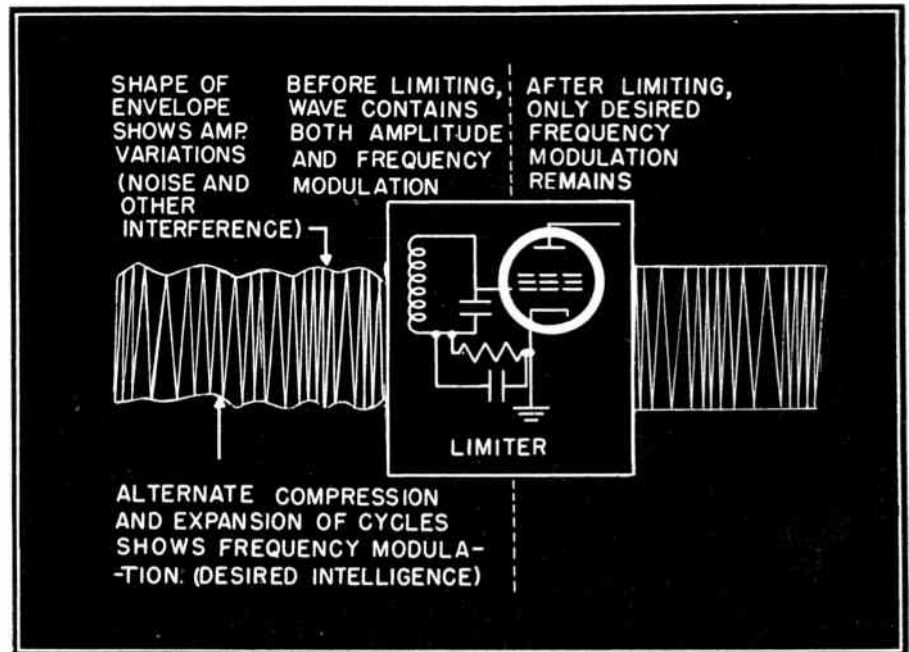


Fig. 6. The limiter "compresses" the amplitude of the intermediate frequency signal sufficiently to remove the superimposed amplitude modulation. This action does not interfere with the desired frequency modulation, which remains a part of the wave emerging from the limiter.

changes, even a relatively small amount, the detector becomes unbalanced and the a.f. output signal is distorted. Thus, if the i.f. section is aligned at, say, 11 Mc. instead of 10.7 Mc., readjustment of the heterodyne oscillator in the tuner to make the i.f. signal 11 Mc. will not produce proper reception because the detector will be out of balance. Further practical alignment attempts to balance the detector at 11 Mc. would change the deviation percentage of the signal and are therefore very bad practice.

Because of the above facts, the practice of tuning in a signal and then trimming up the i.f. circuits for maximum signal, while mildly suc-

cessful in AM receivers, is a very *unwise procedure* with FM receivers. The i.f. must be strictly adhered to in alignment.

### I.F. Coupling

As we pointed out earlier in this article, the pass band requirements of an FM receiver are similar to those of a high fidelity AM receiver with a 455 kc. i.f. Like the AM receiver i.f. section, it is desirable that the i.f. section of the FM receiver have a response that is flat on top and falls off rapidly at the edges. The tendency of the response to have a sharp drop at the sides is known as the

# NEW TELEVISION SIGNAL GENERATOR

by John B. Ledbetter



The Hickok 610 is a valuable addition to television servicing equipment.

**I**N most cases, AM and FM receivers can be aligned satisfactorily with only a signal generator and VTVM. Although a scope is of considerable value in checking distortion, i-f and discriminator alignment in FM receivers, it is not an absolutely essential item. In television alignment, however, the situation is quite different. Since the frequency response of video stages in television receivers must be uniform over an extremely wide band of frequencies (6.0 Mc.), a scope *must* be used, along with a television signal generator, in order to align each stage properly.

A television signal generator differs from the ordinary AM or FM generator in that it must cover all television i-f and r-f frequencies, in addition to the regular FM frequencies. It must also provide sufficient frequency deviation for alignment of wide-band video amplifiers. Some form of frequency markers must be included. These conditions are amply met by the Hickok Model 610 Universal Television Signal Generator.

This versatile instrument covers all television bands and intermediate frequency ranges, and provides frequency markers for checking the response curves and alignment sound

traps, video and sound strips, and discriminator circuits. Provisions also are included for insertion of external crystals for alignment of the receiver's local oscillator.

Main features of the Model 610 include: (1) Four FM ranges (0-40 Mc., 35-75 Mc., 75-115 Mc., and 150-230 Mc.) with adjustable sweep width, center frequency and output level. (2) Frequency deviation range of 0-15 Mc. (3) 60-cycle sweep. (4) Oscillating "pip" or absorption "dip" marker range from 20 to 30 Mc. (5) AM frequency range of 20-30 Mc. with variable output. (6) 400-cycle modulating frequency (at 50% modulation). (7) External marker frequency (1 Mc. to 250 Mc.); and (8) External crystal input. The r-f output voltage is continuously variable from 0 to 250 millivolts in multiplier steps of X1, X10, X100, X1,000 and X10,000. A phasing control is incorporated to compensate for possible shifting of the scope trace and retrace patterns. With the above features, pure r.f. or amplitude-modulated r.f. can be obtained for the alignment of sound traps. Crystal-controlled r.f., modulated or unmodulated, is also available for setting the receiver's local

oscillator to any of the 13 standard television channels, or for i-f alignment.

## FM Oscillator

It is interesting to note the method by which the necessary FM sweep frequency is obtained. A 6J6 twin triode, parallel-connected (V-1) is used as a Colpitts oscillator, and the inductance of its spiral-type tank coil is varied over the desired sweep range by a dynamic drive motor. The rapidly changing position of the dynamic-drive motor shaft produces a corresponding change in frequency of the tank inductance.

The sweep width can be controlled from 0 to 15 Mc. by varying the a-c motor control voltage. This is accomplished by varying the setting of R-22. The main tuning condenser C-3, tunes the oscillator through the 75-115 Mc. range.

## Fixed Oscillator

In addition to the center frequencies provided by the FM oscillator, a fixed oscillator, employing a 6AK6 Hartley (V-6), is operated at 75 Mc. When this oscillator is in operation, its 75 Mc. output beats against the variable output of the FM oscillator.



By taking the fundamentals, or first harmonics, of each oscillator and utilizing the sum or difference frequencies, full coverage and direct calibration of all television frequencies can be accomplished.

### Crystal-Controlled Oscillator

A Pierce oscillator, employing  $\frac{1}{2}$  6SN7 (V-7) can be used to adjust the receiver oscillator to the sound carrier of any local television channel or to provide for crystal marker frequencies. For operation, a crystal of the proper frequency is inserted in the front-panel socket; 400-cycle modulation is provided when desired by a fixed audio oscillator (V-4).

The output of this oscillator is fixed at 50% modulation for use in modulating the variable oscillator while making sound trap adjustments. (It might be noted that crystals are available from the factory for any frequency between 10 Mc. and 215 Mc.)

### Variable Marker Oscillator

The other half of the 6SN7 (V-7) is employed as a variable Colpitts oscillator tuning the 20 to 30 Mc. marker range. Since standard television i-f and trap frequencies fall within this band, an extremely large and well-calibrated dial is made possible.

The internal marker control may be set either to provide marker "pips"

(Fig. 1) or absorption "dips" (Fig. 2) of the response curve traced by the scope. By tuning the variable oscillator dial, the pip can be moved over the response curve until the dial reading represents the exact frequency of the curve at the pip position.

In some cases, the variable oscillator may heterodyne with some undesirable frequency and produce more than one marker on the response curve. This condition may be checked by switching a 1-megohm resistor into the circuit to stop oscillation. The tuned tank circuit will then absorb energy from the sweep generator and put a dip in the response curve at the frequency setting of the variable oscillator.

A 6J6, parallel-connected, (V-2), is used as a mixer for the FM and fixed oscillator outputs. Since the mixer output is fed to a 6AK5 cathode follower (V-3), the sweep originated by the generator is independent of the load on the low-impedance output.

### General Alignment Notes

Basically, alignment of all receivers follows the same pattern. Complete and detailed information on alignment of individual receivers usually is supplied by the manufacturer and should be followed to the letter. The following notes on general alignment procedure, however,

should help in giving a better picture of the various functions of the Hickok 610 Signal Generator.

First, it is absolutely necessary that a good ground be provided. Best results are obtained when a metal bench top is used. Efficiency of the ground system may be checked by touching any piece of equipment or lead wire. If the sweep pattern changes, a better ground should be used.

The recommended order of alignment is: (1) Television I-F Sound Traps, (2) Television Adjacent Channel Traps, (3) Television I-F Amplifiers, (4) Sound I-F Channel, (5) Television Receiver Oscillator, and (6) Television R-F Amplifier.

### Television I-F Sound Traps

Since the sound and picture frequencies beat against the same oscillator, the sound (4.5 Mc. from the picture) will pass through the video circuits and cause the picture to weave and bob along with variations in audio, unless sound traps are employed. These traps should be adjusted *before* video i-f alignment, to avoid upsetting the alignment.

### Television Adjacent Channel Traps

Although adjacent channels must be 75 miles apart, it is possible for sound from one channel to interfere

→ To page 34

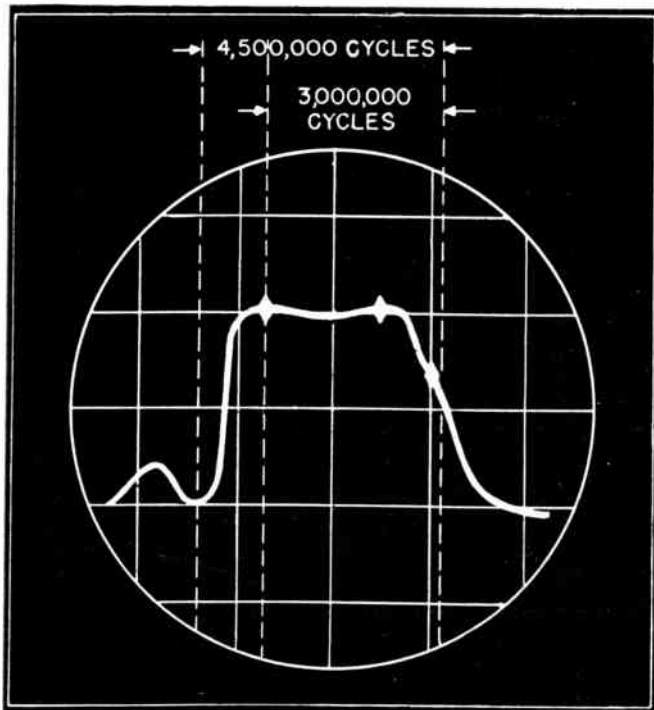


Fig. 1. TV i-f response curve with oscillator markers... "pips".

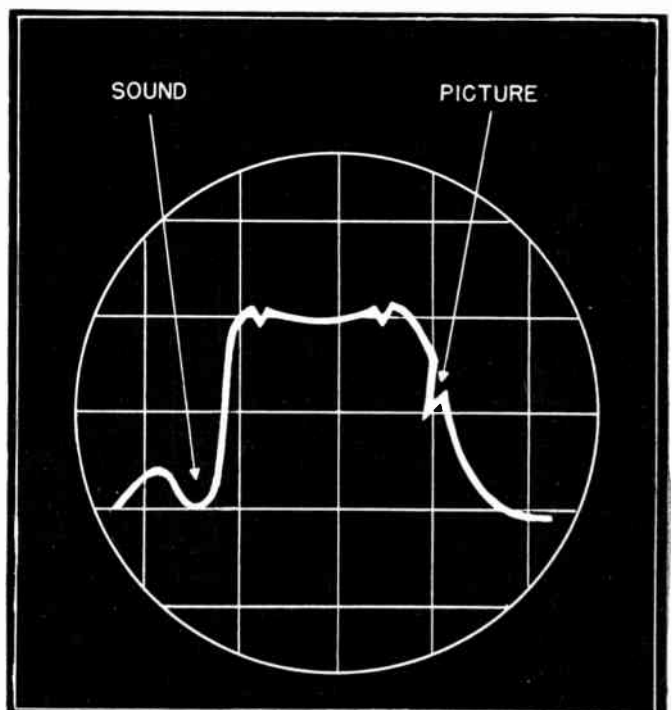


Fig. 2. Television i-f response curve with absorption markers.

# TELE-PAD AND TEL-ADJUST

Here are two units which are an aid in installing television near TV transmitters, where excessive signal strength must be reduced to avoid tearing, distortion and lack of detail in television pictures.

By ALDEN CAPEN



**M**ANY radio service technicians who have worked extensively with television find that sets installed very near to TV transmitters have reception difficulties as bothersome as installations in the "fringe" areas. These installations are so near to the transmitter that signals are too strong for proper control, and the television images are consequently distorted and vague.

Roger Television, Inc., has put two units on the market which do a great deal to help overcome this problem.

By nature, the human eye is a far more analytical instrument than the ear. Consequently, television picture aberrations are far more obvious than

their audio counterparts. For example, lack of high frequency response in an audio amplifier or radio receiver is generally overlooked by the customer. In fact, according to many a dealer, the fault is very often *demanded*. However, the same trouble, lack of high frequency response, shows up in a television set as lack of detail, and is usually cause for returned receivers and profit-wasting service calls.

Foggy reception of one or two stations on a broadcast set, such as may be caused by an overloaded r-f stage, is rarely sufficient cause for calling in a serviceman. The corresponding trouble in television, however, turns

up as torn pictures, and is utterly unacceptable to the television set owner.

Similarly, a slight phase-shift in a received signal may be entirely ignored by a radio listener, while the television audience may react strongly to the same trouble showing up as either a ghost or smearing pictures. A barely audible interfering signal becomes a very annoying screen pattern; unnoticed tube noises become snow on the screen; and the slight clicking of a passing vehicle's ignition will blot out parts of a television image.

Because of the perfection required of a television signal, the entire installation must be arranged to give

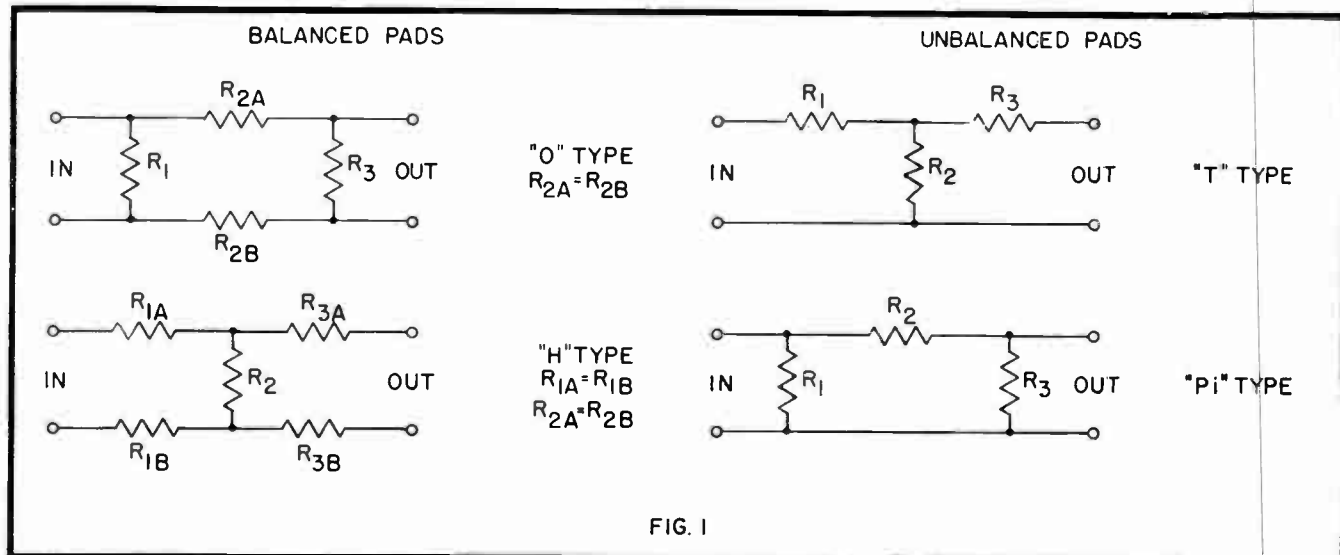


FIG. 1



“personal” attention to each and every desired station. Thus the need arises for an *individualized* installation rather than the usual compromise arrangement.

One of the faults very often overlooked by a television installer is characterized by tearing, distortion, mottling and lack of detail, all of which can be due to excessive signal strength.

Signals which are not quite strong enough to cause tearing will often cause vertical bending or distortion. The basic reason is the same as that which causes tearing, being different only in degree.

Together with, or separate from, the tearing and bending, there may be tone distortions which show up as mottled patches and lack of detail. This is due to the distortion of the video portion of the composite signal, which takes place at the same time the synchronization pulse is distorted.

To prevent these effects, among others, the television receiver is equipped with a contrast control, and often with automatic gain control. This circuit, however, is always designed to cut down overall gain by reducing amplification in several stages simultaneously. Therefore, an extremely strong signal may overload the first r-f stage before the contrast or gain control can be of help. The result on the screen may be the puzzling situation of a light, thin picture which is nevertheless splotchy, bending, torn or otherwise distorted.

### Tel-Adjust

Obviously then, until means are provided in television receivers to reduce signal strength before the first stage is reached, this must be done by the installing serviceman. Preferably,

the work should be done without the need to remove or rewire the chassis. This can be accomplished by the use of an external switching and signal equalizing box, installed in the antenna's transmission line. One commercially available unit of this type, in kit form, is the Tel-Adjust.

Basically, the Tel-Adjust is a low-loss switch in an enameled black steel can with colored aluminum cover, arranged for mounting to the side of the receiver or to the window sill. Provision is made to install fixed attenuation pads consisting of several carbon  $\frac{1}{2}w$  resistors inside the box. By making use of the switch, a choice of several attenuation values are possible, and each station's signal may be attenuated by the proper amount, even though the strength may vary greatly.

Several types of fixed pad arrangements will accomplish the same results. For balanced lines, however, such as 300 ohm twinlead, a balanced attenuation network is preferred, such as the “O” and “H” types shown in Fig. 1.

On the other hand, when coaxial transmission line carries the signal from the antenna to the receiver, an unbalanced pad is sufficient, and cheaper to install. Examples are the “T” and “Pi” types, Fig. 1.

In order to install these equalizing pads, however, two things must be known: (a) How much attenuation is needed, (b) the resistance values which will produce exactly the needed attenuation without upsetting the impedance values of the receiver and transmission line system.

### Tele-Pad

The only practical method of determining the amount of attenuation needed to prevent overloading, tear-

ing and distortion, is to insert a variable pad box into the transmission line close to the receiver, and to vary it until the trouble is eliminated.

This variable pad box should have a constant impedance equal to that of the transmission line, whatever it may be, and fairly accurate calibration at television frequencies. In addition, low-loss components are desirable, to keep down the insertion loss at “zero” attenuation position. A unit of this type, employing ceramic switches with silver plated components, is the Tele-Pad. Its etched, calibrated dial reads to 30 db attenuation in steps of 3 db.

Experimentally determining the amount of attenuation needed on each overloading station is the first step. The next is to achieve this attenuation without sacrificing impedance matching, which would create standing waves in the line, and therefore ghosts on the picture.

Fortunately, most receivers utilize either 300 ohm or 72 ohm transmission line and receiver input impedances, and the complicated formulas and figuring can be reduced to table form, as in the case of the detailed charts which accompany the Tele-Pad and Tel-Adjust. Some of these values, together with proper circuits, are shown in Fig. 2.

The use of a switch for equalizing purposes permits of another step towards better and clearer pictures—the elimination or suppression of ghosts and interference. While some other means of eliminating these faults have been attempted, the basic and reliable approach is via the use of highly directional dipoles with multi-element parasitic arrays. If care is taken to choose a very highly directional beam antenna, most interfering signals can be dodged out completely by slowly orienting the antenna in both vertical and horizontal directions for best signal versus weakest interference.

Obviously, however, the best direction for pointing the beam on one station's signal must be altogether different for another station. Therefore, if two or more stations have this trouble, it will usually be found worthwhile to install two or more dipole arrays, connected through separate transmission lines, and a Tel-Adjust to the receiver's input terminal.

DB Attenuation	300 ohm impedance 'O' pad			72 ohm impedance 'Pi' pad		
	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>
6	1000	100	1000	150	100	150
12	470	300	470	100	220	100
18	390	560	390	82	470	82
24	330	1000	330	---	---	---
30	310	2200	310	---	---	---

(all 'R' values are in ohms)

FIG. 2

# TRIODE FREQUENCY CONVERTER CIRCUITS

by D. N. Parker

A clear understanding of the operation of the basic circuits is necessary for efficient servicing. Here is an examination of one of these basic circuits.

**F**OR operation at higher frequencies (around 100 megacycles), triode tubes have been devised which possess certain advantages over the multi-element tubes customarily used as mixers or frequency converters.

Dual triodes have the advantage that one tube can serve as both oscillator and mixer with resulting economy of current drain and initial cost. Dual tubes of the 6J6, 7F8 and XX7 types have been specifically designed for optimum performance at higher frequencies, such as encountered in FM and TV receivers.

The triode provides a much lower mixer gain at standard broadcast frequencies than the conventional multi-element tubes. For this reason, many FM-AM combinations use two mixer circuits, a triode for FM and a pentode for AM. However, r.f. and i.f. circuit gains using a triode mixer are greater at broadcast frequencies, and a satisfactory overall result is possible with careful design.

One of the major factors governing the ultimate sensitivity of a radio receiver is the inherent circuit and tube noise in the early portions of the circuit. Obviously, a receiver will not respond to a signal having an intensity less than the noise generated within the set itself. For best results, the inherent noise in the front end of the set should be about 1/3 of the minimum signal to be received. In the design of the triode tubes mentioned, the inherent grid noise has been reduced to a minimum. The loading effect of these triodes on the tuned circuit connected to the grid is small, so that the selectivity and "Q" of the circuit are not badly affected by the tube in this type of mixer circuit.

The oscillator and mixer stages of the recent Montgomery-Ward Model No. 74WG-2705A are shown in the partial schematic diagram, Fig. 1. Due to the fact that the 6J6 tube used has a common cathode, the bottom portion of the oscillator coil is used as a "tickler" to couple the

oscillator signal into the mixer section of the tube. Both the oscillator and the mixer grid returns share the path through the lower section of the oscillator coil to the cathode. Good design practice dictates that the portion of the coil devoted to the "tickler" function be made as small as possible. Frequency drift in this circuit with tube warm-up is fairly small. Maximum coupling of the "tickler" coil to the oscillator tank

coil is, of course, also achieved in this circuit.

The mixer is biased by means of the 100,000 ohm grid leak, which functions to regulate automatically the conversion gain with changes in the oscillator injection voltage. The oscillator injection voltage is rectified by the mixer grid and develops a d.c. bias proportional to the magnitude of the injection voltage. The oscillator

→ To page 38

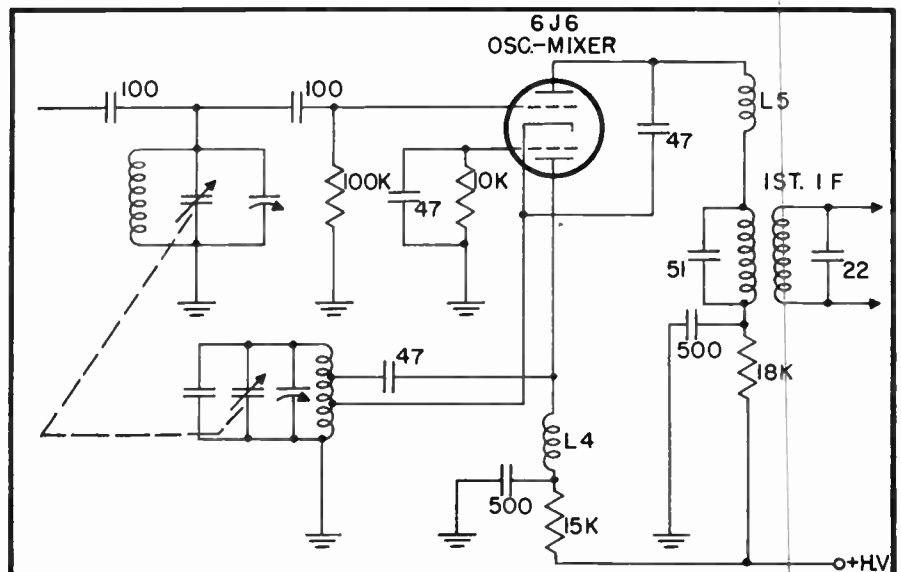


Fig. 1. Oscillator-Mixer stages of Montgomery-Ward Model 74WG-2705A.

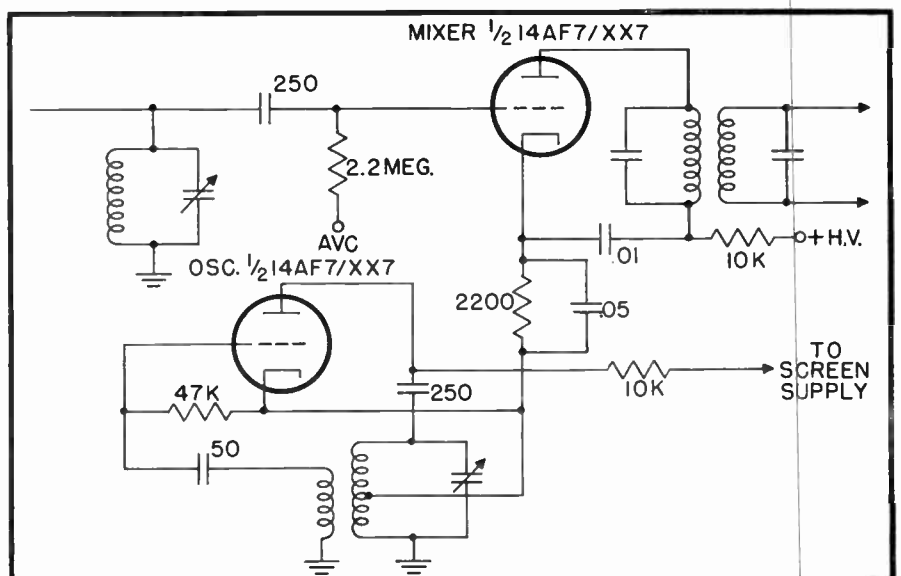


Fig. 2. Oscillator-Mixer stages of Philco Model 46-427.



# COIN-OPERATED RADIOS

by W. I. Fischman

Here is how one radio service outfit has added a profitable sideline to its business.

**T**AKE a coin operated radio. Put in a quarter and it will play for two hours. In Philadelphia, two men are able to go about their jobs while quarters pile up in three hundred of their coin operated sets all over the surrounding section.

The two men are Robert Klein and Art Lipschutz, and both consider their coin-operated business part-time work. Art, who services these radios, owns and runs "Art's Radio Shop," handling neighborhood radio servicing and specializing in the repairing of auto radios. Bob Kline is a full time salesman and, like Art, handles the route on the side.

Their company had its inception in May 1946, with the purchase of 25 coin-operated sets. The public response was excellent, and two weeks later they invested in 50 more, followed by a purchase of another 50 a few weeks after that. Fifty more sets a couple of months later completed their stock for a year.

At first, the response was amazing. "It can't stay this good . . . it's bound to slump," they thought. It did slump but, to their delight, the slump did not come close to hitting bottom. After the initial novelty had worn off, the financial returns from each location leveled off to a modest but steady sum that shows almost no seasonal variation.

## Location

A bit of experimentation was necessary to determine the best locations for sets. They did not work out in the better hotels. Such places provide a cocktail lounge, a night club and other diversions for guests. In second and third rate hotels, however, the quarters really mounted up. In such hotels, entertainment facilities are limited. Tourist cabins also provided an excellent outlet. No single sets (outside of those for test purposes) were installed. Everything was done on a concentrated mass basis . . . a hotel . . . a set of tourist cabins, so that collection could be made swiftly.

When a hotel is sold on the idea of a coin-operated radio installation (and they are approved by the Hotel Association), a test setup is made. Radios are put in representative locations. If the response is good more sets are added, until the location's saturation point is reached. Art and Bob operate on a three year contract with their locations. This insures expenses and a reasonable profit on an installation. The hotel or tourist cabin gets 25% of the gross take and stands absolutely no expense or trouble. Art and Bob provide the machines, install them, service them, and make regular collection rounds.

The radios are set to play either

one or two hours for a quarter, depending on the location. Bob Kline figures that each set is played an absolute minimum of one hour out of each day. This means a minimum gross of 25 cents a day, or \$1.75 each week. After the hotel takes its cut, approximately \$1.37 remains. The cost of maintenance and collection funnels this down to a net of about \$1.10 each week for each machine.

## Servicing

Collections are not much of a problem for, barring breakdowns, the radios can go as long as a month without needing attention. Two days every few weeks are used to make the rounds collecting and servicing. In the car they carry a volt ohmeter and several sets of spare tubes, which are quicker to use and easier to carry than a tube checker.

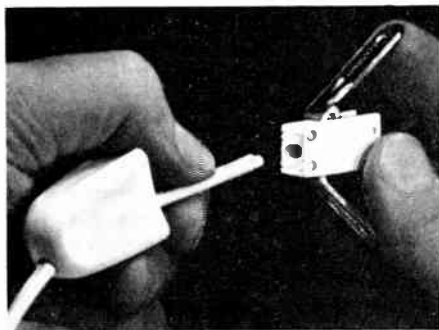
A large portion of the service consists of prying match sticks, hair pins and odd bits of paper out of the coin slot. Bad tubes are replaced and minor repairs made on the spot, but sets that need extensive service work are replaced with a spare and the faulty radio brought back to the shop. Out of the 300 sets, only 5 or 6 are brought back to the shop each collection round. Half of these

→ To page 36



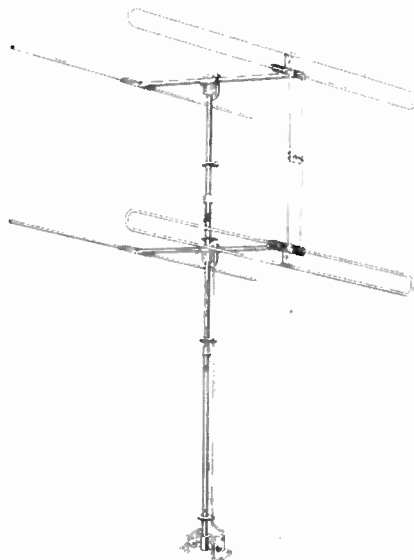
Besides restaurants, coin-operated radios may be profitably installed in hospitals, beauty parlors (with special earphones), etc.

# THE INDUSTRY PRESENTS



## LIFETIME AUTOMATIC PLUG

A new type Lifetime Automatic Attachment Plug Cap, which requires no stripping or slitting, is being manufactured by the Academy Electrical Products Corp., 4849 Broadway, New York 34, N. Y. The plug is molded of durable Plaskon and comes in a wide variety of modern pastel colors. No screws, soldering or crimping is used to attach the plug. Connection is automatically accomplished by metal points incorporated in swingable blades. These points pierce insulation of individual conductors and make electrical contact. It is very well made, and only seconds are required to assemble it completely.



## TV ANTENNAS

Many gains in television reception have been made possible by the tests of the Research Laboratories of the Ward Products Corporation, 1523 East 45th Street, Cleveland 3, Ohio. Under the direction of Jim

Finneburgh, Chief Engineer, Ward has developed their new Model TV S-6 stacked array, many times more powerful for TV reception in remote installations and poor signal locations. The strong signal pick-up of the Ward TV S-6 is accomplished by stacking two of their finest antennas, one above the other with correct half-wave spacing. An ingenious method of allowing complete adjustability for orienting, even though bays are stacked, has also been engineered. Pre-assembly of component parts has been designed to save installation time and expense.



## MICROGROOVE ARM AND CARTRIDGE

Engineers of The Astatic Corporation, Conneaut, Ohio, worked directly with Columbia technical experts in designing their new FL-33 Pickup and LP-33 Crystal Replacement Cartridge, for use with the new, long playing Microgroove discs produced by Columbia Records, Inc., the pioneer pickup and microphone manufacturers have announced. As a result, the Astatic tone arm and its cartridge are capable of getting the most out of LP records.

They are being manufactured to meet precisely the specifications set forth by the record manufacturer.

An outstanding feature of the Astatic equipment is that the LP-33 Crystal Cartridge, which has a permanent sapphire needle with .001-inch tip radius for microgroove recordings, is readily interchangeable with a companion cartridge, LP-78, for playing conventional 78 rpm records. The cartridges may be changed in seconds, by anyone, because they fit firmly into position in the pickup on the same slip-in principle by which cap and body of some modern fountain pens are joined together.

The FL Filter, an accessory for the pickup that assures perfect performance with high quality speakers, is also being produced by Astatic.



## BROADCAST MICROPHONES

Two completely new high fidelity, high output, dynamic Broadcast Microphones are announced by Electro-Voice, Inc., Buchanan, Mich. Developed in cooperation with network and station engineers, the new Models 650 and 645 are designed to meet the exacting requirements of modern high fidelity FM and AM broadcast service. Consistently accurate wide range high fidelity response out to 15 kc, extremely high output level, and rugged shock-resistant construction make them suitable for either studio or remote pick-up. Manufactured to close tolerances, under laboratory quality control, every unit is individually calibrated.



## VOLT-OHM-MILLIAMMETER

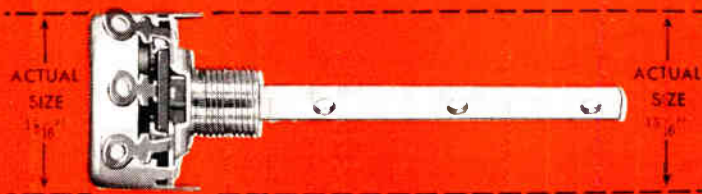
The Simpson Model 221 is something entirely new in test instruments. It is actually the equivalent of 25 individual instruments. Designed as a high sensitivity a.c.-d.c. volt-ohm-milliammeter and equipped with rotating dials, it is ideal for television, radio, and industrial testing. Patented by Simpson Electric Co., the Roto-Ranger principle eliminates the confusion of numerous scales and multiplying factors common to ordinary multi-range testers. Its operation is simple—as the selector switch is moved to the range desired, the proper scale for that range is brought into place behind the meter window. There are no cramped calibrations; each scale is large and full-sized, as it would be for a separate instrument. The case of the Model 221 is finest wood construction, leatherette covered. Finish of the panel is brilliantly gleaming black anodized aluminum, combining attractiveness with extreme durability.

→ To page 26



**ALL  
NEW**

P. R. MALLORY & CO. Inc.  
**MALLORY**  
**Midgetrol**



*The Little Volume Control  
with BIG Advantages*

**Bigger  
Market**

The small size of the Mallory Midgetrol lets you service portables, auto radios and small AC-DC receivers which require  $1\frac{5}{16}$ " controls.

**Simpler  
Installation**

The unique shaft design of the Mallory Midgetrol saves installation time with *all* types of knobs.

**Simpler  
Stocking**

Electrical characteristics let you use the Mallory Midgetrol to replace  $1\frac{1}{8}$ " as well as  $1\frac{5}{16}$ " controls. Stocks are further reduced because no special shafts are needed.

The Mallory Midgetrol is quietest by actual tests—and tests prove it stays quiet, too. In addition, it has nine big features that are *all new*.

- NEW SIZE
- NEW DESIGN
- NEW SHAFT
- NEW EXTENSION
- NEW SWITCH
- NEW ELEMENT
- NEW CONTACT
- NEW TERMINAL
- NEW TWO-POINT SUSPENSION

*It's the NEW Standard in Carbon Controls. See your Mallory Distributor.*

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**

# American Beauty

## ELECTRIC SOLDERING IRONS

are sturdily built for the hard usage of industrial service. Have plug type tips and are constructed on the unit system with each vital part, such as heating element, easily removable and replaceable. In 5 sizes, from 50 watts to 550 watts.

### TEMPERATURE REGULATING STAND

This is a thermostatically controlled device for the regulation of the temperature of an electric soldering iron. When placed on and connected to this stand, iron may be maintained at working temperature or through adjustment on bottom of stand at low or warm temperatures.



For descriptive literature write

110-1

**AMERICAN ELECTRICAL  
HEATER COMPANY  
DETROIT 2, MICH., U. S. A.**



# OVER THE BENCH

by John T. Frye

**P**SYCHOLOGISTS tell us that every now and then it does you good to take your hair down and get rid of some of your pet peeves by talking about them. Working on this theory, I am confident that I am speaking for the whole service fraternity when I say plaintively that I WISH CUSTOMERS WOULDN'T . . .

Call me on the telephone and give me a ten-minute case history of their set without allowing me to squeeze in a single question, and then blandly inquire: "Now what would you say is the matter with it?"

Invariably comment, "I am sure there is not much the matter with the set. It was playing perfectly alright before it started to smoke and smell so funny. It's probably just some little thing that you can find in a minute."

Continue to cling grimly to the idea that a radio has *one* single solitary condenser in it, and that after this has been replaced, there should be no further condenser trouble for at least ten years.

Cling just as fondly to the theory that "loose wires" cause most of the trouble in radio receivers and be darkly suspicious that, when a serviceman says that the trouble was a defective oscillator coupling condenser, he is just trying to use big words to cover up the fact that all that was wrong was one of these "loose wires" that are so common to the customer and so rare to the serviceman.

Let Cousin Willie, "who had something to do with radio in the war," give the set an expert going over before it is brought to the shop. "Of course, if he had the necessary tools, he could have fixed it; but he said to tell you that he is certain that one of the oscillator wave-guides is out of alignment."

Allow small children to play with

the complicated record changer mechanism over which I have sweated blood adjusting to the acme of perfection and then complain because the job does not "hold up."

Feel that it is my fault if one of the other four tubes in their a-c-d-c receiver goes out a short time after I have replaced, say, the 35L6.

Bring me radios in which mice have been nesting.

Bring me radios in which cockroaches *are* nesting.

Leave me stuck with radios that I have declared not worth fixing for month after month, insisting each time I call that "we will be by for that this week. John wants to make an end table out of the cabinet, and we are going to let Junior play with the insides."

Give me a big song and dance about how necessary it was that a particular set be got out in a rush, and then, after I had worked overtime to get it out, not show up for it for two or three weeks.

Insist that since I did a good job on their radios, I should also work on their vacuum sweepers, electric mixers, heating pads, electric clocks, hair curlers, etc.; and feel half mad because I try to explain that I am not equipped for that kind of service.

Expect my service charges to be in proportion to the original cost of the receiver; i.e., expect that a filter condenser installed in an a-c-d-c set cost about one-tenth of what the same job would cost on a console combination.

Try to get me to say how much it will cost to fix a set before I have even seen the receiver.

Bring in a set that I had worked on a year or so before, and remark: "That set never worked right after you fixed it the other time, but we never got around to bringing it back,

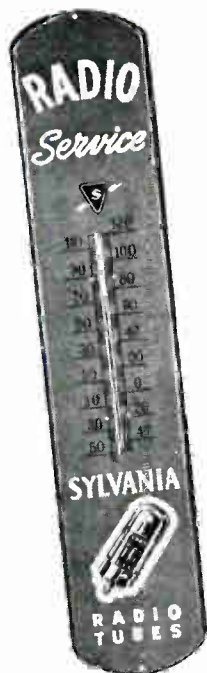
→ To page 47





# MADE TO SELL YOU AND YOUR SERVICE

## 3 NEW SYLVANIA AIDS!



Big, handsome, eye-catching! That's the new Sylvania 38 $\frac{1}{4}$ " high and 8 $\frac{1}{4}$ " wide metal thermometer! Put this green, black and white business aid outside your shop—call attention to the service you offer and the merchandise displayed in your windows!

You can obtain this sales-catcher from your Sylvania Distributor! See him today!

*only* **\$2<sup>95</sup>**

Here's the new Sylvania Service Kit now available to service dealers—a prestige-building and practical addition to your service business!

Made of laminated plywood covered with brown plastic fabric with the appearance of fine leather, this kit has a tube capacity of over 75 tubes. The interior measures only 18"x 11 $\frac{3}{4}$ " x 5 $\frac{1}{2}$ ". The tool section in the lid is designed to hold the most commonly used tools for on-call service. Ask your Sylvania Distributor for this wonderful new, low-priced Service Kit. Get that added professional touch that means so much.

*only* **\$9<sup>95</sup>**



*(Tools shown not included)*



*only*  
**\$4<sup>50</sup>**

And here's the new Sylvania illuminated shadow box sign that's ready for hanging in your window, on your wall, or on any strategic flat surface in your window. Two eyes in the top of the sign are for hooks or chains.

The big, bright red letters "Radio Service" tell your message in no uncertain terms to every passerby. The sign's face is glass; the background translucent yellow. The red letters are outlined in black, while the bottom half of the sign is black with yellow lettering. The brown metal case is chrome trimmed. Size: 18 $\frac{1}{4}$ " long, 8 $\frac{1}{4}$ " high, 3 $\frac{1}{4}$ " deep. Seven-foot cord provided.

At Sylvania Distributors everywhere! Sylvania Electric Products Inc., Advertising Department, Emporium, Pa.

# SYLVANIA ELECTRIC

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

*a new family joins the sangamo tribe...*

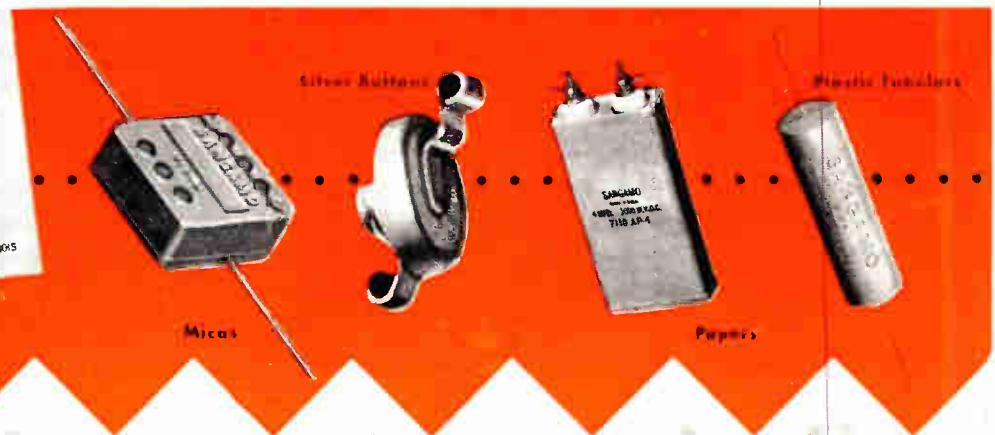
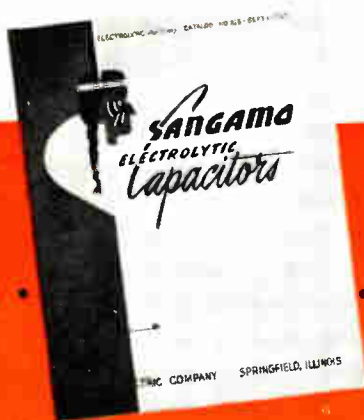


## New Dependability, New Long-Life Performance

Meet Sangamo Electrolytics, the newest family to become linked with the Sangamo Tribe. Introducing, from left to right on the opposite page, are illustrations of the "Chieftain", "Tomahawk", "Warrior", "Apache", and "Mohican". These newcomers now join the established tribe of Sangamo Micas, Silver Buttons, Papers, and Plastic Tubulars. Their heritage of dependability and long-life

performance stems from being built in a factory which was constructed *especially* and *exclusively* for the manufacture of contamination-free electrolytics. Their performance will meet and exceed the most stringent requirements of electronic applications. Yet, these new, high-quality capacitors are competitive in every respect from a standpoint of design, construction, and price.

Your own trial-use will convince you that new standards of dependability and longevity have been built into Sangamo Electrolytics. Order from the new Sangamo Electrolytic Capacitor Catalog No. 825B, which is yours for the asking, and without obligation.





**SANGAMO**

# electrolytic

## CAPACITORS

*Chieftain*



*Tomahawk*



*Warrior*



*Apache*



*Mohican*



**SANGAMO**

**SPRINGFIELD, ILLINOIS**



# Here's a SENSATIONAL BUY!

## COMBINATION INTERCOM & RADIO

Customers Say—

A REAL MONEY MAKER FOR YOU

"Intercom alone is worth your low price. You get free a 6 tube radio in this deal plus real utility!"



Intercom Sub-Station      Master Intercom Station, Including 6-Tube Radio

Combines a top-quality 6 tube superhet receiver, plus office or home intercom system in handsome walnut-veneer cabinets. Hi-Amplification 3 tube intercom permits instant communication between radio-master and up to 4 remote sub-stations. Any remote station can call the master while radio is playing; call can be returned to any remote station. Operates on 110 volts AC or DC.

It's handsome—It's easy to install—It's easy to use!

Price Includes Radio Master, 1 Remote, 50' wire

Original retail price was \$84.50 with 4 remotes. Buy from RSE and SAVE OVER 50%.

**\$29<sup>95</sup>**

Brand new—only 400 available.

Extra Remotes—\$3.95

## MIDGET I.F. TRANSFORMERS

Back again—by popular demand!



RSE scores again with a new and better I. F. I. 400-500 KC range—1 1/4" square x 3" high—ceramic based mica trimmers—high gain iron cores—pep up old receivers, ideal for new construction—and now available in either input or output types—for peak performance! Individually boxed in the colorful RSE carton. List price \$2.10. LR1—input; LR2—output;

Specify Type.

Each	Matched Pair	Doxen	Egg Crate of 100
36c	69c	\$3.95	\$29.00



## VOLUME CONTROLS

• Our own private brand—made by a nationally known manufacturer. • The same kind that net for \$1.09. • Noise-free carbon construction, standard shaft and bushing. • Individually boxed in our colorful carton carrying the RSE equality seal of approval. • Complete with switch, full range of sizes.

10 M ohms	100 M ohms	each	59c
15 M ohms	250 M ohms	per 10	\$5.50
25 M ohms	500 M ohms	asstd.	
50 M ohms	1 Meg ohms		
2 Meg ohms			
500 M Knurled Shaft			
500 M ohms less switch, 39c each, 100 for \$35.00			

## TUBES

### "The All-American Five"

Here they are—the fastest movers ever made—at RSE's long discount. Brand new, tested top-grades with regular RMA guarantee. Individually boxed in eye-appealing cartons. Know your supplier—his reputation. Shoot us an order today—watch your profits zoom tomorrow!



125A7GT . . .65	125K7GT . .65	125Q7GT . .59
35Z5GT . . .49	50L6GT . . .65	

"All-American Kit", one each of above . . \$2.98



Demand This Seal of Quality

## ORDER INSTRUCTIONS

Minimum order—\$2.00. 25% deposit with order required for all C.O.D. shipments. Be sure to include sufficient postage—excess will be refunded. Orders received without postage will be shipped express collect. All prices F.O.B. Detroit.

**RADIO SUPPLY & ENGINEERING CO., Inc.**  
87 SELDEN AVE. DETROIT 1, MICH.

# ELECTRONICALLY SPEAKING



One of the most dynamic of the organizations of skilled radio technicians that have been formed by radio servicemen, is the Radio and Television Service Engineers Association, Inc., of Anderson, Ind. Anticipating the advent of at least one telecasting station in central Indiana in the not too distant future, this association has been conducting its own television service training program with excellent results.

W. D. Renner and W. W. Hensler, of Howard W. Sams & Co., Inc., recently spoke at an Anderson association meeting on the subject of television installation and signal distortion. Basing his talk on data developed in the extensive Photofact program of television receiver installation and servicing analysis, Bill Renner pointed out that successful

reception of a usable signal at points as far as 150 miles from the telecasting antenna may bring about a modification of the previously considered requisite of line-of-sight limitations for satisfactory television receiver installations.

A four-year program of TV expansion into over eighty cities has been announced by CBS. At present, the CBS TV network includes New York, Boston, Philadelphia, Baltimore and Washington. Before the end of this year, CBS plans to extend its services to the Toledo, Detroit, Cleveland, Atlanta and Los Angeles areas. Twenty-five more stations are contemplated for 1949, thirty-six more for 1950, and nineteen during 1951.

→ to page 28



Gerard P. Diaz, radio serviceman of Parkville, Mo., receives the June prize in the Hytron Servicemen's Contest. Merle Applebee, of Burstein-Applebee Co., displays the double prize and William T. McGary, Hytron representative, offers congratulations.

THIS IS TO CERTIFY THAT

**CUSTOMER INSURANCE-For You-At No Cost**

**RAYTHEON  
FOR  
BONDED ELECTRONIC TECHNICIANS**

A Surety Bond Has Been Issued by the WESTERN NATIONAL INDEMNITY COMPANY

Expiring the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, Bonding This Firm Respecting its Agreement with Raytheon Manufacturing Company to

1. GUARANTEE ITS RADIO RECEIVING SET REPAIR WORK FOR 90 DAYS FROM DATE PERFORMED AND REPLACEMENT PARTS FOR 90 DAYS FROM DATE INSTALLED.
2. Use only parts of recognized quality in such repair work.

3. Not charge more than list price for parts installed in such repair work.
4. Test customers' radio receiving tubes as accurately and reliably as possible.
5. Keep charges for labor in such repair work at a fair and reasonable level.
6. Perform only such repair work as is necessary or authorized.

7. Maintain and use service equipment essential to good radio receiving set repair work and reliable tube checking.
8. Maintain in such repair work the high quality service indicated by the experience required of all Bonded Electronic Technicians.



The amount of coverage for the above Dealer under this Surety Bond is limited to the sum of One Hundred Fifty and No. 100 (\$150.00) Dollars in the aggregate and is further limited to the sum of Fifty and No. 100 (\$50.00) Dollars for any claim involving any single customer.

Agreed and Attested  
WESTERN NATIONAL INDEMNITY COMPANY  
By Blaine  
Vice President

You're a responsible citizen. You do good work. But how are the people in your neighborhood, the radio owners that pass your store every day going to know it unless you tell 'em and *make it stick!*

The RAYTHEON BONDED DEALER PROGRAM makes it stick! It provides you with an iron-clad 90-day BONDED guarantee on labor and parts that is backed by the hundred million dollar assets of the Western National Indemnity Company. Raytheon pays for your bond. It doesn't cost you a cent!

**YOUR RAYTHEON DISTRIBUTOR HAS A BOND FOR YOU**

Ask him about the Raytheon Bonded Dealer Program and how you can use it to build steady, profitable volume.

Act now — while there is still an opportunity for you to become a *Raytheon Bonded Electronic Technician*.

**RAYTHEON MANUFACTURING COMPANY**  
RADIO RECEIVING TUBE DIVISION  
NEWTON, MASSACHUSETTS • CHICAGO, ILLINOIS • LOS ANGELES, CALIFORNIA

The Raytheon Bantal Tube simplifies your tube stock without loss of sales. Eight fast-moving Bantals replace sixteen equivalent GT and metal types. A new and better tube at no extra cost! Ask your Raytheon Distributor for Raytheon Bantal Tubes.



RADIO RECEIVING TUBES • SUBMINIATURE TUBES • SPECIAL PURPOSE TUBES • MICROWAVE TUBES



Presenting  
**DURANITE**  
 the  
**SUPERIOR**  
**CAPACITOR**



● An entirely new tubular capacitor—featuring Aerolene, the new impregnant; new processing methods; new DURANITE casing. Such is DURANITE—the toughest tubular yet offered for use in stay-put assemblies. Therefore don't confuse DURANITES with conventional molded tubulars. DURANITES are different.

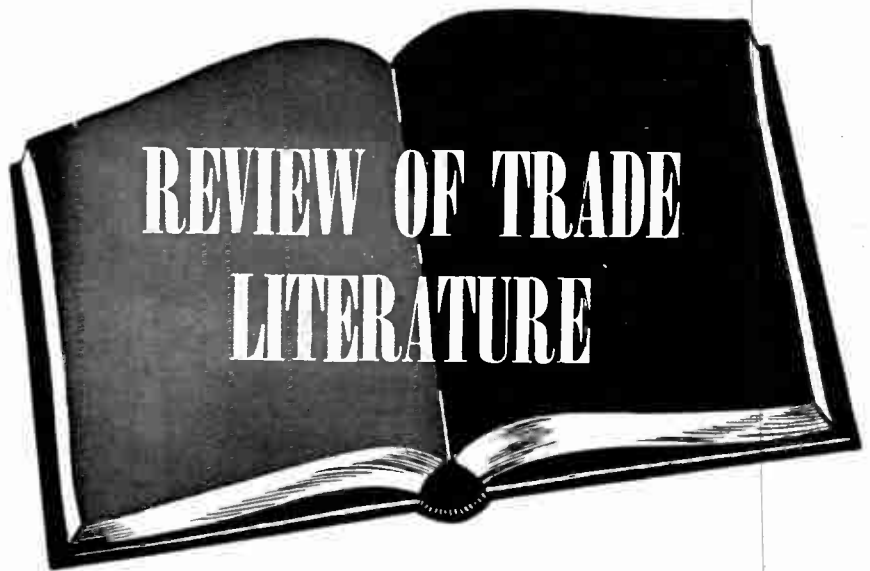
Drop, bang, scratch—no damage to the permanent, non-varying, rock-hard DURANITE casing. Unaffected by high temperatures—nothing to melt or burn. Thoroughly moistureproof. No shelf deterioration. Pigtails won't pull out. And so on.

Order DURANITES from your Aerovox jobber. Popular capacities. 200 to 1600 v. D.C.W. Try them. You'll be amazed!



**FOR RADIO-ELECTRONIC AND INDUSTRIAL APPLICATIONS**

AEROVOX CORP., NEW BEDFORD, MASS., U.S.A.  
 Export: 13 E. 40th St., New York 16, N.Y. • Cable: 'ARLAB'  
 In Canada: AEROVOX CANADA LTD., Hamilton, Ont.



To avoid delay when writing to the manufacturer give issue and page number

**Antenna Manual**—This book presents in a single volume a comprehensive compilation of antenna, transmission line, and propagation data of vital interest to those associated with the practical aspects of radio broadcasting and communication. Its author, Woodrow Smith, has placed his emphasis on this text on engineering approximations and physical reasoning, rather than complex mathematical treatment. It is 306 pages long, and illustrated where necessary by photographs, sketches, and graphs.

The book examines radio waves, transmission lines, basic antenna theory, low and medium frequency antenna systems, high frequency antenna systems, VHF and UHF antenna systems, receiving antenna considerations, coupling, measuring equipment and techniques, and antennas for navigational guides. This discussion embraces television antennas.

This book is published and distributed by Editors and Engineers, Ltd., 1300 Kenwood Road, Santa Barbara, California.

**Sylvania Campaign Literature**—Sylvania Electric Products, Inc., has put out a brochure describing the advertising material available to Sylvania radio service dealers in connection with its advertising campaign for the remainder of 1948. This available material, planned to fit in with other aspects of Sylvania's nationwide advertising, consists of special postal cards, four-color window displays, full-color window streamers, one and two column newspaper ad mats and eight and twelve inch decals for window, door and truck.

**Public Address Manual**—The first industry-wide Public Address Man-

→ To page 30

# Permoflux SPEAKERS

**YOUR JOBBER CAN SUPPLY YOU!**

Permoflux quality and dependability—the same as supplied to the major set manufacturers—is your assurance of complete customer satisfaction. You'll find Permoflux Speakers easy to install and readily available in both PM and Electrodynamic types. You'll find too, that it pays to give your customers "tops in tone" with a Permoflux Replacement Speaker.

TWO COMPLETE FACTORIES TO SERVE YOU

**PERMOFLUX**

WRITE FOR FREE BULLETIN

PIONEER MANUFACTURERS OF PERMANENT MAGNET DYNAMIC TRANSDUCERS

PERMOFLUX CORPORATION

4900 WEST GRAND AVE., CHICAGO 39, ILLINOIS  
 236 SOUTH VERDUGO ROAD, GLENDALE 5, CALIFORNIA





Model 266  
Vacuum Tube  
Voltmeter  
for TV, FM, AM

RANGES: Volts: (A.C. and D.C.) 0-1, 5, 10, 50, 100, 250, 500, 1000, 5000

Milliamperes: (D.C.) 0-1, 5, 10, 50, 100, 250, 500  
Amperes: (D.C.) 0-10

Ohms: 0-100 (10 ohms center)  
0-10,000 (100 ohms center)  
0-100,000 (1000 ohms center)  
0-1 megohm (10,000 ohms center)  
0-10 megohms (100,000 ohms center)  
0-100 megohms (1 megohm center)  
0-1000 megohms (10 megohms center)

Size: 8 1/2" x 9 1/2" x 8". Dealer's Net Price complete with Operator's Manual..... \$94.50

for  
**TV, -FM, and AM**  
servicing

— your 3 finest basic testers

On Model 266 Vacuum Tube Voltmeter, note these distinguishing Simpson features: the 1 volt ranges for full scale deflection, necessary in low R.F. voltage measurements; the zero center switch provides for discriminator circuit alignment, a feature which embraces all D.C. voltage ranges. D.C. volt input resistance ranges from 50 megohms to 200 megohms. The low input impedance at 60 cycles is 40 megohms. The high input capacitance of the probe (approximately 4 micro-microfarads) insures the accuracy essential for the high frequencies encountered in servicing FM and television receivers.

Ask  
your  
jobber  
or send for  
literature.

SIMPSON ELECTRIC COMPANY  
5200-5218 W. Kinzie St., Chicago 44, Ill

In Canada: Bach-Simpson Ltd., London, Ont

**Simpson**  
INSTRUMENTS THAT STAY ACCURATE



Model 330 RCP  
Mutual Conductance  
Tube Tester  
for TV, FM, AM

The Simpson Model 330 tests tubes in terms of PERCENTAGE of rated DYNAMIC MUTUAL CONDUCTANCE, a direct indication of tube performance with reference to the manufacturer's STANDARD MICROMHO rating. Shows tubes as good, fair, weak or definitely bad. When you have finished a tube test ONE BUTTON returns all switches to the normal position ready for the next test.

Size: 15 1/2" x 9 1/2" x 6 1/4"

Dealer's Net Price, complete with Operator's Manual,

\$132.50



Model 415-A Signal Generator for FM and AM. Incorporates built-in sweep circuit for modern FM servicing. Frequency modulated signal with a sweep of 1 megacycle, more than adequate for all FM alignment. Internally modulated at either 60 cycles or 400 cycles or modulated from an external source. A 120 cycle saw-tooth voltage is available as scope synchronization or as actual scope sweep. AM bands cover complete frequency range from 75 KC to 130 MC. For 105-130 volts, 50-60 cycle  
Size: 5 3/8" x 11 3/8" x 15 1/8"  
Dealer's Net Price, complete with Operator's Manual..... \$145.00

## A Sensational Announcement to the Top "1/3" in Servicing . . .

After 2 Years of Preparation CREI Introduces Its New Home Study Course in

# TELEVISION AND FM SERVICING



G. E. PHOTO

### PREPARE FOR A BETTER JOB WITH THIS 100% PRACTICAL "ON-THE-JOB" TRAINING

This new course was prepared by CREI at the request of several large manufacturers, distributors and dealers who said, "We must have more servicemen trained to handle the approximately 800,000 television sets and 4,000,000 FM sets to be produced this year alone! CREI knows exactly what you need and every effort has been made to keep this course practical and to the point. If you are now in service work you will be able to thoroughly understand and apply each lesson. It has been reviewed and checked by qualified service experts who know what you must know to get ahead in this booming field.

Start your training now and you start applying your new-found knowledge immediately. Every lesson in this course can be helpful in your daily work. As you progress in your training you will find yourself equipped to handle complicated Television and FM work that only a few months ago looked "impossible". The time to start is now.

It costs you nothing but a few minutes time to read the interesting facts and the complete lesson-by-lesson outline. So practical, so simple to understand.

**GET ALL THE FREE FACTS NOW — FILL OUT AND MAIL COUPON**

**Capitol Radio Engineering Institute**  
16th & Park Rd., N.W., Dept. RT-10  
Washington 10, D. C.

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

## The Industry Presents

→ From page 16



### VIDEO SWEEP GENERATOR

New television test equipment which will speed television amplifier production, improve television broadcasting and aid designers of high-frequency television amplifiers is now in quantity production and will shortly be available, it was announced by the RCA Engineering Products Department. The new instrument, a precision video sweep generator (RCA Type WA-21A), when used in connection with suitable detector and oscilloscope, will facilitate rapid testing of video frequency systems by permitting visual observation of the frequency response characteristic. The sweep generator permits direct viewing of the envelope of the output wave of a video circuit while the input signal sweeps through a range of 100 kc. to 10 Mc. at the rate of 60 complete sweeps per second. It also embodies a c.w. generating section that produces sine wave signals tunable from 100 kc. to 10 Mc. for point-to-point or steady-state tests. The beat-frequency principle is employed, and the entire range is covered in one continuous band.



### SQUARE WAVE GENERATOR

A new square wave generator, Type YGL-1, for use in school and college research pro-

— To page 32

### ANTENNA GUY RINGS

Rust Proof—Light Weight—Cast Aluminum

Center Hole Sizes: 1" Each 55c

Other Sizes 1 1/8 Pastpaid

Made to Order 1 1/4 Cash

1 3/8 with order

Hill Manufacturing Co.  
Box 573, Laureldale, Penna.

## NEW TOOLS FOR RIGGING TV!

### PINPOINT YAGI-BEAM

RQ-2-13. Extreme directionality; high gain, to dodge out persistent ghosts, reduce noise. Peaked to your specified channel.

### TEL-ADJUST

RQ-33. Kit for switching dipoles, traps, pads, receivers.

### TELE-PAD

RQ-30. Calibrated pad for analyzing ghosts, tearing pix.

### TELE-MATCH

RQ-46. Lossless; couples 1 high, 1 low band dipole into 1-6 TV receivers. Models for all impedance combinations.

For information, call your local jobber, or write:

Roger Television Inc., 366 Madison Ave., New York, N. Y.

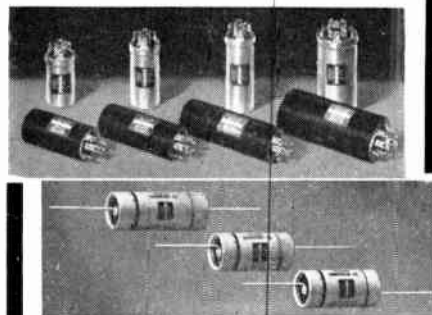
The Trade Mark of "Time-Tested Quality"



ILLINOIS CONDENSERS belong

IN THE BEST

## Electronic Sets



Look to Illinois for a complete line of electrolytic capacitors for every electronic application and radio replacement use. When you need a capacitor that has superior ability to withstand extreme temperature changes, that's manufactured to exacting specifications, that's time-tested through 14 years of high quality production experience—you want an Illinois condenser!

Write for our latest catalog.



ILLINOIS CONDENSER CO.  
1614 NORTH THROOP STREET • CHICAGO 32 ILL.



# Your **HYTRON SERVICEMEN'S** Contest

## A REPORT TO YOU

### THE EDITOR-JUDGES COMMENT

"Judging the contest is fun, and I'm learning something from it . . . am impressed with both quantity and quality of the entries . . . contributors took genuine interest in a challenge to their American ingenuity . . . hard to make a choice . . . it is evident that servicemen have found it necessary to devise for themselves special tools . . . no designer sitting off at a distance can possibly anticipate their needs so well . . . basis of a fine exhibit . . . would like to print . . . will result in valuable additions to serviceman's tool kit."

### FIRST PRIZE WINNERS

May

Harry L. Smith, Long Island City, N. Y., was picked by the judges as the lucky winner of the DuMont Type 274 Five-Inch Oscillograph.

June

To lucky Gerard P. Diaz, Parkville, Missouri, went the RCP Model 665-A "Billionaire" vtvm and Model 705-A Signal Generator.

Heartiest congratulations to them both, as well as to the other winners.



**FIRST PRIZE  
SEPT.**  
Jackson 641  
Universal  
Signal Generator

Second prize — each month, \$50 U. S. Savings Bond.  
Third Prize — each month, \$25 U. S. Savings Bond.  
Grand Prize, \$200 U. S. Savings Bond — to contestant whose idea is judged to be best of the 6 winning monthly first prizes.



**FIRST PRIZE  
OCT.**  
Weston 769 H-F  
Electronic Analyzer

## AN INVITATION TO YOU

Come on in, servicemen! The contest's fun — and easy, too. Many prizes left. Only one thing to worry about — time's a-wasting. Pick up an entry blank today at your Hytron jobber's. Or drop us a penny postal. The easy-to-follow entry blank will help you do the rest.

Just describe briefly your proposal for a simple, economical shop tool like the Hytron Tube Tapper or Miniature Pin Straighteners. Enter in any or all monthly contests. Mail to Hytron Contest Editor. Then make room on your bench for one of those deluxe first prizes.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921.



# HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS





# FREE ALLIED'S NEW 1949 RADIO CATALOG

Everything for the Radio Service Technician . . .

SEND FOR THIS 180-PAGE BUYING GUIDE NOW

Radiomen! Here's the new 1949 ALLIED Buying Guide that brings you everything you need in radio and electronic equipment. Get everything that's newest and finest from the world's largest stocks—test instruments, sound systems and P. A. equipment, thousands of parts, tubes, tools, books—all at lowest money-saving prices, ready for instant expert shipment. Send for your FREE copy of the new 180-page ALLIED Catalog—today!

## ALLIED RADIO

ALLIED RADIO CORP., DEPT 27-K-8  
833 W. Jackson Blvd., Chicago 7, Ill.  
 Send FREE New ALLIED Catalog.

Name.....

Address.....

## Electronically Speaking

→ From page 22

The JFD Manufacturing Co., Inc., Brooklyn, N. Y., is part of its service to television installation technicians, announces the formation of the JFD TV-FM Antenna Installation Department. The department will offer free advice to all servicemen in the analysis and solution of their TV-FM antenna installation and reception problems. This is the first department of its kind supported by an antenna manufacturer for the sole benefit of its customers. The new service is an outcome of the JFD TV-FM Antenna Installation Forums, which are now being conducted in television centers all over America. All servicemen interested in taking advantage of this new facility should address their inquiries to the JFD TV-FM Antenna Installation Service Department, c/o The JFD Manufacturing Co., Inc., 4110 Fort Hamilton Parkway, Brooklyn 19, N. Y.

Westinghouse Radio Stations, Inc., a subsidiary of the Westinghouse Electric Corporation, has filed a petition with the FCC which, if approved, would grant authorization for the first commercial strato- television station to bring television broadcasting to "about 6,000,000 people who under present allocations will not receive protected service." The petition requests allocation of channel 8 for an air-borne television station to operate about a point 30 miles of Pittsburgh and to provide service in an area with a radius of approximately 200 miles, an area 35 times that normally covered by ground television stations.

Transvision Inc. is planning a nationwide service of TV clinics for servicemen. Meetings will be held in TV centers across the country, under the sponsorship of Transvision Inc. and your local jobber. They will be conducted by Transvision engineers. Watch your jobber for further details. ✓ ✓ ✓

## REVOLUTIONARY SOLDERING IRON

# TRANSVISION Soldetron

Tr. Mark Reg., Pat. Pend.

For Easier, Better Soldering—on Any Job!

- Weighs only 3 ozs., yet can do the job of a 200 watt iron.
- Heats up in 20 seconds from a cold start; saves time.
- Fingertip control; permits soldering without fatigue.



Ready for attachment and operation on 110 V A.C., 50-60 cycles, through transformer supplied with iron, or 6-8 volt A.C. or D.C. without transformer (from an automobile battery).

Overall size 9 1/4"x15/16"; ship. wt. approx. 4 lbs.

- Ideal for fine precision work in "hard-to-reach" places.
- Readily interchangeable tip-heads; no cleaning or filing.
- Retains heat with switch off up to 1 minute; efficient.
- Bakelite handle, cork covering, for comfortable cool grip.

PRICE: including transformer and Tip-Head "A", \$13.95  
5% higher west of Mississippi; fair traded.

Ask your distributor, or for further information write to:  
**TRANSVISION, INC. DEPT. RM NEW ROCHELLE, N. Y.**  
In Calif.: Transvision of Cal., 8572 Santa Monica Blvd., Hollywood 46

## Television 'HOW IT WORKS'

Just out. Here is practical theory on the biggest development since the introduction of radio. Deals with transmission and reception of television signals, giving clear overall picture. Goes into frequency standards, antennas, and describes the various parts of a television receiver. Covers portions of a television Manual. If of Vol. 1 Rider Television Manual. If you are ordering the Manual (\$18.00) you automatically get this book.

Even if television is not yet in your area it will be soon. You need to know about it now.

- Manufacturers: Here is the textbook you can use in training your servicemen.

Over 200 pages  
Illustrated . . . \$2.70

## UNDERSTANDING VECTORS AND PHASE

Provides easy understanding of vectorial presentations so you will get more benefit from radio articles and books.

160 Pages Cloth bound . . . \$1.89  
Paper bound . . . . . 99c

## BROADCAST OPERATORS' HANDBOOK

by H. E. Ennes, Station Engineer, WIRE  
Tells how to operate a radio station and keep it in operation. Covers transmitter operation and maintenance, what to do and how to operate control room, master and remote controls.

288 Pgs.—Profusely Illus.—\$3.30

## JOHN F. RIDER Publisher, Inc.

404 FOURTH AVENUE, NEW YORK 16, N. Y.

Export: Rocks-International Corp.  
13 E. 40th Street, New York 16, N. Y.

## LEARN RIGHT WITH RIDER!

### FM TRANSMISSION & RECEPTION

by John F. Rider and Seymour D. Uslan

Included among the "100 Best Technical Books of 1947 and early 1948" by the "Library Journal" this book has been adopted with equal enthusiasm by schools, colleges, engineers and radio servicemen.

Latest in theory, method of operation, high and low power, antennas, methods of alignment, solutions of servicing problems—everything needed.

416 Cloth Cover, \$3.60  
Pages

### OTHER RIDER BOOKS

Inside Vacuum Tube 424 Pgs. \$4.50

Servicing by Signal Tracing 360 Pgs. 4.00

Cathode Ray Tube at Work 338 Pgs. 4.00

Send for Complete Catalog of titles

BY THE PUBLISHER OF RIDER MANUALS

Order From Your Jobber or write direct to us.

# NO CHARGE FOR THESE AUTOMATIC SALESMEN!

They have sold thousands upon thousands of



Flat Cell "B" Batteries

WRITE IN FOR YOURS TODAY!

PUT THIS ON YOUR COUNTER

This colorful display will help you get your share of the high-profit radio battery replacement business . . . estimated this year at many millions of dollars.

Printed in 3 brilliant colors. Stands 16 inches high, 12 inches wide. Set it up where customers will see it . . . on your counter . . . next to your cash register . . . at any high-traffic spot in your store. NOTE! We show the BOND-OLIN Counter Display. A similar WINCHESTER-OLIN Counter Salesman is also available.

Available only in the



of OLIN INDUSTRIES, INC., Electrical Division, New Haven, Conn.

**NEW! DIFFERENT! BETTER!** FOR YOUR PORTABLE RADIO

**OLIN INTERLOCKED**

**HERE'S WHY**

- 1 Triple Sealed Water-Proof Flat Cell and English Standard - Insuring against leakage
- 2 Built-in Switch, More Positive Protection
- 3 No Waste Spill
- 4 175 Low Self-Heat Conductivity - Heat-Resistant Battery Action
- 5 Positive 45 HOUR TEST - Proven for longer life
- 6 Tested and Approved by leading Radio Manufacturers

**FLAT CELL "B" BATTERIES**  
with Activated Charcoal . . . Guarantee You More Playing Power!

**LAST LONGER. YET COST NO MORE!**

**OLIN INDUSTRIES, INC.**  
ELECTRICAL DIVISION, NEW HAVEN, CONN. AND BRANCHES

**OLIN INTERLOCKED**

**FLAT CELL "B" BATTERIES**

**TRIPLE SEALED - INSURING AGAINST LEAKAGE**

**LAST HOURS LONGER**  
**... Yet Cost No More!!!**

**New! Better! Different!**

There's an **OLIN** Radio Battery for Every Purpose — WE HAVE THEM

PUT THIS ON YOUR WINDOW

This eye-catching window streamer measures 25 x 10½ inches, printed in 3 brilliant colors. Especially designed for high visibility. It will attract and invite customers into your store. NOTE! We show the WINCHESTER-OLIN Window Streamer. A similar BOND-OLIN Window Salesman is also available.

Send in TODAY...NO CHARGE

Olin Industries, Inc.  
Electrical Division  
New Haven, Conn.  
Dept. D-3  
Mail me at once—no charge—Counter Display and Window Streamer.  BOND-OLIN or  WINCHESTER-OLIN. (Check brand desired.)

NAME \_\_\_\_\_

STREET & NUMBER \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



# THE NEW DU MONT TYPE 274-A OSCILLOGRAPH IS EVEN BETTER FOR

**RADIO and  
TELEVISION  
Servicing**



**TWICE THE BAND WIDTH!  
THREE TIMES THE  
SENSITIVITY!**

★ With several notable improvements over its predecessor, the Du Mont Type 274, this new Du Mont Type 274-A is an even finer instrument for the job of radio and television servicing.

An improved vertical deflection amplifier offers a sensitivity of better than 0.2 rms volt/in., and a range (within 30%) of 20 cps to 100 kc in frequency response.

As a result, in your servicing of both radio and television receivers, you can now look at *more parts of more*

*circuits with still greater accuracy and therefore better results.*

For example, you can see *lower level* signals and you can handle *more parts* of the detector and i-f circuits. You can now minimize "hum" troubles more easily, and you can do a better job on sync circuits as well as on other circuits of television receivers.

In fact, with the new Type 274-A, you can't miss doing an all-around, bang-up, more satisfactory and therefore more profitable job. And remember, the new Type 274-A still has the big, 5-inch tube!

Cat. No. 1420-A with 5BP1-A..... \$136.50

Cat. No. 1422-A with 5BP11-A..... \$139.25



**ALLEN B. DU MONT  
LABORATORIES, Inc.**  
Passaic • New Jersey  
Cable Address: Albeedu, Passaic, N. J., U. S. A.



## Trade Literature

→ From page 24

ual by Rider, containing the products of 147 p-a equipment manufacturers, now is being delivered to jobbers.

The Manual will contain 2024 pages covering the products of 147 manufacturers and the years of equipment production embraced by the manual is from 1938 to date—a span of 10 years. The general makeup of the Rider P-A Manual is like the other manuals produced by this publisher. This number of manufacturers is 12 more than was originally announced in advertisements. The publisher went all out in his efforts to give the public address servicing industry the greatest amount of information so that p-a servicing can be carried out at a profit. The price of the manual, which is loose-leaf and bound in the sturdy blue Rider binders, is \$18.00. It may be obtained from John F. Rider, Publisher, Inc., 404 Fourth Ave., New York 16, N. Y. Accom-

→ To page 32



Free illustrated booklet tells the "Inside Story" of an amazing new servicing method. It also contains valuable "hints and kinks" for every radio man. Just send your name, address, and the words—"Inside Story"—on a post card and we will mail your copy at once, without cost or obligation. Do it now before you forget!

**FEILER**

FEILER ENGINEERING CO.  
Dept. 10M 8, 945 George St.  
Chicago 14, Ill.

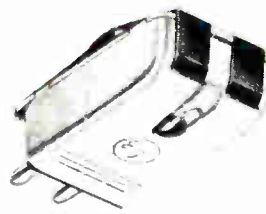


**Lightest  
Most Efficient  
Crystal Pickup  
Cartridge  
Ever Conceived!**

**NEW**  
SERIES 12



ACTUAL SIZE →



← WEIGHS ONLY  $\frac{1}{5}$  OZ



**HANDY NEW KIT MAKES SALES AND SERVICE EASY!**

Enables you to service most replacements immediately—helps you sell more replacement jobs to old and new customers—cuts overhead and inventory—increases turnover and profit! Contains 6 cartridges, 4 needles, mounting plates, literature, replacement chart and full instructions. Available in KIT "A" (Osmium) or KIT "B" (Sapphire).

**New Model L-14 for MICROGROOVE**

New Microgroove Torque Drive Crystal Cartridge now available—at same price. Model L-14 has smooth, peak-free, wide range response to 12,000 c.p.s. No filter necessary. Replaceable Osmium-tip or Sapphire-tip needle.

**Model 20 MAGNETIC CARTRIDGE**

Now available for REGULAR or MICROGROOVE records. Uses Model 503 Matching Transfilter.

**BETTER COUPLING OF RECORD GROOVE TO CRYSTAL**

Exclusive Electro-Voice development now brings amazing improvement in record playing . . . outmodes existing crystal pickup cartridges . . . opens up vast new replacement opportunities. Fully tested and proved . . . the new Series 12 TORQUE DRIVE provides a more rugged cartridge for everyday use in home phonographs, booth demonstrators, and coin-operated machines. Assures finer reproduction, less surface noise, less needle talk, less record wear, longer record life, more needle plays!

**3 BASIC MODELS REPLACE OVER 100 STANDARD TYPES**

Comes in low, medium and high voltage outputs to provide universal replacement. Speeds servicing, steps up your profit. Installation is simple. Each cartridge is furnished with replaceable Osmium-tip or Sapphire-tip long-life whisker needle. It is available individually or in kits.

Series 12 with Osmium-tip needle. . . . . List price, \$7.50

Series 12 with Sapphire-tip needle. . . . . List price, \$8.50

*It's the talk of the industry! Ask your E-V Distributor, or send now for Bulletins 141 and 142.*

**ELECTRO-VOICE, INC., BUCHANAN, MICH.**

Export: 13 East 40th St., New York 16, U.S.A.  
Cables: Arlab



**ANOTHER FIRST BY**

**Electro-Voice**

# Tailor-made

## for WIRE RECORDER- RADIO combinations



MODEL  
**78**

with push-button  
control

## Webster-Chicago WIRE RECORDER

is a top quality, precision unit designed for installation in radio console or for use in semi-portable applications with radio or high fidelity amplifier. Model 78 provides all combinations... recording from radio or microphone; playback through headphones, radio or external amplifier, with simple push-button control of electrical circuits. A sensitive meter provides accurate recording level indication and the wire transport mechanism is positive acting and foolproof.

**Easy to install...** Model 78 is easy to install, and makes an ideal combination. Contained in an attractive metal case which mounts as a complete unit, Model 78 is furnished complete with microphone, one spool of wire and all necessary plugs, cords and instructions for neat installation.

■ The radio-listening public is demanding auxiliary equipment for more complete enjoyment of their radio programs, record music and home entertainment.

■ DEMONSTRATE and install Webster-Chicago Model 78 Wire Recorder.

■ Ask your Webster-Chicago Distributor



## WEBSTER-CHICAGO

famous, too, for Webster-Chicago Record Changers and  
Magic Nylon Phonograph Needles  
5610 W. BLOOMINGDALE AVE. • CHICAGO 39, ILL.

## Trade Literature

→ From page 30

panying the manual is the "How-It-Works" book, describing the theory of the special circuitry found in numerous p-a systems. The index is complete with references to the contents of each page in the manual.

**Tube Sales Aid Catalog**—*Schematic for Bigger Profits and Better Servicing* is the name and theme of a completely new sales-aid catalog presenting the comprehensive 1948 line of merchandising and servicing aids prepared by the RCA Tube Department for radio servicemen and dealers. Now available from RCA tube distributors, the new and colorful 12-page sales-aid "Schematic" illustrates and describes many up-to-the-minute displays, promotional and business aid items. A five-point business-getting formula is outlined in the booklet, and the advantageous use of each item is fully explained.

Sales aids described range from a new RCA "Fireball" fluorescent sign to a complete, packaged direct-mail campaign, and include many new and novel items. The new "Fireball" fluorescent sign, more brilliant than neon by actual test, is for store and window use and is designed to sell "radio service" night and day. Of heavy steel construction with chrome trim, and measuring 26 inches long and 3½ inches deep, the sign has a red and white fluted glass panel and comes ready for hanging with a 6-foot chain.

The RCA Tube Department's "big poster" of the year is its "top performer" girl designed as a sure eye-catcher in a 22 by 30 inch full-color poster of three-dimensional construction. ✓ ✓ ✓

## Industry Presents

→ From page 26

jects and in scientific laboratories, has been made available by the Specialty Division of the General Electric Company's Electronic Department. The new precision type instrument features six overlapping frequency ranges, giving continuous coverage from 5 to 215,000 cycles. It delivers a rectangular wave output voltage with a 25% negative pulse, and a rise time for the leading edge of .3 microsecond.

A self-contained power supply is electronically controlled to provide stable output under conditions of commercial line voltage fluctuations. The output may be synchronized to an external source, if desired.

OCTOBER 1948 • RADIO MAINTENANCE

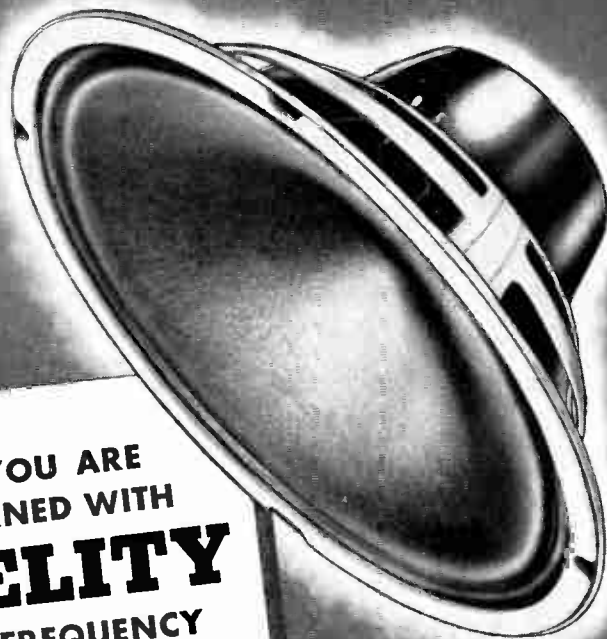


**Specify the**



**1201**

**DELUXE ALNICO 5  
LOUDSPEAKER**



WHEN YOUR  
JOB DEMANDS  
**POWER**

25 WATTS  
POWER HANDLING  
CAPACITY

WHEN YOU ARE  
CONCERNED WITH  
**FIDELITY**

BROAD FREQUENCY  
CHARACTERISTIC  
50-13,000 CYCLES

EQUIPPED WITH  
THE FAMOUS  
**GENERAL ELECTRIC**  
**ALUMINUM FOIL BASE**  
**VOICE COIL**



**P**OWER, fidelity and a price that will amaze you for a speaker of this exceptionally high quality—it's the G-E 1201.

It's a wide range speaker with the frequency response stretched out at both ends of the curve to give intense realism, smooth, full lows and "high fidelity." A curvilinear cone is employed to provide this extended frequency response. Alnico 5, 14½ ounces of it, gives high sensitivity and smooth response.

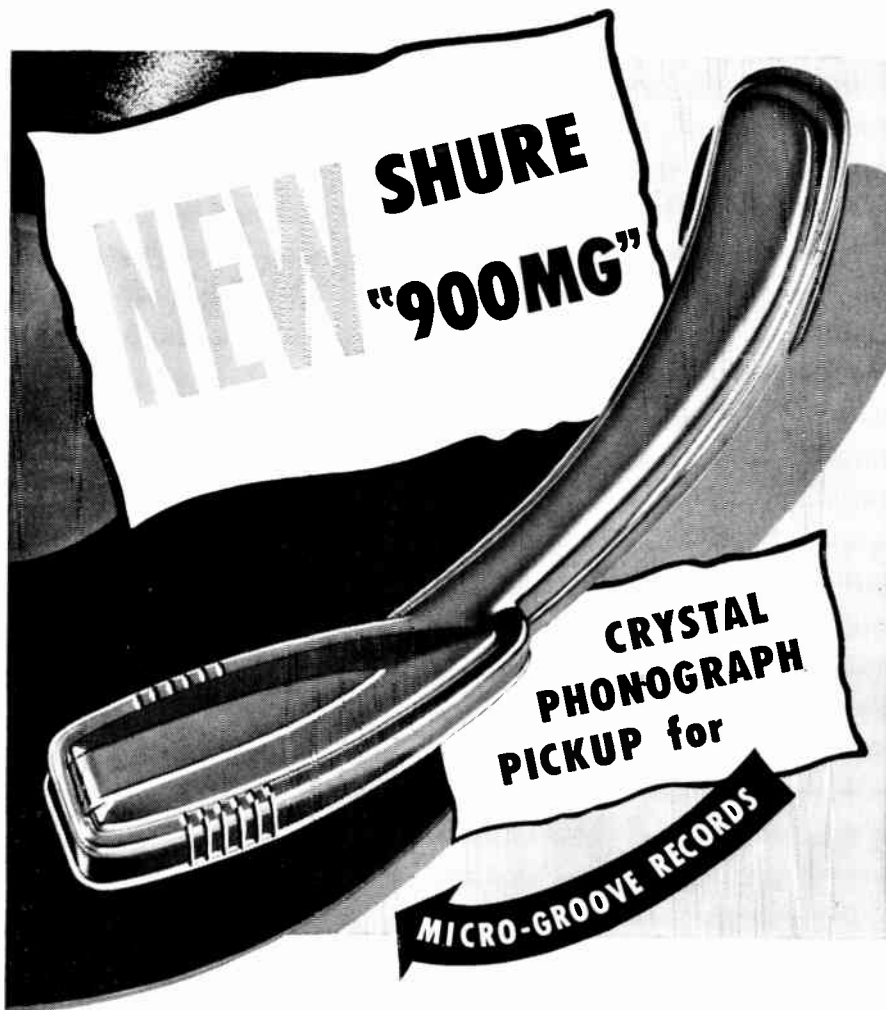
The moving parts in the speaker assembly are ruggedly designed to take high power without damage to the speaker in any way.

Note: Frequency response 50-13,000 cycles.

For complete information on this outstanding speaker write: *General Electric Company, Electronics Park, Syracuse, New York.*

**GENERAL**  **ELECTRIC**

169-G8



## Provides Vast New Sales Fields For Dealers and Servicemen

The long-playing micro-groove records have opened a vast new sales field for Servicemen and Dealers. Hundreds of thousands of record enthusiasts are ready to buy the new records, but they must have a new pickup to play them. This is your big opportunity to "adapt" their present sets with the Shure "900MG." It is a tremendous market—an immediate, anxious, impatient market. Here are opportunities, sales, PROFITS! Think of the hundreds of phonograph users in your immediate area. You will render an outstanding service by using a Shure "900MG." It is unsurpassed for the most brilliant reproduction of music you have ever heard.

**AVAILABLE AT SHURE DISTRIBUTORS NOW!**

**Model 900MG Code: RUZUZ List Price — \$12.50**

(Shure Patents Issued and Pending. Licensed under Patents of Brush Development Co.)



**SHURE BROTHERS, INC.**

*Microphones and Acoustic Devices*

255 W. HURON ST., CHICAGO 10, ILL. • CABLE ADDRESS: SHUREMICRO

## Television Signal Generator

→ From page 11

with the video of an adjacent higher-channel station. FM sound on Channel 5, for example, may interfere with video reception on Channel 6. Some receivers employ adjacent channel traps. These should also be adjusted *before* video alignment.

### Television I-F Amplifiers

With the signal generator set at the correct television i-f frequency and adjusted for the proper sweep width, alignment should start with the i-f stage preceding the detector, working back to the r-f section. Since video i-f amplifiers must pass a band of frequencies 6 Mc. wide, the importance of proper adjustment cannot be overemphasized. (To visualize the tremendous response of video amplifiers, stop a moment and consider that the entire broadcast band can be put into just *one* television channel 6 times!)

Exact alignment procedure depends, of course, on whether over-coupled or stagger-tuned i-f transformers are employed. The manufacturer's service data should be consulted before proceeding with specific alignment.

In stagger-tuned amplifiers, each i-f transformer is tuned to a different frequency. The marker is successively set to the correct frequencies and alignment carried out as indicated in the manufacturer's alignment notes.

Oscillator adjustment in receiver having no automatic frequency control (AFC) should be made with the "fine tuning" adjustment turned to its center position. R-F adjustments are mainly "trimmed up" adjustments, and are made with the generator connected to the antenna, with the deviation set at 10 Mc.

### Sweep-Shooting Procedure

The ideal method for sweep shooting or comparison-checking the video, audio and associated circuits, is to obtain first a television receiver in good operating condition and feed calibrated signal voltages into various stages. ✓ ✓ ✓



# Are you Building a Business ... or Burning your Bridges?

*Would you patronize a dentist who filled your teeth with plaster of Paris?*

*Would you trust your children's lives to a doctor who prescribed cut-rate pills?*

Your business, too, is built on *customer confidence!* And your reputation is too valuable to risk with inferior or unknown products. The cost of the parts you use in the average repair job is insignificant com-

pared with your investment in *your reputation.*

That's why we say—**YOUR CUSTOMERS AND YOUR REPUTATION CAN AFFORD ONLY THE BEST! ... SPRAGUE.**



CAPACITORS

# SPRAGUE

\*KOOLOHM  
RESISTORS

\* T.M. Reg.  
U. S. Pat. Off.

SPRAGUE PRODUCTS COMPANY, North Adams, Mass.

JOBGING DISTRIBUTING ORGANIZATION FOR PRODUCTS OF SPRAGUE ELECTRIC CO.

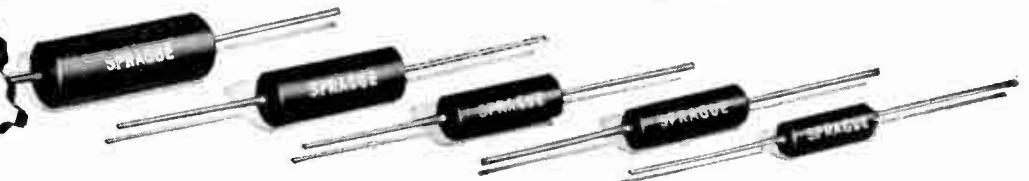
## Reach for a **SPRAGUE** and Know You're Right!

The superiority of the new Sprague type TM High-Temperature Molded Paper Capacitors didn't happen by chance. You can use this better unit in your work today only because of more than four years of intensive research and one of the largest retooling programs in Sprague's history. That's why we can say "*The First Truly Practical Molded Paper Tubulars are Sprague TM's*"—and it is also the reason you can use them on any job with confidence and pride.

- Highly Heat Resistant
- Conservatively Rated
- Moisture Resistant
- Small in Size
- Non-inflammable
- Mechanically Rugged
- Completely Insulated

**UNCONDITIONALLY  
GUARANTEED!**

You can stake your reputation on Sprague replacement parts. If used at rated capacitance and voltage, they are **UNCONDITIONALLY GUARANTEED** to give satisfactory performance. Insist on Sprague and get the best!





## The Toast of the Trade!

It is rather remarkable how, year after year, so many of the largest and finest radio and electronic manufacturers depend on Quam for their speaker requirements.

This should be of especial significance to the serviceman. For one thing, it means that these receivers are designed with Quam Speakers as a component part and, when replacements are required, another Quam Speaker should be used to maintain the same high quality of performance.

And it also indicates the confidence these manufacturers place in Quam, and their dependence on the consistently high quality of Quam engineering and production.

Take a tip from the people who buy speakers by the thousands, always specify Quam for your replacement job!

Write for catalog of  
Quam Adjust-a-Cone Speakers

### QUAM NICHOLS COMPANY

530 East 33rd Place, Chicago 16, Illinois

Quam speakers are listed in the radio industry Red Book.

## Coin-Operated Radios

→ From page 15

have foreign matter jammed into them so firmly that on-the-spot removal is impractical. Incidentally, despite explicit instructions on each radio, the quarter slot is often jammed with two dimes and a nickel.

Of the remaining radios, volume and tuning controls suffer the most, along with celluloid windows and dial pointers. Occasionally, a speaker will be damaged due to liquid being poured on the set, or a condenser will give up the ghost; but the coin-operated radios are sturdily constructed with rugged circuits. Most of the set is tamper proof and so the repair ratio is very low. Only one or two sets a month need service because of electronic failure. Little equipment is needed for service in the shop. Art Lipschutz has found that a signal generator and his regular kit are sufficient.

In cases where a set is inoperative, the management is instructed to refund the money and tag the radio out of service. Unless in an urgent location, the servicing usually waits until the next collection round when the faulty set is repaired on the spot or replaced with a spare. The effect of so many units spread out over a large area means that although one set may be out of service for a few days, the decrease in income is negligible.

### Installation

Installation is simple. The back of the radio is screwed to the wall. Depending on the surface, toggle bolts, wood screws or lag bolts are

used. The rest of the radio looks to the back. The job can be handled by one man in 15 minutes, but is a little awkward, and two men can do the work easier and in only five minutes. Radios are always located near an outlet and the cords neatly tacked to the baseboard running to the receptacle.

When Bob Kline and Art Lipschutz started their route, they thought stolen sets would be a major problem. So did the insurance companies, who were reluctant to write out a policy. The radios were so firmly anchored to the wall, however, that very few of them were stolen. As a matter of fact, it's been almost a year since an attempt was made and they're thinking of giving up the hard fought-for insurance as an unnecessary waste of money.

Altogether, this radio service outfit has found that coin-operated radios can be a very profitable sideline. If you are prepared to give this sideline a certain amount of your time and attention, you too may find that it will pay. Investigate its possibilities for *your* area. ✓ ✓ ✓

## Tele-Pad and Tel-Adjust

→ From page 13

While the methods discussed above are more expensive to use than the usual compromise procedure, it happens that in the final analysis they are the only ways for delivering to the customer perfect reception on *all* channels. It has been the writer's experience that of late this concrete fact is becoming more and more recognized by thoughtful servicemen. ✓ ✓ ✓

## Notice to Service Organizations!

### RADIO MAINTENANCE Magazine Special Group Plan

Radio Servicemen enrolled in service trade organizations may subscribe to RADIO MAINTENANCE at a special Group Plan price. WRITE US FOR PRICES. Here's how it's done:

1. Offer open to members of Radio Servicemen's Associations, societies or organizations.
2. Applies to all orders from these organizations containing *five* or more names.
3. Orders must be on the *organization* letterhead and must give the name and address of each subscriber. State subscriber's service status (is he a shop owner, employee of service department, service manager, etc?) Magazines will be delivered to subscriber's address.
4. Payment must accompany each order.
5. If a serviceman already has a subscription he may renew it through this group plan, but be sure to mark plainly "RENEWAL" in these cases.
6. Address all orders to:

RADIO MAINTENANCE Magazine, 460 Bloomfield Ave., Montclair, N. J.



# Build YOUR OWN TEST EQUIPMENT

## Heathkit ELECTRONIC SWITCH KIT DOUBLES THE UTILITY OF ANY SCOPE



**\$34.50**

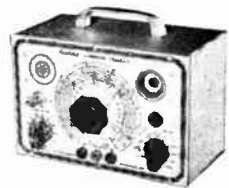
Gives two separately controllable traces with individual inputs on any scope. See both the input and output traces, locate distortion, phase shift, etc., immediately. Individual gain controls and positioning control. Coarse and fine sweeping rate controls. Complete Heathkit matches others, with 5 tubes. All metal parts are punched, formed and cadmium plated. Complete with tubes, all parts, detailed blueprints and instructions. Shipping Wt. 13 lbs.

**Nothing ELSE TO BUY**

## HEATHKIT CONDENSER CHECKER KIT

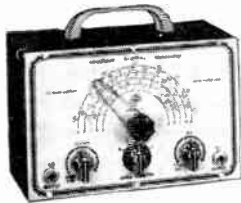
**\$19.50**

*Nothing ELSE TO BUY*



A condenser checker anyone can afford to own. Measures capacity and leakage from .00001 to 1000 MFD on an calibrated scales with test voltage up to 500 volts. No need for tables or multipliers. Reads resistance 500 ohms to 2 megohms. 110V 60 cycle transformer operated complete with rectifier and magic eye indicator tubes. Easy quick assembly with clear detailed blueprints and instructions. Small convenient size 9" x 6" x 4 3/4". Wt. 4 lbs.

## HEATHKIT SIGNAL GENERATOR KIT

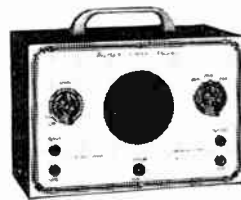


**\$19.50**

**NOTHING ELSE TO BUY**

Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc. 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 30% 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 4 3/4". Wt. 4 1/2 lbs.

## HEATHKIT SIGNAL TRACER KIT



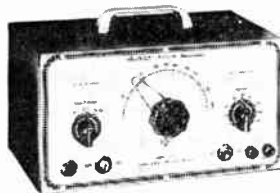
**\$19.50**

*Nothing ELSE TO BUY*

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. 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. Small portable 9" x 6" x 4 3/4". Wt. 6 pounds. Ideal for taking on service calls. Complete your service shop with this instrument.

## HEATHKIT SINE AND SQUARE WAVE AUDIO GENERATOR KIT

The ideal instrument for checking audio amplifiers, television response, distortion, etc. Supplies excellent sine wave 20 cycles to 20,000 cycles and in addition supplies square wave over same range. Extremely low distortion, less than 1%, large calibrated dial, beautiful 2 color panel, 1% precision calibrating resistors, 110 V 60 cycle power transformer, 5 tubes, detailed blueprints and instructions. R.C. type circuit with excellent stability. Shipping weight 15 pounds.



**\$34.50**

*Nothing ELSE TO BUY*

## THE NEW HEATHKIT VACUUM TUBE VOLTMETER KIT

The most essential tool a radio man can have, now within the reach of his pocketbook. The Heathkit VTVM is equal in quality to instruments selling for \$75.00 or more. Features 500 microamp meter, transformer power supply, 1% glass enclosed divider resistors, ceramic selector switches, 11 megohms input resistance, linear AC and DC scale, electronic AC reading RMS. Circuit uses 6SN7 in balanced bridge circuit, a 6H6 as AC rectifier and 6 x 5 as transformer power supply rectifier. Included is means of calibrating without standards. Average assembly time less than four pleasant hours and you have the most useful test instrument you will ever own. Ranges 0-3, 30, 100, 300, 1000 volts AC and DC. Ohmmeter has ranges of scale times 1, 100, 1000, 10M and 1 megohm, giving range .1 ohm to 1000 megohms. Complete with detailed instructions. Add postage for 8 lbs.



**\$24.50**

*Nothing ELSE TO BUY*

## HEATHKIT FM AND TELEVISION SWEEP GENERATOR KIT



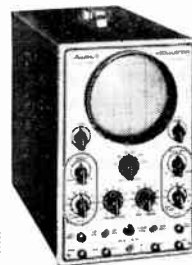
**\$24.50**

**NOTHING ELSE TO BUY**

### THE BASIC FM AND TELEVISION SERVICE INSTRUMENT

At the lowest cost possible, anyone can now service FM and television receivers. The Heathkit sweep generator kit operates with oscilloscope and covers all necessary frequencies. A few pleasant hours assembling this kit puts any organization in position to share the profits of the FM and TV boom. Every part supplied - grey crackle cabinet, two color calibrated panel, all metal parts punched, formed and plated. 5 tubes, complete detailed instructions for assembly and use. Shipping weight 6 lbs.

## The NEW 1948 HEATHKIT 5 INCH OSCILLOSCOPE KIT



**\$39.50**

**NOTHING ELSE TO BUY**

New improved model of the famous Heathkit Oscilloscope. Building an oscilloscope is the finest training for television and newer servicing technique and you save two-thirds the cost. All the features and quality of instruments selling for \$100.00 or more. Supplied complete with cabinet, two color panel, 5B1 tube, 2 5Y3 tubes, 2 6J57 tubes and 884 sweep generator tube. Power transformer supplies 1000V negative and 350 volt positive. Sweep generator 15 cycles to 30 M. cycles. Has vertical and horizontal amplifiers. Oil filled filter condensers for long life. Complete blueprints and instructions included.



**The HEATH COMPANY**

**... BENTON HARBOR 10, MICHIGAN**

**NEW 15/16" CONTROLS**



**ACTUAL SIZE!**

★ Yes sir, a brand new member of the well-known Clarostat family of controls. Type 47 or 15/16" diameter miniature control is smaller, handier, yet just as tough as its bigger brother, Type 37 composition-element control.

It's a beauty. Note the trim lines. It includes the famous Clarostat *stabilized element* you can bank on. Nothing sacrificed by way of electrical and mechanical sturdiness in attaining smaller size. Available with (factory-equipped) or without switch. Available with one tap. Choice of tapers.

Write for literature. Let us quote on your requirements.



*Controls and Resistors*

CLAROSTAT MFG. CO., Inc. · 285-7 N. 6th St., Brooklyn, N. Y.

In Canada: CANADIAN MARCONI CO., Ltd. Montreal, P.Q., and branches

## Triode Frequency Converter Circuits

→ From page 14

injection voltage can be readily measured by measuring the developed d.c. at the mixer grid with an electronic voltmeter, isolated with a one megohm resistor in series with the probe.

For optimum operation of the 6J6 tube, the developed voltage at the mixer grid should be about 4 or 5 volts. This should be measured while rotating the tuning condenser from minimum to maximum, to check for sharp peaks or valleys in the developed bias, indicating unstable oscillator operation.

→ to page 40

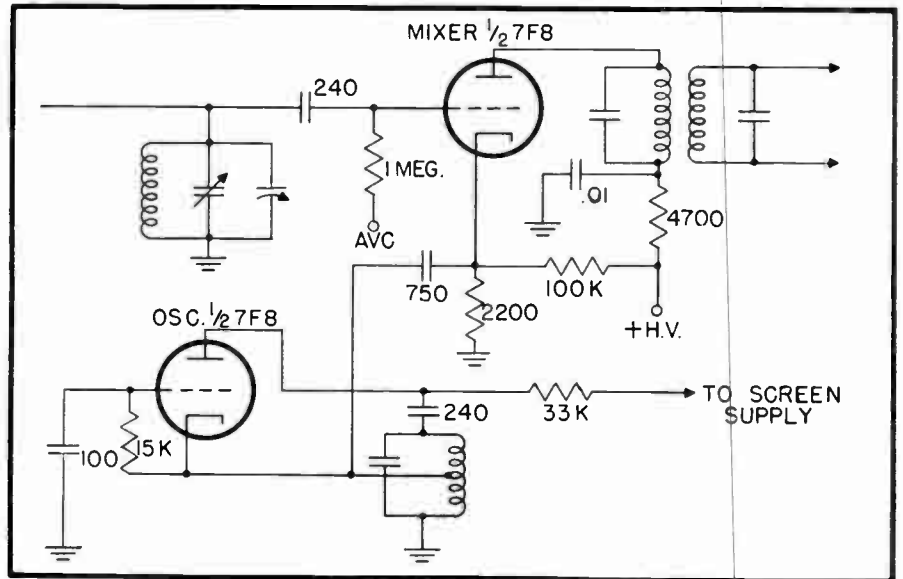


Fig. 3. Mixer-Oscillator stages of Philco Model 46-1226.



## Astatic FL-33 PICKUP FOR COLUMBIA MICROGROOVE RECORDS

● Here is no mere version of what a pickup for use with Columbia Microgroove Records should be—but the actual playing arm designed to meet the precise requirements of Columbia's new recordings. This new Astatic Pickup is manufactured to meet the specifications by Columbia, to insure maximum quality performance of the Columbia LP Microgroove Record. Available, then, in the Astatic FL-33 Pickup and LP-33 Crystal Replacement Cartridge, is the ultimate of Microgroove companion equipment . . . alone capable of getting the most out of LP Records.

ALSO AVAILABLE is the LP-78 Cartridge that fits the FL Arm, but having a .003" radius needle for playing 78 RPM Records.

**FL FILTER:** For best performance with high quality speakers. Controls pickup response—Eliminates high frequency peak.

## FEATURES OF ASTATIC'S FL-33 PICKUP

- 1 Five-Gram Needle Pressure;
- 2 Permanent Sapphire Needle with .001" Tip Radius;
- 3 Approximately One-Half Volt Output;
- 4 Frequency Range 30 to 10,000 c.p.s.;
- 5 Novel Design at Base Eliminates Tone Arm Resonances and Assures Perfect Tracking;
- 6 LP-33 Cartridge, with replaceable, permanent sapphire needle.

LISTED IN RADIO INDUSTRY RED BOOK

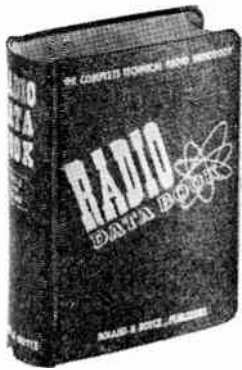
Astatic Crystal Devices Manufactured Under Brush Development Co. Patents





# TWO GREAT BOOKS...COVERING EVERYTHING IN RADIO & TELEVISION

EVERYTHING IN RADIO AND ELECTRONICS IN ONE BOOK!



## THE RADIO DATA BOOK

the only radio handbook of its kind . . . 1148 pages . . . 12 sections, each covering a radio subject more completely than any other book!

Used by Engineers, Servicemen, Designers, Laboratory Technicians, Draftsmen, Operators, Inspectors, Amateurs, Experimenters, Research Development, Consultants, Broadcast Technicians, Planners, Installation Men, Military, Marines, Police, Fire, Forestry and Railroad Communications.

Anyone and everyone in radio and electronics can use this book!

### SECTION 1. 150 BASIC CIRCUITS

Each circuit properly classified and clearly labeled for instant reference! Every basic operating unit in the entire field of electronics for the convenience of everyone in radio—150 circuits—completely illustrated—ALL in this one section!

### SECTION 2. TEST EQUIPMENT

All types of volt, current and ohmmeters, tube checkers, condenser meters, inductance meters, bridge measuring devices, RF signal generators, AF signal generators, signal tracers, distortion analyzers, test speakers, oscilloscopes, square-wave generators, frequency meters, field strength and tuning meters are explained and illustrated.

### SECTION 3. TESTING AND MEASURING

How to use test equipment and make every kind of measurement in radio. This section alone is worth the price of the entire book.

### SECTION 4. ANTENNAS

This section presents complete information on all antennas, transmitting and receiving. Completely illustrated, showing various types of antennas, their construction and wave patterns.

### SECTION 5. SOUND SYSTEMS

The planning, selection of equipment and the assembling and combining of various components in complete PA installations. Every type of unit used is described and analyzed in detail.

### SECTION 6. RECORDING

This section is the only complete description of disc recording found in any radio manual on the market. Here all phases of recording are covered—both home and commercial.

### SECTION 7. TUBE MANUAL

The only uncommercial tube manual giving complete listing of all transmitting and receiving tubes with each tube base illustrated alongside the description.

### SECTION 8 & 9. CHARTS, FORMULAS, CODES, GRAPHS, SYMBOLS

Here in these two sections are found all data and information useful to anyone in radio and electronics.

### SECTION 10. TESTED CIRCUITS

88% of all equipment built in radio & electronics is covered here in a section presenting the typical circuit with parts lists and descriptions of each type. This is by far the most useful collection of circuits ever presented.

### SECTION 11. DICTIONARY OF ELECTRONIC TERMS

This dictionary will explain every radio term—any word used in radio.

### SECTION 12. BIBLIOGRAPHY

Here is a unique and valuable list of books for anyone desiring further details on any subject in Radio.

12 complete books in one only  
Less than 42c per book!

**\$5.00!**

THE MOST COMPLETE TELEVISION MANUAL

## THE VIDEO HANDBOOK

768 pages . . . 14 sections, covering every phase in television . . . over 800 illustrations . . . handsomely bound in Du Pont Fabrikoid with red and silver letters.

How Television Works, Basic . . . through advanced.  
How to Design and Engineer Television.  
How to Troubleshoot and Repair Television, Safety procedures.  
How to Select and Install a Television Antenna.  
How to Create a Television Show.  
How to Build an Operating Television Receiver Complete Instructions.  
How to Select a Television Receiver.



### SECTION 1. TELEVISION, PAST, PRESENT AND FUTURE

Here you will find an account of the inventions, discoveries and developments that led to the present system of television.

### SECTION 2. FUNDAMENTALS OF ELECTRONIC TELEVISION

In this chapter, a simplified explanation of the complete electronic television system is given.

### SECTION 3. THE TELEVISION STATION—PICK-UP—CONTROL—TRANSMISSION

Each operation and piece of equipment is taken in a step-by-step presentation, illustrated with photographs, schematics, white on black scope patterns and graphs, and simplified line drawings.

### SECTION 4. THE TELEVISION RECEIVER

*Programming and Production*

Each stage is individually studied and its function completely described as a unit and in relation to all the other stages.

### SECTION 5. TELEVISION ANTENNA SYSTEMS

*Circuit Variations—Design—Mechanical Features*

The proper antenna for the various receivers and locales are explained.

### SECTION 6. CREATING A TELEVISION SHOW

In television programming is tightly interwoven with technical operation—the man who knows this and studies both will profit greatly.

### SECTION 7. DESCRIPTIONS OF MODERN TELEVISION RECEIVERS

*Troubleshooting—Interpreting Test Patterns—Alignment—Repair*

This section includes a circuit diagram of every type of receiver on the market today.

### SECTION 8. INSTALLING TELEVISION RECEIVERS

Every step is covered . . . pre-installation surveys, equipment required, locating and erecting the antenna, laying transmission lines, locating the receiver in the building.

### SECTION 9. SERVICING TELEVISION RECEIVERS

This is another section devoted to detailed, how-to-do-it procedure, this time on servicing the receiver.

### SECTION 10. TELEVISION TEST EQUIPMENT. HOW TO USE IT—HOW TO BUY IT

Section 10 of the VIDEO HANDBOOK was expressly designed to give you this information—it can save you as much as \$1000.00 in purchasing test equipment.

### SECTION 11. BUILDING A TELEVISION RECEIVER

Included here are complete plans, diagrams, photographs of components needed and step-by-step assembly instructions.

### SECTION 12. DATA SECTION

Here are compiled all the graphs, charts, curves, nomographs, symbols, formulas and rules used in television.

### SECTION 13. TELEVISION TERMS

A complete dictionary of words, terms, phrases and titles used in television.

### SECTION 14. BIBLIOGRAPHY

This is the most complete list of literature on television issued to date.

**ADVANCE SALE ORDER NOW!**

**\$5.00**

These books are best sellers in the radio and television field. Make sure you get your copies . . . order now! Use this coupon to order either one or both books—get them both, you'll profit by the valuable information they contain!

Mail This Coupon to Your Jobber Today — or Direct to: **RM-10**  
BOLAND & BOYCE, 460 Bloomfield Ave., Montclair, N. J.

Send me 1 RADIO DATA BOOK

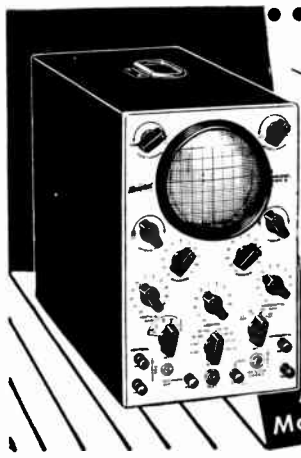
I enclose \$5.00 (\$5.50 Foreign)  
 I enclose \$1.00 and will pay postman \$1.00 on delivery (in U. S. only)

Send me 1 VIDEO HANDBOOK

I enclose \$5.00 (\$5.50 Foreign)  
 I enclose \$1.00 and will pay postman \$1.00 on delivery (in U. S. only)

NAME .....  
ADDRESS .....  
CITY ..... ZONE .....  
STATE .....

**BOLAND & BOYCE INC., PUBLISHERS**



**THE HICKOK** *World Famous*  
**CATHODE RAY OSCILLOGRAPH**  
 For Television

This 5" Oscillograph is SEVEN to TWENTY times more sensitive, for stage by stage alignment.  
 Features: Phasing control with HICKOK exclusive sinusoidal sweep. • Extra high gain vertical amplifiers—.03 V per inch. • Synchronized linear FM sweep.  
 • Wide band amplifiers for FM and Television—better than 1 megacycle.  
 See Your Jobber or Write for Literature.  
**THE HICKOK ELECTRICAL INSTRUMENT CO.**  
 10634 Dupont Avenue, Cleveland 8, Ohio

Ask for Model 195 B

**Triode Frequency Converter Circuits**

→ From page 38

A unique feature of this circuit is the part played by the small inductance, L5, in series with the mixer plate. This inductance in combination with the 51 mmf condenser across the primary of the first i.f. transformer, forms a series resonant circuit which effectively short circuits the plate at the resonant frequency. The values are chosen to resonate near the middle of the FM band, say, at 98 megacycles. The "Q" of the coil is intentionally poor so that the circuit tunes broadly and "traps" or shorts out any frequency between 88 and 108 megacycles appearing on the mixer plate, where only the i.f. frequency is desired. This gimmick also materially increases the mixer grid resistance, so that the loading of the grid on the input tuned circuit becomes negligible. A high "Q" tuned circuit is therefore possible, which greatly improves the image rejection and r.f. selectivity.

The inductance, L5, could have a detrimental effect however, since in combination with the plate-to-cathode capacity of the tube, it would form a parallel resonant circuit at a frequency of several hundred megacycles. This could make the tube oscillate at a high frequency and cause unstable and erratic operation of the set. To prevent this, the 47 mmf shunt capacitor is provided from the mixer plate to cathode. This adds enough shunt capacity to prevent parallel resonance at any frequency higher than the band.

Due to the relatively low plate impedance of the triode mixer, the typical i.f. transformer used is limited in effect, so that the mixer gain is less than that of a pentode mixer. However, the decreased grid loading enables a much higher gain in the preceding r.f. stage than is possible with other tubes, so that the overall gain from antenna to mixer plate is approximately the same. The overall selectivity is also about the same. If high "Q" r.f. circuits are used, the triode has the advantage of much improved image rejection.

The tuning of the signal circuit in the triode mixer grid causes a shift

→ To page 41



**QUALITY, FIDELITY  
 FOR FM, MONITORING,  
 RECORDING, AND  
 OTHER SOUND USES**

**WIDE RANGE and  
 PA SPEAKERS**

**GET HIGH** quality sound reproduction throughout the tonal range with Utah Wide Range Speakers. These Wide Range Speakers assure exceptionally brilliant response in the middle range plus extension of the higher frequencies to 10,000 cps. Unusual sound requirements in FM, laboratory, monitoring, or recording work, often can be met with Utah Speakers. Ask about the SP8JW and SP12LW.

**WHEN YOU** have a public address job use SP8K, SP12M, SP12P. Utah Speakers are quality built and severely tested. They are completely dust proofed and have pot covers. Write for catalog today!

**UTAH RADIO PRODUCTS**

**HUNTINGTON, INDIANA**  
 DIVISION OF INTERNATIONAL DETROIT CORPORATION  
 EXPORT DIVISION: MORHAN EXPORTING CORPORATION  
 NEW YORK, NEW YORK



**BUILT STRONGER TO LAST LONGER**



## For Replacements

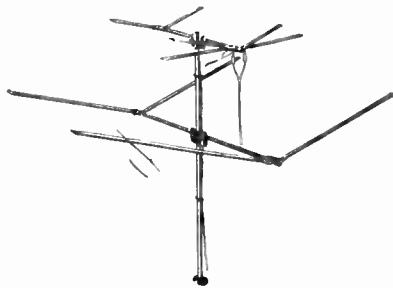


### Rely on these ERIE RESISTOR components

For years many leading set manufacturers have used ERIE RESISTOR components. When repairs call for replacement—replace with ERIE RESISTOR. If your distributor can not supply you, write us for information. New catalog on request.



Covers All Twelve Channels



### The Profitable TV Antenna

Premax No. T-448 Television Antenna is radically new and has been severely simplified in design for quick, easy assembly and erection—for its rugged strength and service—plus a low cost that means real profit for the dealer or service man.

It covers ALL 12 CHANNELS! Tests show a relative response (db.) of about 1 to 3.25 on Channels 2 to 6, with a drop from 0 to -8 after 90 meg.—coming back to -2 to 3.5 on Channels 7 to 13.

Consists of two separate arrays on same mast, each fully adjustable in vertical and horizontal planes. Interconnected by a NEW circuit licensed under AA&K patents. Can be had for all frequencies or either band.

Write for complete details and price.

**PREMAX PRODUCTS**  
DIVISION CHISHOLM-RYDER CO., INC.

4907 HIGHLAND AVE., NIAGARA FALLS, N. Y.

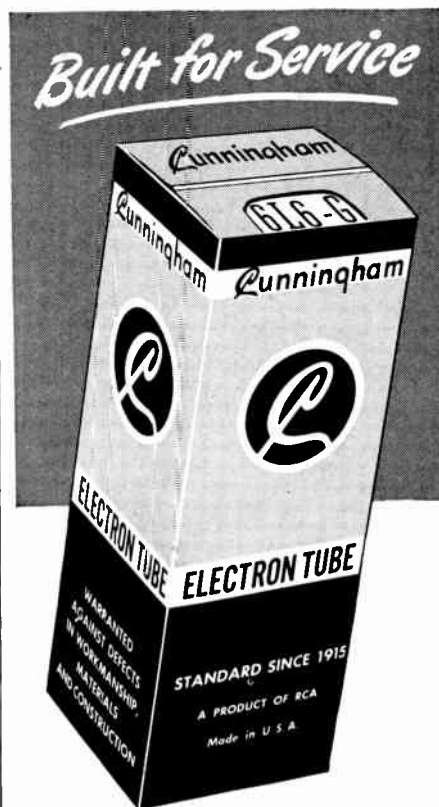
## Triode Frequency Converter Circuits

→ From page 40

in oscillator frequency of 20 or 30 kc, but this is fairly small compared to the i-f frequency, and causes no particular difficulty.

In Philco Models 46-427, Fig. 2, and 46-1226, Fig. 3, the circuit is much the same except that a.v.c. is applied to the mixer grid. A small amount of delay is inherent in the a.v.c. due to the regulating action of the grid leak bias. This is somewhat overcome by the fixed bias provided by the resistor in the cathode lead. Degeneration in the cathode is prevented in the 46-427 model by bypassing the cathode resistor with .05 mf. It is reduced in the 46-1226 model by a 100,000 ohm bleeder resistor from the high voltage supply. The application of a.v.c. results in a slight shift in oscillator frequency, but in a well designed set the shift is kept within reasonable limits. The plate resistance of a triode mixer rises with a.v.c. voltage, which somewhat narrows the band-pass of the first i.f. transformer. This effect is not desirable in an FM set, where overall fidelity is a requisite.

Repairing a set which uses a triode mixer will be no particular trouble for the radio serviceman who clearly understands the reason for each part in the circuit. A good thing to bear in mind when servicing any modern radio is that the manufacturer is extremely cost conscious, and will not put extra parts in the set without very good reasons. The triode mixer can be treated the same as any other amplifier at high frequencies. Shields which may be in the set are especially important on triode tube sockets because of the grid-plate capacities which might cause regeneration. Never change the point at which a ground wire is connected to the chassis or other grounded structure. Lead lengths must be short, and care should be exercised in dressing the leads in the manner recommended by the manufacturer. The inductance of a short straight length of wire, even though not formed into a coil, becomes extremely important at frequencies approaching 100 megacycles. ✓ ✓ ✓



**Servicemen's choice!**  
in...



● Cunningham tubes assay high in esteem in Montana—because Cunninghams measure high in quality and performance. They're built to give long life and trouble-free service. When new tubes are called for, replace with Cunninghams, and you won't have to go prospecting for new customers.

See your  
**CUNNINGHAM DISTRIBUTOR**  
**George Steele & Co.**  
**Butte**





# GET INTO THE TELEVISION BUSINESS IN A BIG WAY NOW WITH THE NEW **TRANSVISION** DEALER PLAN

It brings you a sure-fire means of doing a **BIG** and **PROFITABLE** business in Television Receivers

*It's simple . . . but it's great!*

- NO FORCED PURCHASES
- NO "TIE-IN" DEALS
- NO CAPITAL PROBLEM
- NO INVENTORY PROBLEM

Get the **FACTS** about this amazing new Transvision Dealer Plan which will give you a big stake and big future in television.

**FILL OUT AND MAIL THIS COUPON NOW!**

Transvision, Inc., New Rochelle, N. Y.

( ) Rush all the information on your special new Dealer Plan.

( ) I want to attend your Special Dealer Television Meeting.

Name .....

Address .....

My distributor is .....

## FM I.F. Amplifiers

→ From page 9

*skirt selectivity.*

To obtain the necessary flat top response with good skirt selectivity, several coupling methods have been used by different receiver manufacturers. One method is to make each of the coupling circuits have a different resonant frequency. The resonance curves of all these circuits combine to form the desired overall response curve as shown in Fig. 3. When such an i.f. section is aligned, each tuned circuit must be aligned separately with an AM signal generator, and only the final overall response check can be made by the visual alignment (sweep generator) method.

Another method is illustrated in Fig. 4. In this case the individual response of each stage is designed to be somewhat broader than the desired overall response. Each circuit is then aligned on the designated i.f. of the receiver. The combined effect of the three stages illustrated is to sharpen the response to the desired value for the whole amplifier. In this case, individual AM alignment is not necessary and the circuits can be adjusted conveniently while viewing a sweep pattern on an oscilloscope.

In a few receivers other arrangements are employed. In some cases, loading resistors are used to broaden the response of some stages, while other stages are more selective. The two different responses in the same amplifier combine to give the desired overall response characteristics.

### I.F. Coils

Outwardly, FM i.f. coils greatly resemble AM i.f. coils, except that many of the FM variety are smaller. The internal construction of FM i.f. coils is quite different in appearance because the FM i.f. is so much higher than the AM i.f. Instead of the large, universal (pi-) wound coils found in 455 kc. i.f. coils, the 10.7 Mc. variety consist of only a few turns, in a solenoidal form. The coil form is usually any size from 1/4 to 3/4 in. in diameter and has an adjustable slug mounted inside.

Sometimes the coils (primary and secondary) are wound on the same form. In this case there may be an adjustable slug for each coil, with the adjusting screws for these slugs projecting from the top and bottom of the can respectively. In other mod-

els, the coils are wound on separate forms which are mounted horizontally on the side of the can. Discriminator transformers are frequently of this design, because of the independent nature of the primary and secondary adjustments.

An interesting new type of i.f. transformer is called the "K-tran," and is found in G.E. receivers. The tuning slug also forms an electromagnetic shield over the coils, thus minimizing the stray pickup which is often a factor at frequencies as high as the 10.7 Mc. standard FM i.f.



Now—a really high-powered

## RADIO ENGINEERING LIBRARY

- especially selected by radio specialists of McGraw-Hill publications to give most complete, dependable coverage of facts needed by all whose fields are grounded on radio fundamentals

The library comprises a selection of books culled from leading McGraw-Hill books in the radio field. These books cover circuit phenomena, tube theory, networks, measurements, and other subjects—give specialized treatments of all fields of practical design and applications. They are books of recognized position in the literature of the field—books you will refer to and be referred to often. If you are a practical designer, researcher or engineer in any field based on radio, you need these books for the help they give in hundreds of problems throughout the whole field of radio engineering.

5 volumes! 2559 pages! 2558 illustrations!

### FUNDAMENTALS OF VACUUM TUBES

by A. V. Eastman—2nd edition

### RADIO ENGINEERING

by F. E. Terman—3rd edition

### COMMUNICATION ENGINEERING

by W. L. Everitt—2nd edition

### HIGH FREQUENCY MEASUREMENTS

by A. Hund

### RADIO ENGINEERING HANDBOOK

by K. Henney—3rd edition

### SPECIAL LOW PRICE • EASY TERMS

Special price under this offer less than cost of books bought separately. In addition, you have the privilege of paying in easy installments.

For 10 days examination send this

an approval coupon

McGraw-Hill Book Co., Inc.,  
330 W. 42nd St., N. Y. 18

Send me Radio Engineering Library for 10 days' examination on approval. In 10 days I will send \$2.50 plus few cents postage, and \$5.00 monthly till \$27.50 is paid, or return books postpaid.

Name .....

Address .....

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

Company .....

Position .....

\*SAVE! We pay postage and packing charges if you send first payment with your order. Same return privilege.

RM-10-48

No discussion of FM coils is complete without mention of the combination i.f. transformer used in this type of receiver. Fig 5 shows a schematic diagram of a typical combination circuit. As can be seen in this figure, two interconnected transformers are employed. These transformers are sometimes included in the same shield can; at other times in a separate shield can. The low frequency (AM, 455 kc.) primary tuned circuit (L1-C1) is connected in series with the high frequency primary tuned circuit L3-C3. The secondary tuned circuits are similarly connected.

To signals of the 455 kc. i.f., L3 offers such a low impedance that the bottom end of L1-C1 is effectively grounded. To signals of the 10.7 Mc. i.f., the impedance (reactance) of C1 is so low that the top of L3-C3 is effectively connected to the plate of the tube. Similar conditions exist in the secondary circuit.

With this arrangement, no switching is ever necessary in the i.f. amplifier section. When the tuner section of the receiver is switched from AM to FM, the i.f. section automatically adjusts itself to the proper

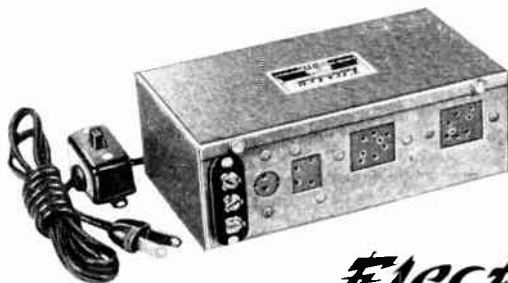
i.f. It is important that the serviceman remember that this arrangement is frequently used. It means that trouble in the i.f. section coils may make the receiver inoperative on both AM and FM. For instance, a short-circuit from some part of the low frequency primary winding to ground would interfere with the operation on FM or AM.

In spite of the fact that several new detectors for FM reception accomplish their own limiting, a large number of receivers now in use include a limiter and a discriminator. The limiter is necessary because the discriminator with which it is used is sensitive to AM signals or disturbances as well as to the desired FM signal. Because the FM signal and the resulting i.f. signal has been purposely modulated only in frequency, the amplitude of the wave can be distorted in any desired manner without interfering with the frequency modulation we wish to preserve.

The limiter circuit reduces the amplitude of the i.f. signal sufficiently to remove amplitude variations of the signal without interfering with the

→ To page 45

## OPERATE RADIO RECEIVERS FROM SINGLE BATTERY?



### It's Easy with this SYNCRON POWER UNIT

**ELECTRO**  
ELECTRICAL AND RADIO EQUIPMENT

The Model "Q" Syncro power provides A & B voltages from a 6-volt battery with only 1/8 the drain that an auto radio exerts on battery. Gives over three weeks reception for a 4-tube radio from a single storage battery charge. Costs but a few cents a day to operate.

There is a big country market for the Model "Q", and the Model "R", for dealers in the farm country, and for city dealers whose customers have summer homes. Model "R" for 2-volt 4, 5, 6 and 7-tube radios. Model "Q" for 1.4 volt, 4, 5 and 6-tube radios.

There is an Electro Battery Eliminator for every requirement operating from either 110V, 220V, 50 to 60 cycles, or from 6V storage battery; also 6V, 15 amp. Model "A" operating from 110V, to 50 to 60 cycles. All are completely filtered and hum free. Compact units of sturdy construction with Hammerloid finish. Operate in any position.

### ELECTRO PRODUCTS LABORATORIES

PIONEER MANUFACTURERS OF BATTERY ELIMINATORS  
549 W. Randolph Street, Chicago 6, Illinois



**Servicemen's choice!**  
in...



Up where the salmon run, Cunningham tubes are a big catch, too ... because Cunninghams have a quality and performance you can't beat. They've been satisfying particular customers since 1915. They'll bring more satisfied customers your way.

See your  
CUNNINGHAM DISTRIBUTOR

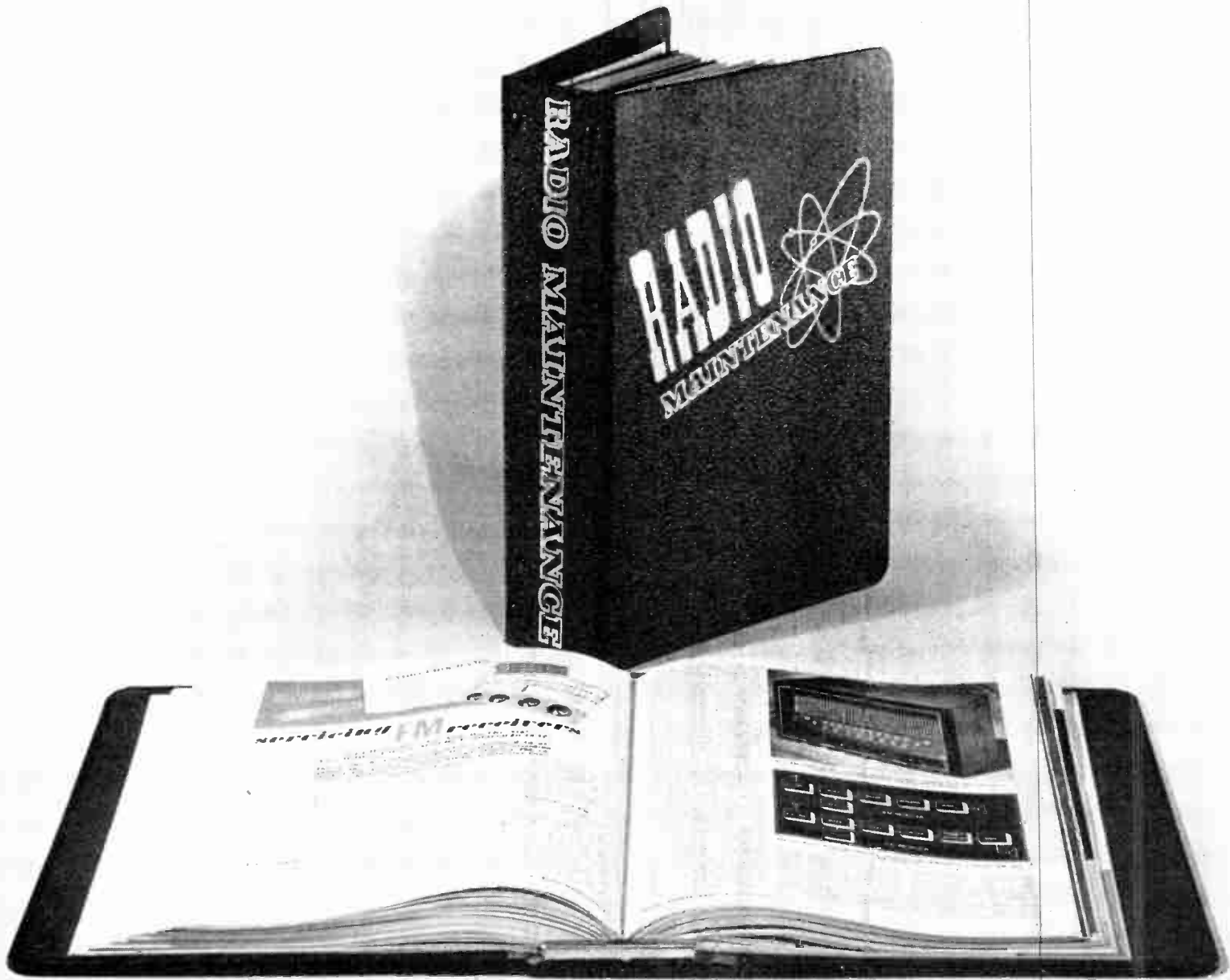
Northwest Radio Supply Co., Inc.  
Portland

United Radio Supply, Inc.  
Portland

**Cunningham Tubes**

A product of  
RADIO CORPORATION OF AMERICA  
Harrison, N. J.





# BINDERS

**SPECIAL SALE DURING  
OCT. ONLY \$2.00 EACH**

Keep your back numbers of **RADIO MAINTENANCE** in these handsome green and gold binders. Each binder will hold up to 18 copies of the magazines without puncturing holes or mutilating them in any way. They are held securely but are easily removed if desired. With the index printed at the end of each year, your magazines will be a constant reference for . . . a valuable service library. Send for your binders now . . . at this special big, BIG saving! **LIMIT 2 TO A CUSTOMER!**

**RADIO MAINTENANCE**  
460 Bloomfield Avenue  
Montclair, N. J.

Please send me . . . binders at the  
special sale price of only \$2.00 each.  
Total amount enclosed . . . . .

Name . . . . .  
Address . . . . .  
City . . . . . Zone . . . . .  
State . . . . .

## FM I.F. Amplifiers and Limiters

→ From page 43

frequency modulation, as shown in Fig. 6. This action is obtained by use of an extra i.f. stage so adjusted that signals of even moderate strength cause the tube to reach plate saturation. The grid of the limiter is allowed to go positive on signal peaks and draw current. A series bias resistor in the grid circuit maintains the value of the bias such, that saturation occurs at a higher amplitude level for strong signals than for weak signals.

Tubes chosen for the limiter stage are preferably the sharp cut-off pentode variety. The 6SJ7 is a popular type. A detailed description of the operation of limiters was given in a previous article in RADIO MAINTENANCE.

The ideal limiter section is the cascade type. Two single-ended limiter stages are connected so that the output of one stage is coupled to the input of the next. In this way, any severe amplitude variations which

managed to get through the first limiter stage are limited in the second. Another advantage of the cascade type is the fact that two different grid circuit time constants can be used.

The time constants are the products of the resistance and the capacitance used for bias in each stage. They determine how quickly each stage will respond to an amplitude variation of a certain rapidity. A small time constant (smaller resistor and/or smaller condenser) operates better on fast variations, while the larger values are better for slow changes like fading effects. With the cascade limiter, one stage can have a high time constant and the other a low time constant, thus providing good limiting action for either fast or slow amplitude variation.

### Possible Troubles

Many of the troubles which the serviceman will encounter in FM i.f. sections are similar to those he has experienced in AM receivers. In fact, most of the FM receivers you will be called upon to service, will be combination types. They will contain both 455 kc. and 10.7 Mc. i.f. transformers, or combinations of the two as described above. Probably less cases of B plus shorts and open windings will be experienced. The high frequency coils are smaller and usually wound with a larger size of wire.

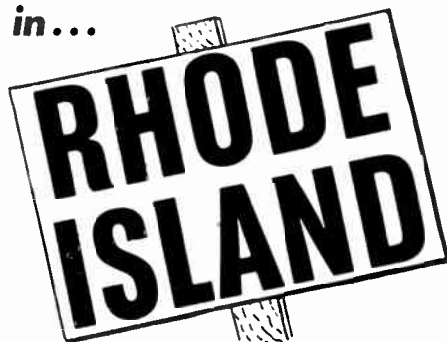
More likely trouble in FM i.f. sections is instability (tendency toward oscillation). This can arise from any of a number of causes. Improper alignment or defective shielding are two causes. Lead length is very important; usually the shorter the better as far as leads are concerned, although *the serviceman is safest in maintaining the original wiring layout as closely as possible.*

By-passing in the i.f. circuits is very important and it is strongly advised that replacements of by-pass condensers be exact whenever possible. Be especially careful of paper condensers, which have unsatisfactory characteristics at high frequencies due to the inductance resulting from their tubular shape and construction.

The next articles about FM receivers will discuss the various types of detector circuits, including the latest lock-in oscillator and superregenerative types. ✓ ✓ ✓



**Servicemen's choice!**  
in...



• For quality in jewelry and textiles, it's Rhode Island . . . and in Rhode Island it's "Cunningham" for quality tubes. For 32 years, Cunningham tubes have been noted for their top performance and long service life. Vote to use Cunninghams exclusively in *your* work.

See your  
**CUNNINGHAM DISTRIBUTOR**  
**WILLIAM DANDRETA & CO.**  
Providence



**FREE**

**SERVICE MEN REPAIRMEN!**

**WALDOM REPLACEMENT CONE MANUAL**

Just mail your name and address today for **FREE** copy of the big 20 - Page **WALDOM Replacement Cone Manual**, listing replacement data for 69 different brands of speakers—from Admiral to Zenith! Manual also gives complete instructions, together with clear illustrations for installing cones properly. Invaluable reference guide for servicemen and repairmen. Get your copy **FREE!** Just send name and address.

### FOR FINER TONE A WALDOM CONE

**Waldom Replacement Cone Assemblies** will satisfy the high standards of precision workmanship and performance set by you and by your customers because . . .

- **WALDOM CONE ASSEMBLIES** feature **HAWLEY** diaphragms with the patented thin, tapering edge that assures maximum speaker efficiency and true low frequency response.
- **WALDOM CONE ASSEMBLIES** are guaranteed unconditionally as to construction and performance. Only the very finest voice coils and spiders, precision made to exact specifications, are used.
- **WALDOM CONE ASSEMBLIES** carry full R. M. A. Warranty.

### Write for Your FREE

**REPLACEMENT CONE MANUAL!** The big 20 - Page **WALDOM Manual** puts every bit of replacement cone information at your fingertips, in seconds! It will speed your speaker repair work, and help you handle those jobs more profitably. Send your name, address for **Free** copy.

**WALDOM ELECTRONICS, INC., Dept. RM**  
911 N. LARRABEE STREET CHICAGO, ILLINOIS



**LIFE-SIZE TELEVISION is here!**



Here's great news in television! The brand-new CORTLEY PROJECTION TELEVISION RECEIVER — an amazing set capable of throwing an image, varying in size from several inches up to 6x8 feet, onto a screen — just like a home movie projector. This compact, highly mobile CORTLEY RECEIVER now enables hundreds to view a telecast without squinting and straining at images previously measured in inches.

**UNLIMITED SALES OPPORTUNITIES**

Bars, Restaurants, Schools, Clubs, Churches, Hospitals, Resorts—these are but a FEW prospects! They have been clamoring for television that can be seen by several hundred people at one sitting—and now you can supply them. Here is television reception of the future brought to you right now.

Get in on this brand-new, easy-to-sell market. Be the first to fill the enormous need. Send for full information and price today.

A limited number of Cortley Distributorships are still available. Write for particulars today.

**CORTLEY TELEVISION CORP.**

Dept. RM 15 West 27th St.  
New York 1, N. Y. Tel. MU 3-3624

**BACK NUMBERS**

**Get Them While They Last**

**JANUARY 1946**

THE PROBLEMS OF ORGANIZATION  
TELEVISION RECEIVER INSTALLATION  
RADIO MAINTENANCE IN AVIATION  
USING THE OSCILLOGRAPH FOR  
DISTORTION MEASUREMENTS

**APRIL 1946**

A MIDGET AUDIO FREQUENCY  
OSCILLATOR  
IF I WERE A SERVICEMAN  
AN EQUALIZED AMPLIFIER FOR  
MAGNETIC PICKUPS

**MAY 1946**

PA SYSTEMS  
TEST PANEL FOR THE MODERN BENCH  
RINGING THE BELL

**JUNE-JULY 1946**

FUNDAMENTALS OF TELEVISION  
VOLUME CONTROL TAPERS  
THE ELECTRONIC OHMMETER  
VECTOR ANALYSIS

**AUGUST 1946**

AVC CIRCUITS  
FM TROUBLESHOOTING  
TELEVISION RECEIVER FUNDAMENTALS  
RECORD CHANGERS

**DECEMBER 1946**

TELEVISION RECEIVERS . . .  
THE RF SECTION  
TUNING THE INDICATORS  
PART II—THE OSCILLOGRAPH . . .  
HOW TO USE IT  
REPLACING AUTO CABLES

**JANUARY 1947**

SERVICING BY EAR  
TELEVISION RECEIVERS . . . VIDEO  
CHANNEL  
PART III—THE OSCILLOGRAPH . . .  
HOW TO USE IT  
MINIATURE TUBE CHART

**FEBRUARY 1947**

THE OSCILLOGRAPH . . . HOW TO USE  
IT PART IV  
TELEVISION RECEIVERS . . . THE SOUND  
CHANNEL  
THE AUDIO OSCILLATOR  
SELENIUM RECTIFIERS

**MARCH 1947**

ANTENNAS . . . FM AND TELEVISION  
PART I  
SERVICING AUTOMATIC RECORD  
CHANGERS  
OSCILLATORS AND CONVERTERS  
TELEVISION RECEIVERS . . . THE VERTICAL  
SWEEP

**APRIL 1947**

ANTENNAS . . . FM AND TELEVISION,  
PART II  
PHASE INVERTER CIRCUITS  
A UNIVERSAL SPEAKER  
TELEVISION RECEIVERS . . .  
THE HORIZONTAL SWEEP

**MAY 1947**

THE OPEN AND CLOSE CASES  
VOLTAGE DOUBLERS  
SIGNAL TRACER  
TELEVISION RECEIVERS . . . THE  
CATHODE RAY TUBE

**JUNE 1947**

WHEN THE CUSTOMER ISN'T RIGHT  
TEST EQUIPMENT MAINTENANCE  
CRYSTAL CONTROLLED SIGNAL  
GENERATOR  
TELEVISION RECEIVERS . . . THE  
POWER SUPPLY

**JULY 1947**

SERVICING FM RECEIVERS  
TEST EQUIPMENT MAINTENANCE, PART II  
TELEVISION RECEIVERS . . .  
FLYWHEEL SYNC

**AUGUST 1947**

SPEAKER MATCHING  
TEST EQUIPMENT MAINTENANCE, PART III  
SERVICING FM RECEIVERS  
TELEVISION . . . HF POWER SUPPLIES

**RADIO MAINTENANCE MAGAZINE**

460 BLOOMFIELD AVE., MONTCLAIR, N. J.

Please send me the back numbers checked here . . .  
I am enclosing 35c for each copy, or \$2 for any 8 copies, or \$3.25 for all 14.

- |   |  |                                      |
|---|--|--------------------------------------|
| <input type="checkbox"/> January 1946   | <input type="checkbox"/> December 1946 | <input type="checkbox"/> May 1947    |
| <input type="checkbox"/> April 1946     | <input type="checkbox"/> January 1947  | <input type="checkbox"/> June 1947   |
| <input type="checkbox"/> May 1946       | <input type="checkbox"/> February 1947 | <input type="checkbox"/> July 1947   |
| <input type="checkbox"/> June-July 1946 | <input type="checkbox"/> March 1947    | <input type="checkbox"/> August 1947 |
| <input type="checkbox"/> August 1946    | <input type="checkbox"/> April 1947    |                                      |
- Have selected B copies . . . enclosing \$2.00       Send me all 14 . . . enclosing \$3.25

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_

**ACORN SUPER VALUES**  
for immediate delivery

**ELECTROLYTIC CONDENSERS  
FP TYPE IN CANS**

10 @ 350v	}	.39
30 @ 300v		
20-20 @ 25v	}	.99
30 @ 450v		
20 @ 450v	}	.74
10 @ 450v		
20 @ 25v	}	1.29
20-20 @ 450v		
20-20 @ 400v-250v	}	.44
10-20 @ 350v		
20 @ 25v	}	.59
30-30 @ 450v		
100 @ 50v	}	.49
1000 @ 25v		
10-10-10-10 @ 400v	}	.89
	}	.59

**ACORN**

Bathub Condensers  
2.0 Mfd 600v with side terminals  
@ 44c, 10 for \$3.90

**VALUE**

**OIL CONDENSERS**

2 x .02 mfd 1500v	.69
.1 mfd 3500v	.79
.1 mfd 7500v	1.79
.25 mfd 3000v	1.19
.15 mfd 4000v	1.39
1.0 mfd 500v	1.89
1.0 mfd 2000v	1.29
1.0 mfd 1200v	.99
4.0 mfd 1000v	.89
4.0 mfd 600v	.45
3.3 mfd 800v	.79
6.0 mfd 600v	1.29
8.1 mfd 100v	1.39
10 mfd 600v	.89
15 mfd 100v	1.89
1.0 mfd 330v AC/ 1000 DC	.39
1.5 mfd 330v AC/ 1000 DC	.39

WRITE FOR  
FREE  
CATALOG

TERMS: 20% cash with order. Balance C.O.D. All prices F.O.B. our warehouse N. Y. C. No orders under \$2.50.

**ACORN ELECTRONICS CORP.**  
80 Vesey St., Dept. M-10, N. Y. 7, N. Y.

**SPEAKER SPECIALIST**

Build yourself a reputation for improved tone of every speaker job you handle. A.G. will back you with the finest reconing service.

- Cones and fields in stock for any speaker
- Full range frequency test
- Audio test at full power rating
- Professional workmanship

Send a trial speaker, parcel post, for quick reconing and return in perfect condition . . . 5"—\$1.50 . . . 12"—\$3.00 . . . others low too!

**A. G. RADIO PARTS CO.**

3515 N. 17th St.

Philadelphia 40, Pa.

## ADVERTISERS

Acorn Electronics Co. ....	46
Agency: Ruth Brook Advertising	
Aerovox Corporation .....	24
Agency: Austin C. Lescarboursa & Staff	
Allied Radio Company .....	28
Agency: George Brodsky Adv.	
American Electrical Heater Co. ....	18
Agency: Dudgeon, Taylor & Bruske, Inc.	
The Astatic Corporation .....	38
Agency: Wearstler, Adv., Inc.	
Capitol Radio Engineering Institute .....	26
Agency: Harry J. Kaufman & Assoc's.	
Chicago Transformer Co. ....	4
Agency: Burton Browne Adv.	
Clarostat Manufacturing Co., Inc. ....	38
Agency: Austin C. Lescarboursa & Staff	
Cortley Television Corp. ....	46
Allen B. Dumont Laboratories .....	30
Agency: Austin C. Lescarboursa & Staff	
Electro-Products Laboratories .....	43
Agency: Merrill Symonds Adv.	
Electro-Voice, Inc. ....	31
Agency: Henry H. Teplitz, Adv.	
Erie Resistor Corporation .....	41
Agency: W. S. Hill Co.	
Feiler Engineering Co. ....	30
General Electric .....	2, 33, 3rd Cover
Agency: Maxin, Inc.	
The Heath Co. ....	37
Agency: Paxon Advertising	
Hickok Electrical Instrument Co. ....	40
Agency: The White Adv. Co.	
Hill Manufacturing Co. ....	26
Hytron Radio & Electronics Corp. ....	27
Agency: Henry A. Loudon Adv., Inc.	
Illinois Condenser Co. ....	26
Agency: Kuttner & Kuttner Adv. Agency	
Jensen Manufacturing Co. ....	48
Agency: Burton Browne Advertising	
P. R. Mallory Co., Inc. ....	17
Agency: The Aitkin-Kynett Co.	
McGraw-Hill Book Co., Inc. ....	42
Olin Industries, Inc. ....	29
D'Arcy Adv. Co.	
Permoflux Corporation .....	24
Agency: Turner Advertising Agency	
Precision Apparatus Co. ....	5
Agency: Shappe-Wilkes, Inc.	
Premax Products Division .....	41
Agency: Norton Adv. Service	
Quam Nichols Co. ....	36
Agency: Triangle Adv. Agency, Inc.	
Radiart Co. ....	6
Agency: Ohio Advertising Agency	
Radio Corporation of America 2nd Cover, 41, 43, 45, 47 .....	
Agency: J. Walter Thompson Co.	
Radio Supply and Engineering Co. ....	22
Agency: Claude E. Whipple Adv.	
Raytheon Manufacturing Co. ....	23
Agency: Walter B. Snow & Staff	
John F. Rider, Publisher .....	28
Agency: Lansford F. King	
Roger Television .....	26
Agency: Stella L. Dratler	

## Over the Bench

→ From page 18

and now it has gone clear dead."

Try to work psychology on me by telling me what dirty low down skunks my competitors are and how flatly they failed on the receiver at which I am now—lucky me—going to have a chance.

Nail me on the street or at a party and insist on giving me all the symptoms of their receivers.

Ask me about a particular brand of receiver: "Just between the two of us, is a Blank set any good?" When I ask which model number they mean, they give me a cold stare that says plainly they think I am either holding out on them or simply do not know.

Take the set to some other shop and buy a new set of tubes there and perhaps a new set of batteries; and then, when it still does not work bring it to me to locate and replace a thirty-cent condenser that was the main trouble in the first place.

Ask me to cobble up a set "just so we can sell it."

Come carrying in just the chassis of a set without either the special loop antenna or the field-coil dynamic speaker.

There! That makes me feel much better. Could you add anything to the list? ✓ ✓ ✓

Howard W. Sams & Company ..	1
Agency: George Brodsky, Adv.	
Sangamo Electrical Co. ....	20, 21
Agency: Arthur R. Mogge, Inc.	
Shure Brothers .....	34
Agency: Casler, Hempstead & Handford	
Simpson Electric Co. ....	25
Agency: Kreicker & Meloan, Inc.	
Solar Manufacturing Corporation ..	3
Agency: O. S. Tyson & Co., Inc.	
Sprague Products Company .....	35
Agency: The Harry P. Bridge Co.	
Sylvania Electric Products, Inc. ....	19
Agency: Newell-Emmett Co.	
Transvision Inc. ....	28, 42
Agency: H. J. Gold Co.	
Triplett Electrical Instrument Co. ....	7
Agency: Western Advertising Agency	
Utah Radio Products Co. ....	40
Agency: Bonsib Advertising Agency	
Waldom Electronics, Inc. ....	45
Agency: E. H. Brown	
Webster-Chicago Corporation ..	32
Agency: Fuller, Smith & Ross, Inc.	



**Servicemen's choice!**



## Cunningham "FIRE BALL" Fluorescent Sign

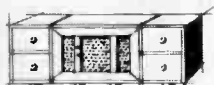
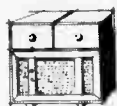
● Here's a sign so brilliant—so penetrating—that it will sell your service day and *night!* In store or window, it's an immediate eye catcher... and it associates your business with Cunningham tubes... the "standard since 1915."

Of heavy steel construction with chrome trim, and measuring 26" long by 3½" deep, the sign has an orange and white fluted glass panel and a 6-foot hanging chain. Comes equipped with a 20-watt fluorescent lamp, ready to plug into any 110-120 volt, 60 cycle AC line.

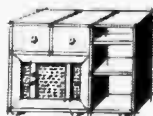
Get your "Fire ball" sign today. Ask your Cunningham Distributor for order form 2F685.







# Jensen Customode



**The answer to your HOME ENTERTAINMENT CENTER.** Designed by leading furniture stylists and electronics engineers, CUSTOMODE custom cabinets give you hundreds of refined functional arrangements, enhancing all interior styles and requirements.

Four Basic Units: Reproducer Cabinet—Bass Reflex design utilizes any 15" speaker including Jensen coaxial speakers; Medium Utility Cabinet—for large equipment, communications receivers, television sets, amplifiers, etc.; Small Utility Cabinet—for tuner, amplifier, recorder, record changer, etc.; Record Cabinet—holding more than 200 records. Mahogany in Blond or Cordovan finish.

Customode's "building block" versatility enables you to create your own layouts as you wish, when you wish. Please accept our invitation to write today for free literature and scale cut-up illustration. Jensen Manufacturing Company, 6601 S. Laramie Ave., Chicago 38, Illinois.

# "KEN-RAD TUBES STAND UP!"

"Nobody can tell me about Ken-Rad tubes—I've been using them for 14 years!

"When you've used them as long as I have, you know you can depend on them.

"I don't know any tube that stands up better than Ken-Rad tubes. They're quality through and through.

"Customers like them. This means repeat business—better business.

"Ken-Rad tubes do the trick, all right!"

**JAMES E. CAMPBELL,**  
Foreman, Quality Control  
Section, who oversees the  
quality sampling inspection  
(below) before tubes are  
accepted into warehouse.  
Ken-Rad tubes are con-  
stantly being tested to as-  
sure dependable perform-  
ance, long life.



**W. B. STYLES** of Styles & Appleton, Oakland, California, one of thousands of reliable servicemen—who depend on Ken-Rad tubes to build repeat business.



## "KEN-RAD TUBES MUST STAND UP!"

"They have to stand up—through test after test.

"This comprehensive testing results in dependable tubes that satisfy your customers, increase your business.

"Ken-Rad tubes are factory-tested for noise, microphonics, static, life, shorts, appearance, gas, air and hum.

"No wonder they're tops in quality, stamina and endurance. No wonder they're customer-pleasers, profit-makers."

**KEN-RAD** *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

176-GA11-8850

**The  
Serviceman's  
Tube**







**How to make  
more money  
in the servicing  
business!**

Your local jobber believes in helping you—his best customer—to make more money, because then you will become a bigger customer and everyone will be happy!

In line with this policy, he pledges his high standard of service and better buys for radio servicemen . . . AND he will present ideas to help you expand your business. In the months to come he will feature a different subject each month on this back cover of RADIO MAINTENANCE. This may be in the nature of new moneymaking ideas, or announcements of special sales in his store, or suggestions on the proper equipment for your work. In all cases, the idea will be to help you—the radio serviceman—make more profit.

Of course his staff of experienced clerks are ready to serve you every day. Drop in his store today—browse around. He has all kinds of good buys you may want to look over. Just mention RADIO MAINTENANCE—and watch this back cover for extra profit for you!

**RADIO MAINTENANCE MAGAZINE**  
460 BLOOMFIELD AVE. MONTCLAIR 1, N. J.