



# radio service dealer



JANUARY, 1948



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RADIO & TELEVISION PORTENTS FOR 1948  
MASTER VS INDOOR TV ANTENNAS  
AUDIO EXTRACTOR FOR SIGNAL GENERATORS  
TV KIT ALIGNMENT PROCEDURES  
THE "260" VOLT-OHM-MILLIAMMETER  
70 VOLT SPEAKER DISTRIBUTION LINE

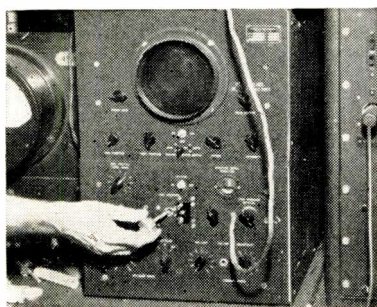
# Quiet as a Moonbeam Falling on Velvet

## It's Impossible to Hear a Mallory Control Operate!



Ultra-sensitive sound testing meters built for the U. S. Navy prove that the noise level of the Mallory control in operation is so low as to be totally inaudible!

Contact with the talcum-fine carbon element is made by a special Mallory Alloy that passes over it smoothly and silently.



*Meter used in the noise level test. Readings were taken on volume controls of all leading manufacturers. Mallory controls gave no audible sound, registered 22% below all others in inaudible sound vibrations.*

The things you look for in a control are low noise level, long life, accurate resistance values and smooth, uniform tapers. Competitive tests prove that Mallory leads the field on all four points!

You can use Mallory Volume Controls, Capacitors and Vibrators with complete confidence. They are carefully built to assure ease of installation and complete customer satisfaction. Mallory's standardized range of sizes and types makes the Mallory line a profitable line to stock.

### "Good Service for Good Business"

A Mallory plan to build business for radio-electronic service shops.

There's a unique customer follow-up system that will produce repeat business. There's a close tie-in with the Mallory trade mark. Ask your distributor about it!



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

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

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

**APPROVED PRECISION PRODUCTS**

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

# BOBBY-SOXERS

play their radios long and hard  
.. buy plenty of tubes, parts, and repair time  
.. will patronize your shop once they see the G-E monogram



## RADIO TUBES

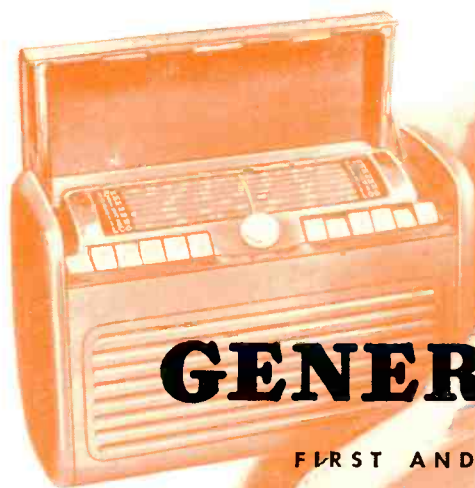
**D**ON'T begrudge 'em their fun. It's the last fling before demure seventeen, studious nineteen, and engaged twenty-one . . . Jive aside, they're smart kids—and loyal. When they buy, it's with an eye to established reputation.

General Electric? *Natch!* . . . Brought up in homes bright with G-E lamps, where breakfast toast—when they take time to eat it—jumps up out of a G-E toaster, where food stays fresh in a G-E refrigerator, time is kept by G-E electric clocks, and G-E fans hum softly in summer . . . these youngsters know the familiar G-E monogram as a friend to be trusted.

Their radio tube and repair business—plenty of it in your area!—goes to the serviceman with the General Electric sign. And years from now they'll still be customers.

Only with larger home sets, meaning a bigger service potential. Start now to make these clients-of-tomorrow patrons of *your* shop. Display and handle General Electric radio tubes! *General Electric Company, Electronics Department, Schenectady 5, New York.*

G-E miniatures, other tubes of all types for servicing portables and home receivers are listed, rated, and described in G.E.'s complete Tube Characteristics Booklet ETR-15. Write for your free copy.



# GENERAL ELECTRIC

176-GA2-8850

FIRST AND GREATEST NAME IN ELECTRONICS

*A Sign of Successful Servicing*



**NELSON HAS ALL  
16 RIDER MANUALS**

(and Volume XVII on order)



**"There's Nothing  
More Essential"**

"Rider Manuals are a must, for an efficient radio servicing business. Of all the equipment we have, there is nothing more essential, more free from obsolescence, more everlastingly profitable than our complete set of Rider Manuals."

*Says*

**DON. D. NELSON**  
Don. D. Nelson Radio  
Seattle, Wash.

**VOL. XVII**  
to be published  
**IN MARCH**  
1600 pages

This volume, taking up where Vol. XVI leaves off, will contain authorized\* servicing data on the products of over 100 manufacturers. In it will be found not only single band but also multi-band receivers with their Rider-exclusive "clarified-schematics." Record players and wire recorders used with receivers are covered. Also with each Vol. XVII will be the separate "How It Works" book and a cumulative index covering Volumes XVI and XVII.

Watch for publication date of separate manual on Television exclusively.

In towns and cities from one end of the country to the other you will find all 16 Rider Manuals over the benches of profit-making shops. This, because they earned that fingertip position of prominence. They are there, not for display, but for use — not on occasion, but for practically every job that comes to rest on the bench.

Nowhere else, nowhere else but in Rider Manuals can be

\* Rider Manual data is **OFFICIAL, AUTHORIZED**, right from the service departments of the set manufacturers. They know best, the proper servicing procedures for their own products.

**24 HOUR DATA SERVICE**

For 10c (stamps are OK) you receive photostats of schematic, voltage data, parts list (and everything else that will fit on two 8 x 11 inch sheets) on any newly issued, or old, receiver. (Additional necessary sheets same rate.) Send 20c with order; adjustment will be made. Here is a way to get whatever service data you need between Rider Manual publication dates.

found the wealth of authoritative\* radio servicing data needed to quickly diagnose the troubles in ailing American-made receivers issued since 1920. Volume XVII to be published in March will contain material that is time-savingly-valuable to you right now.

Order it today — give your shop the Sign of Successful Servicing, a complete set of Rider Manuals.

Volume XVI	\$ 8.40
Volume XV	18.00
Volumes XIV to VII (ea. vol.)	15.00
Volume VI	11.00
Abridged Manuals I to V (one vol.)	17.50
Record Changers and Recorders	9.00
Master Index, covering Manuals, Vols. I to XV	1.50

NOTE: Individual Volumes VI, VII and VIII will be replaced after this year by a single Abridged Manual Vol. VI to VIII.

**JOHN F. RIDER PUBLISHER, Inc., 404 Fourth Avenue, N. Y. 16**  
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**RIDER MANUALS**  
**MEAN SUCCESSFUL SERVICING**

# EDITORIAL

by S. R. COWAN

## Licensing Radio Technicians Impends

An ordinance proposed by the New York City Council, if passed, will require that all radio servicemen and technicians be licensed. The Bill's sponsor charges the radio servicing profession as being rife with dishonesty, charging excessively, rendering dissatisfactory service, etc. Action on the proposed legislation has been deferred while RMA's Service Committee and various Dealer and Service Groups, all of which oppose the impending law, attempt to work out a solution and submit a counter-proposal. All radiomen must keep closely in touch with this at-present purely local New York City development because, without doubt, if licensing becomes mandatory in Gotham, other cities and towns throughout the country will quickly follow suit.

During the past year and a half *Radio Service Dealer*, alone of all magazines purporting to cater to the radio servicing profession, has actively surveyed the Nation's service fraternity to ascertain whether it favors or opposes municipal licensing. As reported here last Spring, the great majority oppose licensing giving as the basic reasons "the fear that no practical laws can be promulgated to cover all contingencies"—and that "licensing gives rise to a greater hazard, to wit, the opportunity for graft and political footballing and pork barrelling."

### There are Some Sinners

Our own experiences, checking on the honesty and competence of radio servicemen have been sad indeed. We find, in larger cities particularly, too many radiomen are not technically competent, too many are downright gyms, and too many, who although technically able, are not adverse to dishonest tactics in that they occasionally try to pad bills in order to make an extra "buck." Mind you—we say "too many"—but this only implies that a relatively small percentage of the whole are not 100% honest and legitimate. Unfortunately this tiny percentage is large enough to cast a blot on the entire profession, despite the proven integrity of the great majority.

It is uncontrovertible that there is no sure cure for quackery and dishonesty. No laws or types of legislation ever have or ever can completely eliminate such evils. The problem then, insofar as radio servicing is concerned, is to find a way or means to reduce malpractice, intentional or inadvertent, to the barest possible minimum. Without doubt Municipal licensing will do much toward

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*Editor & Publisher*

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## This New IRC JUNIOR Control Cabinet Belongs on Your Bench



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

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

### HERE'S WHAT YOU GET

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

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

### SWITCHES

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

### SHAFTS

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

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

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

Cabinet furnished at no extra charge.

INTERNATIONAL **IRC** RESISTANCE COMPANY  
Wherever the Circuit says 



*It's*  
**Stewart-Warner**  
 for *1948*  
**Radio-Phonographs**  
 with **Strobo-Sonic Tone**



**THE ALLEGRO**—old-world mahogany in the popular 18th Century style; bronze grille; AM plus automatic phonograph. The name that's *big news* in top-quality entertainment!

*This Year* of all years, the really lucky dealer is the Stewart-Warner dealer. No one has new models with more *self-selling appeal*. No one has new models better designed for the home of *today*. No one has *quality* models more attractively priced.

**NEW FEATURES**, too . . . that people *want!* The brilliant new Shadow-Box Dial. The amazing new Electro-Hush Reproducer. The retractable, unbreakable Dura-point. And the famous Strobo-Sonic Tone System.

**GREAT PERFORMANCE** is the result: performance that *sells* when your customers *listen!*

A Model for Every Purpose →  
 a Radio for Every Room ←


**Stewart-Warner**

AM RADIOS • FM • RADIO-PHONOGRAPHS • TELEVISION

CHICAGO ILLINOIS



**LET THIS "ALL-STAR SALESMAN" CLOSE YOUR SALES!**



Wonderfully effective special demonstration recording . . . made with a famous symphony orchestra! Works for you like a Trojan . . . sells each feature by demonstration . . . in your store. Just like a big-time radio show right on your sales floor!

Don't let another day pass without putting this great "salesman" to work for you. Get it *now* from your Stewart-Warner distributor!



**THE GAD-ABOUT**—1948's popular portable. AC, DC, safe *dry* cells. Recharges on house current. Brilliant, powerful!



**THE NEW MINSTREL**—smart, contemporary styling in smooth walnut; AM plus automatic phonograph.

# TRADE FLASHES

A "press-time" digest of production, distribution & merchandising activities

## Novel Test Instrument

A clever battery test instrument devised by Radio Parts of Arizona demonstrates to customers the merits of the line of batteries they "push."



The device has two identical circuits, each containing a No. 43 miniature lamp for a load and 1½-colt dry cell as a power source. A standard 0-500 milliammeter can be connected in turn to each circuit, by means of a three-pole, double-throw switch.

The instrument has been so successful as a sales demonstrator, that the Arizona RCA distributor has made it standard equipment for his field sales force.

## G-E FM Clinics

Attendance at the first ten meetings of the General Electric traveling FM radio workshop has reached a total of over 4,500, it was reported by H. A. Crossland, manager of sales of the Electronics Department's Specialty Division.

At New York City, 750 radio technicians and servicemen attended one of the meetings being conducted by G-E engineers in cooperation with company distributors. Over 690 servicemen were present at the Cleveland, O., session.

Conducted to aid local technicians service FM radio receivers, the tour will cover 23 more cities before December 23. G-E engineering personnel are accompanying the FM caravan, which is equipped with a variety of servicing units and miscellaneous demonstration equipment.

## Meck Introduces FM-AM Line

John Meck Industries of Plymouth, Indiana, announces a new line of radios. The models cover a diversified group

of table sets, ranging in price from \$14.95 to \$79.95, the latter being an FM-AM table set.

One of the models is a radio phonograph combination with automatic record changer. Another is a three-way portable set.

The newest product by Meck is an FM converter-tuner which can be attached to any AM set to bring in FM reception.

"At least 5,000,000 television receivers will be manufactured and sold in the next five years," Edwin M. Martin, vice president and secretary of the Farnsworth Television & Radio Corp., predicted recently when addressing a regional meeting of the Indiana Bankers Association. Mr. Martin said there are nearly 100,000 television sets in use already and that by the end of 1948 television stations will be serving areas including more than 40 per cent of the nation's population.

## HiVolt DC Power Supplies

A line of hermetically sealed high voltage—low current DC power supplies has been announced by the Condenser Products Co., 1375 N. Branch St., Chicago 22, Ill., already in production are the HiVolt PS-1 and PS-2 Sup-



plies, both of which transform 118VAC 60 cycles to 2400VDC. The PS-2 is intended for use in Oscilloscopes, and Television receivers. At an early date HiVolt 4000V. and 10,000V. units will be available. A specification sheet can be obtained from the manufacturer, also, a reprint of a magazine article on "How To Build a High Speed Photo-flash Device."

## Pioneer Gets RCA Tube Line

Pioneer Radio Supply Corporation, 2115 Prospect Ave., Cleveland, Ohio,

has been named distributor of RCA tubes, batteries, parts and test equipment. The announcement was made by Max G. Bauer, vice president and general manager of the company on the occasion of the company's first anniversary celebration.



Samuel Insull Jr., who has just been elected vice-president of Stewart-Warner Corp., in charge of the company's radio division.

## RCA Tube Dept. Ups Bersche

The appointment of Hal F. Bersche as Manager of the Renewal Sales Force for the RCA Tube Department has been announced by W. L. Rothenberger, Manager of Renewal Sales.

In his new capacity, Mr. Bersche will coordinate field sales activities of RCA tubes, batteries, test equipment, electronic components, and package sound products sold through distributors. He will operate out of the Tube Department's headquarters at Harrison, New Jersey.

## RCA Victor Sets Renewal Terms For TV Owners' Policies

RCA Victor has announced provisions for renewal of its Television Owner's Policy to provide service, maintenance, and parts replacement coverage for RCA Victor television sets beyond the first year of set ownership. The step has been taken, it was announced, to meet widespread requests from RCA Victor set owners.

The policy originally provided for supplying a television antenna, installation of antenna and receiver by trained technicians of the RCA Service Company, and service, maintenance, and any necessary replacement of parts for one year. Extension of the program, an-

(Continued on page 16)



Laboratory Tests Prove  
that FEATURE for FEATURE

## AIR KING

Portable WIRE RECORDER  
PHONO-COMBINATION



*Tops all Competition!*

**Compare these features:**

- **A record player too!** Plays 10"—12" records! Records from phonograph! Has Fidelitone permanent needle.
- **5 Tubes exclusive with Air King!** ... 5 tube amplifier (including rectifier) guarantees finest fidelity.
- **Has radio attachment!** At no extra cost there's a cable attached to record on wire from radio without use of microphone. This assures original high fidelity. Can also dub in voice (through mike) while recording from radio.

- **Practical, compact carrying case!** Housed in sturdy wooden luggage-type carrying case.
- **Console features in portable case!** Has the superior engineering qualities of a console wire recorder including automatic shut-off (motor shuts off automatically after wire rewinds)... safety lock that prevents accidental erasures... visual-tone indicator to maintain recording level... highly sensitive microphone with table stand makes it ideal for conference use... few simple controls, most easy to operate!
- **Price is complete ... includes these extras!** Two spools of wire... cord for radio recording... microphone table stand.



**\$129<sup>50</sup>**

Including Federal Tax.  
(Slightly higher west of Rockies)

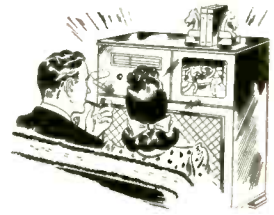
See Your  
**AIR KING**  
Distributor  
Today!

MODEL 750

AIR KING PRODUCTS CO., Inc., 176 53rd Street, Brooklyn 32, N. Y.

**AIR KING RADIO**  
Division of HYTRON RADIO & ELECTRONICS CORP.

*The Royalty of Radio Since 1920*



**FOR** *Television*

**FOR** *F.M.*

**THE WARD *Magic Wand* AERIAL**  
**makes any receiver work better**

Scientific tests prove that quality FM or Television reception is difficult, if not impossible, without a good outdoor aerial. So, don't blame your receiver if reception isn't up to par. Do install a Ward Magic Wand Outdoor Aerial and see for yourself the almost magical improvement that results.

These new Ward outdoor FM and television aerials are available in either straight or folded dipoles (reflector kits also available) for the 88 to 106 mc FM band, and the 44 to 88 mc television band. They do away with bothersome weak spots, and your set functions at full efficiency even on distant stations.

New foolproof design adapts easily to the requirements of each installation. Universal base permits mounting at any roof or wall angle. Sturdy vertical element revolves in base to easily orient dipole for maximum gain. Dipole is of corrosion-preventive aluminum, other parts weatherproofed inside and out. Ring provides for attaching guy wires. Sixty-foot polyethylene-insulated lead-in of 300-ohm colinear transmission line included. Standoffs of exclusive design guide transmission line down mast, and to receiver, minimizing capacity to ground and eliminating line reflections. Complete, step-by-step installation instructions included with each aerial.

Get your Ward Magic Wand FM or Television Aerial today, or mail the coupon below for free catalog and name of your nearest dealer.

**THE WARD PRODUCTS CORPORATION**  
 1526 East 45th Street, Cleveland 3, Ohio  
 DIVISION OF THE GABRIEL COMPANY

IN CANADA: Atlas Radio Corp., 560 King Street, W., Toronto, Ontario, Canada  
 EXPORT DEPT.: C. O. Brandes, Mgr., 4900 Euclid Avenue, Cleveland 3, Ohio



*As  
 Advertised  
 in the  
 Saturday  
 Evening  
 POST*

**ATTENTION DEALERS:**  
 Powerful Ward national advertising in the Saturday Evening Post, and leading newspapers, now is educating over 33 million present (and future) owners of FM and television receivers to their need for Magic Wand Aerials. Write for free details on how you can best capitalize on this advertising in your locality.

**MAIL COUPON TODAY**

**WARD PRODUCTS CORP.**  
 1526 East 45th Street  
 Cleveland 3, Ohio

Please send me free catalog on Ward Magic Wand Aerials for FM and Television, and name of my nearest dealer.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY AND STATE \_\_\_\_\_

MY JOBBER IS \_\_\_\_\_

Here's how  
hundreds of men  
working in Radio  
**WIN PROMOTIONS,  
EXTRA PAY**

## I TRAINED THESE MEN AT HOME



1907 Willow Spring Road, Dundalk 22, Maryland.

"I had been servicing Radios for ten years. I found it necessary to get the technical knowledge I lacked, so I enrolled with NRI. I now have my own business, and am servicing Radios and handling P. A. installations. I believe my earnings have more than doubled since taking the NRI Course."

I. L. Hankey, Jr., 278 W. 5th St., Frederick, Maryland.



ing in vacuum tube circuits of great value."

"Before raking the NRI Course I felt I was a phony holding a job as Assistant Communications Operator, Civil Aeronautics Authority, but since completing the Course, I feel I am worthy of the job and future advancement. I have advanced to Assistant Aircraft Communicator."

Market St. Martinsburg, Pennsylvania.



Market St. Martinsburg, Pennsylvania.

**NOW LET THIS WORLD-FAMOUS  
NRI COURSE HELP YOU STEP AHEAD**

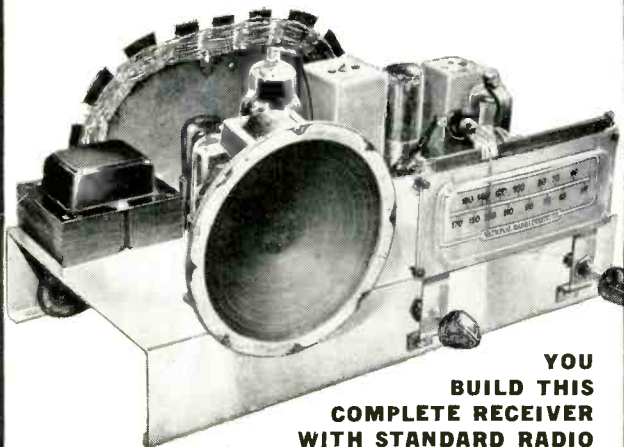
# MAKE MORE MONEY IN RADIO!

### My Course Teaches Timesaving Service Methods, Techniques, Television, FM, Electronics

Here are just a few of the topics covered:

Photoelectric Control  
Circuits with Relays  
Peak and Band-Pass  
R. F. Tuning Circuits  
Broadcast, All-Wave and  
Television Superhet Receiver  
Principles  
Light-Sensitive Cells for  
Control Circuits  
The Vacuum Tube as an  
A. C. Generator in Radio-  
Television Circuits  
Current, Voltage and  
Resistance Measurements  
Vacuum Tube Voltmeters.  
Cathode Ray Oscilloscopes

Frequency Modulated Signals,  
the F-M Receiver  
Automatic Tuning  
Control Systems  
Professional Radio  
Servicing Techniques  
How to Isolate Defective  
Section and Stage  
How to Isolate Defective  
Circuit and Part  
Tuning Circuit Troubles  
Field and Bench  
Testing of Radio Parts  
Uses for Optics in  
Electronics and Television  
Practical Electronic  
Equipment  
Essentials of Outdoor and  
Indoor Public Address Systems



**YOU  
BUILD THIS  
COMPLETE RECEIVER  
WITH STANDARD RADIO  
PARTS I SUPPLY**

You get valuable experience testing and repairing this and many other circuits you build from N.R.I. Kits. These kits are not loaned to you, but become your property. Mail coupon for full details!

**T**HE way to EARN more money in Radio is to handle MORE service jobs in LESS time! And the N. R. I. Course is designed to help you do just that! With N. R. I. training, you KNOW the shortcuts and timesavers that speed up routine repair jobs. You KNOW how to locate trouble fast on the tough jobs as well as the easier ones. And you KNOW up-to-date servicing methods needed on FM, Television, and Electronics.

#### Find Out What N.R.I. Can Do For YOU

Read the letters at top of this page. They are from just a few of many men who were working in Radio before they took my training. I helped them get ahead and I can help you. Mail the coupon for my 64-page book, "How to be a Success in Radio, Television, Electronics," FREE. See how I train you at home, how I give you UP-TO-DATE, PRACTICAL knowledge . . . how you get professional experience building, testing, repairing real Radio circuits with kits I send.

### SAMPLE LESSON FREE

I'll send you a Sample Lesson FREE to show you how quickly you learn from my illustrated, easy-to-understand lessons. No obligation. Get Sample Lesson and Book by mailing coupon. Just mail Coupon NOW in envelope or paste on penny postal. J. E. Smith, President, Dept. 8AJ5, The National Radio Institute, Pioneer Home Study Radio School, Washington 9, D. C.



J. E. SMITH, President  
National Radio Institute

## VETERANS

**APPROVED  
UNDER  
G. I. BILL**

### Good for Both - FREE

Mr. J. E. SMITH, President, Dept. 8AJ5  
National Radio Institute  
Washington 9, D. C.

Mail me FREE, Sample Lesson and 64-page book.  
(No Salesman will call. Please write plainly.)

Age .....

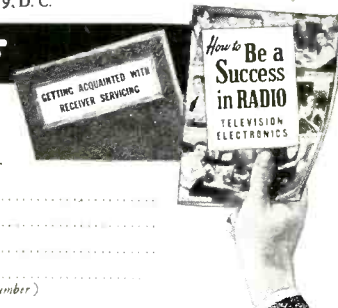
Name .....

Address .....

City .....

State .....

(Please include Post Office Zone Number)



# TRADE FLASHES

(Continued from page 6)

nounced by Henry G. Baker, General Sales Manager of the company's Home Instrument Department, now permits a set owner covered by the initial policy to renew it at a reduced fee upon its expiration.

Terms were released for renewal of these policies covering the first two postwar RCA Victor television receiver models. Renewal fee for the policy covering the Model 621TS, a table model will be \$30 for the second year, compared to \$45 for the first year. The policy for Model 630TS, a larger screen table model will be renewed for \$36. First year's policy fee on this model is \$55. Renewal fees for other models of RCA Victor television sets will be announced before present policies covering these instruments expire.

The new rates will apply where the initial television owner's policy is not permitted to lapse.

Customers who do not renew their policies prior to expiration will be given service and maintenance standard hourly rates plus travel time and cost of materials.

## TV Merchandiser

A neon tubular window sign specifically designed for retailers handling RCA Victor television and radio instruments, is immediately available to dealers through their distributors, RCA Victor's Home Instruments Advertising Department has announced.

## Bodem Joins NU

George A. Bodem, widely known radio executive, has joined National Union Radio Corp., Newark, N. J. as Vice-President in charge of Sales according to an announcement by Kenneth C. Meinken, President of that company. Acquisition of a substantial stock interest in National Union Radio Corporation by members of a new group including Harry E. Collin, Toledo, Ohio, and Forrester A. Clark, Boston, Mass., who were elected to the Board of Directors of the company, was also announced.

## Bendix Telecasts Set Line

For what is believed to be the first time in radio and television history, a

telecast was used on Nov. 10th to introduce a new line of radio and television receivers to the public and trade.

The 1948 models of Bendix radios and television were presented over Station WABD by the Warren-Connolly Company, New York distributors, during the Walter Compton newscast at 6:45 P. M.

## Appointments, Etc.

Charles F. Gill, long associated with the radio and electronics sales fields, has been appointed Stromberg Carlson's district merchandiser for the states of Virginia, North and South Carolina, Maryland and District of Columbia.

Floyd Makstein has been appointed service manager for Emerson Television Service Corporation. He was formerly assistant manager of Emerson Radio's service department.

Mr. S. Sagall, President of Telicor Corporation, manufacturers of Telicor Large Screen Television Receivers, and Intra-Video Corp. of America announced the appointment of W. K. Burlingame as Field Operations Manager of both of the above companies.

The J. P. Seeburg Corporation, Chicago, announces the appointment of Mr. Fleming Johnson as Production Manager. From 1939 to 1943 Mr. Johnson

(Continued on page 13)

## Increase your business now, with the fast selling



# Perma-Power

(THE IMPROVED PORTA-POWER)



## Convert Battery Radios to all electric operation

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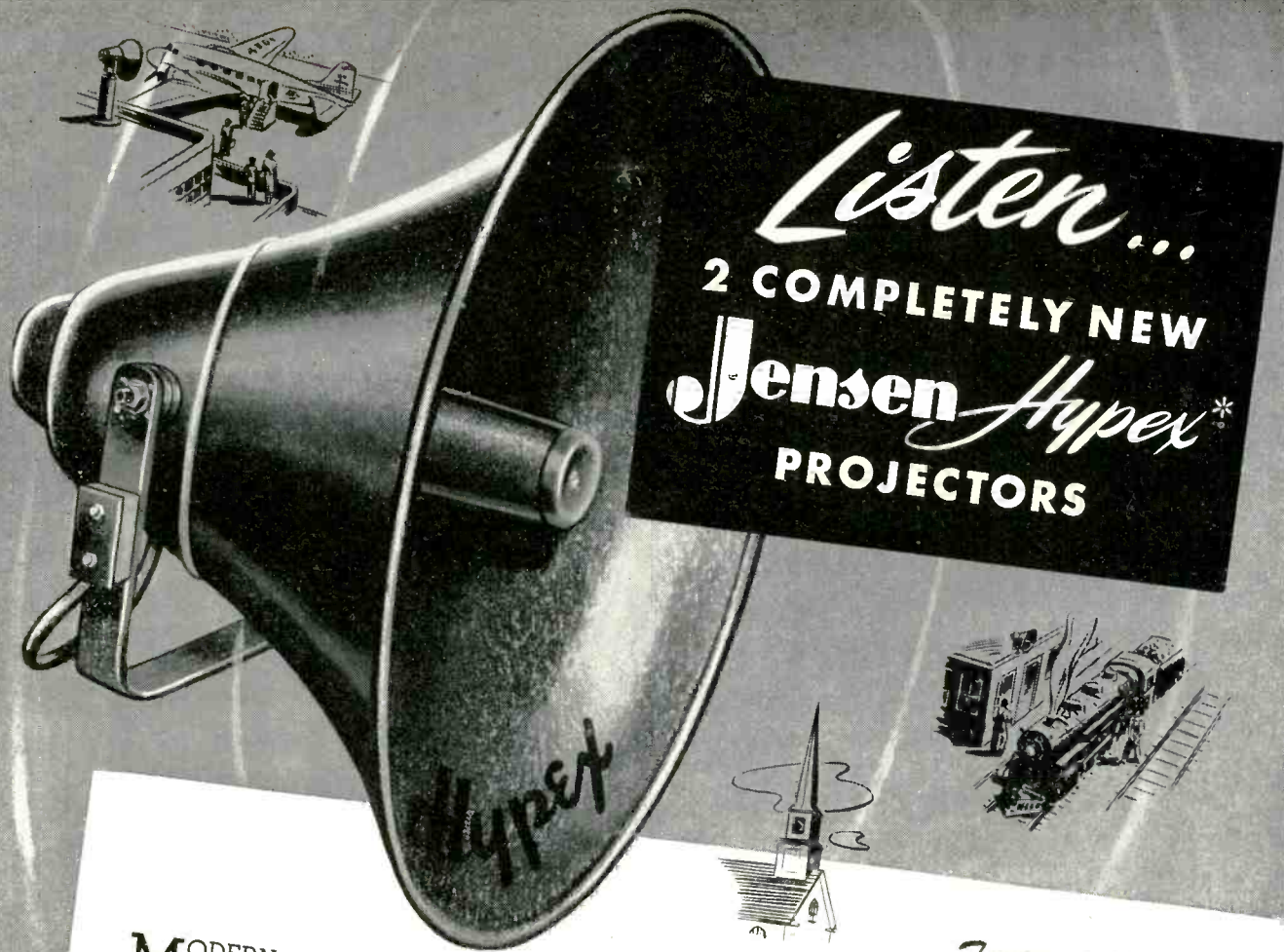
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Manufactured by  
**GENERAL TRANSFORMER CORPORATION**  
4321 N. KNOX AVE. CHICAGO 14, ILL.



*Listen...*  
**2 COMPLETELY NEW**  
**Jensen Hypex\***  
**PROJECTORS**

**M**ODERN requirements for general purpose sound equipment have outmoded older designs. Replacing Models UH-20 and UH-24, these new JENSEN Hypex Projectors answer the demand for something new, better, more reliable, and at lower cost. Power handling capacity 25 watts maximum speech and music signal input. Voice coil impedance 16 ohms.

**MODEL VH-20 (ST-684).** For speech and music reproduction where principal requirement is for speech. Frequency range 140 to 6000 cps. Developed acoustic path length 52 inches. Coverage angle 80°. Mouth diameter 20¾ inches; length 20¼ inches. List price \$63.00.

**MODEL VH-24 (ST-685).** For speech and music reproduction. Superior to Model VH-20 for music because of larger size. Frequency range 110 to 6000 cps. Developed acoustic path length 58 inches. Coverage angle 75°. Mouth diameter 24¾ inches; length 22¾ inches. List price \$74.50.

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1. Non-ferrous and stainless steel rustproof fittings.
2. Rustproof, weatherproof terminal box.
3. No exposed terminals. No soldering to connect.
4. Completely new shielded and enclosed **ALNICO 5** driver unit.
5. Entire structure an integral assembly. No taking units off and putting on. Will withstand plenty of abuse.
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7. Non-metallic diaphragm of war-developed material.
8. Attached adjustable bracket guaranteed to hold projector in position simply by tightening two nuts with small wrench.
9. JENSEN patented Hypex formula for improved acoustical performance.
10. Driver unit removable for replacement without special tools.



*Designers and Manufacturers of Fine Acoustic Equipment*



## When does a man start slipping?

### The moment comes to every man.

The moment when he realizes that he isn't the man he used to be . . .

That the days of his peak earning power are over . . .

**That some day** not so very far away some younger man will step into his shoes.

When does this time come?

It varies with many things.

But of one thing you can be sure. It will come to you as surely as green apples get ripe— and fall off the tree.

Is this something to worry about? Well, yes. But . . . constructively. For that kind of worrying can lead you to save money systematically.

**What's the best way to do this?** By buying U. S. Savings Bonds . . . *automatically*. Through the Payroll Savings Plan. Or through the Bond-A-Month Plan at your checking account bank.

Either method is an almost foolproof system of saving. It's automatic. You don't put it off. There's no "I'll start saving next month"—no "Let's bust the piggy bank."

And you get back four dollars, at maturity, for every three invested.

**So why not take this one step now** that will make your future so much brighter?

Get on the Payroll Savings Plan—or the Bond-A-Month Plan—today.

**Sure saving because it's automatic—U.S. Savings Bonds**

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## TRADE FLASHES

[from page 10]

was with the Philco Company, and more recently he was a director and vice-president in charge of manufacture of the Eastern division of the International Detrola Corporation.

This experience will prove particularly valuable in the production of the music systems and mechanisms produced by the J. P. Seeburg Corporation.

Warren-Connolly Co., Inc., distributors for the Norge Line, were awarded the Bendix Radio franchise for the New York metropolitan area, it was announced by J. T. Dalton, general sales manager for radio and television, Bendix Radio Division of the Bendix Aviation Corporation.

Richard (Dick) Osborne has joined the staff of the S. H. Cohn Sales Company, Los Angeles, Manufacturers' Representative for the Universal Microphone Company, Inglewood, California.

### Scott Joins Hallicrafters

Michael (Mike) Scott, formerly vice president and general manager of Radio Wire Television, Inc., Boston, has been appointed sales manager of the Hallicrafters Co., it is announced by R. J. Sherwood, general sales manager.



Scott, who has been associated with the radio industry since 1926, served during the war as officer in charge of the electronics division of the Navy disposal administration with the rank of lieutenant commander.

### Loudspeaker Catalog

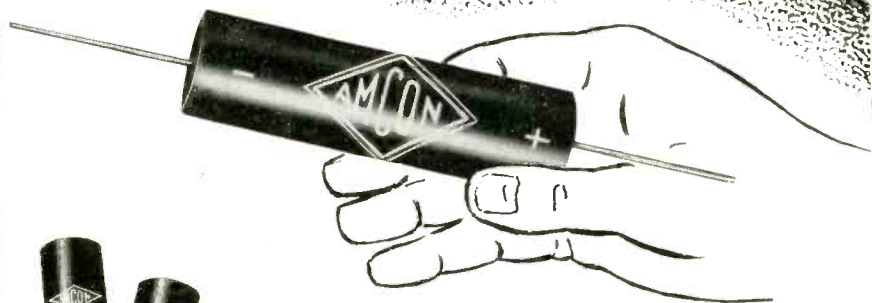
"The most complete line of loud speakers" is illustrated and described in a new catalog, No. 1010, issued by Jensen Manufacturing Company of Chicago.

The contents are arranged by groups  
[Continued on page 31]

Your work looks better  
with

# AMCON PLASTIC

## 3 Star Performers!



Point out the Amcon Plastic-encased Capacitors the next time you return a chassis you have serviced. Your customer can see the quality of your work as well as appreciate the improved performance it has accomplished. Amcon Plastics are top-quality components that look the part—they have sales appeal as well as "engineer" appeal!

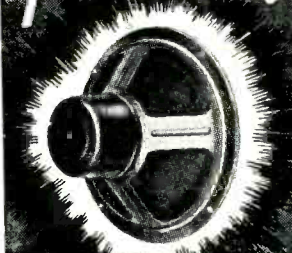
ASK YOUR JOBBER FOR THE "3 STAR PERFORMERS" CATALOG



## AMERICAN CONDENSER CO.

4410 N. Ravenswood Ave., Chicago 40, Illinois

# 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 Electro-dynamic 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

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236 SOUTH VERDUGO ROAD, GLENDALE 5, CALIFORNIA

# RACON'S

## NEWEST Speakers & Driving Units

## Fill the Gap

To the more than 60 different type and size speakers and horn units that already comprise the RACON line—these new models have been added. There is a RACON speaker and horn unit ideal for every conceivable sound system application.

RACON has not only the most complete line, but also the most preferred line. For over 20 years leading Soundmen have recognized and specified them because of dependability, efficiency and low-cost, and because the reproducers are trouble proof.

ASK YOUR JOBBER, OR - Write today for full details

**RACON ELEC. CO., INC.**

52 E. 19th ST., N. Y. 3, N. Y.



NEW SPECIAL PM HORN UNIT, having Alnico V magnet ring, completely watertight, housed in a heavy aluminum spinning. Provides extremely high efficiency reproduction with minimum input. Handling capacity 35 watts continuous, 60 w. peak.



NEW SMALL RE-ENTRANT HORNS, extremely efficient for factory inter-com and paging systems; for sound trucks, R.R. yards and all other industrial installations where high noise levels are prevalent. Watertight, corrosion-proof, easily installed. Two new models—type RE-1½, complete with Baby Unit, handles 25 watts, covers 300-6000 cps.; type RE-12, complete with Dwarf Unit, handles 10 watts, freq. response of 400-8000 cps.



NEW RADIAL RE-ENTRANT SPEAKER, excellent for all types of industrial sound installations. Provides superlative and complete 360° speech intelligibility by efficiently over-riding factory high noise levels. Frequency response 300-6000 cps. Handling capacity 25 watts continuous 35 w. peak. Has mounting bracket. Size 12" wide by 12½" high.

### Other RACON products now available:

PM Horn Driving Units, Straight Trumpets, 21 types Reentrant Trumpets, 10 types Reentrant Cone etc., 7 types, Tweeter & Speakers, 7 types Flat High Frequency Speakers, bell straight trumpets, 3 types, Radial Horns 2 types Armored Cone and Speakers, 3 types Projectors, 7 types

Also—cellular and auditorium horns, inter-com, paging, monitor, and dwarf speakers, cone speaker housings, etc., besides all basic accessories such as swivel brackets, mounting units, cone housings, multiple horn throat combinations, etc.



# RADIO and TELEVISION

## PORTENTS for 1948

**The profit potential for Service Dealers everywhere is bright**

**W**ITH television becoming a major factor in the radio industry, radio sales in 1948 may reach the one billion dollar mark for the first time.

Television receiver sales alone will contribute about 250 million dollars to that total. This figure, based on an anticipated production of 600,000 video receivers, will be a third of the dollar volume on sales of standard broadcast receivers and auto sets.

With more and better television programs being broadcast to constantly expanding audiences, demand for receivers will far exceed the industry's accelerated output.

While about 75 per cent of total television sales will be in the table model class, substantial sales of console type receivers are expected to exert a strong influence on total dollar volume, especially if the installment buying restrictions removed last November 1 are not reinstated.

Television's basic experimental days are over. With 20 years and 50 million dollars spent on research and development, the industry is now ready to become one of the giants of our day.

According to latest data, 12 cities currently have regular television broadcasting: New York, Washington, Baltimore, Schenectady, Chicago, Detroit, Philadelphia, Cleveland, Milwaukee, St. Louis, Cincinnati and Los Angeles. Eighteen stations in these cities are operating on a regular schedule, including one station each on an experimental basis in Cincinnati and Los Angeles.

The expansion of the immediate future is indicated by the fact that 1948 will see television stations in at least 50 major market areas in the United States. A total of 69 stations, in 31 additional cities, has been authorized by the Federal Communications Commission and applications for 26 more

stations are pending. The year also will bring rapid development of the first television networks.

A market increase in the output of radio receivers incorporating FM service also will be noted during the coming year. A total production of at least two million FM receivers may be expected as compared with one million for 1947. An important factor in this increase will be stepped-up production of FM table models.

While we say that 93 per cent of all American homes have radios, and that there is an average of two radios for every home, it is misleading to imply that the market for radios is saturated except for sets to go into "extra" rooms. Many receivers now being used in American living rooms are old and obsolete, both furniture-wise and performance-wise.

Many families now have radios without record changers, and want auto-

matic phonograph combinations. As the country has become more music-conscious, many have become dissatisfied with the tonal performance of their older sets. Many want FM, but have not obtained a new receiver since FM became available. For these and other reasons, there are millions of potential purchasers among existing set owners.

The educational and entertainment characteristics of television and radio are marvelous, and when one realizes that since the war the radio industry has made 31,000,000 radio receivers, one gets some idea of the tremendous capacity of the industry that is destined to make television receivers available to everyone.

### UST Plans Home Video

United States Television Mfg. Corp. will devote the major part of its production to home television sets in 1948.

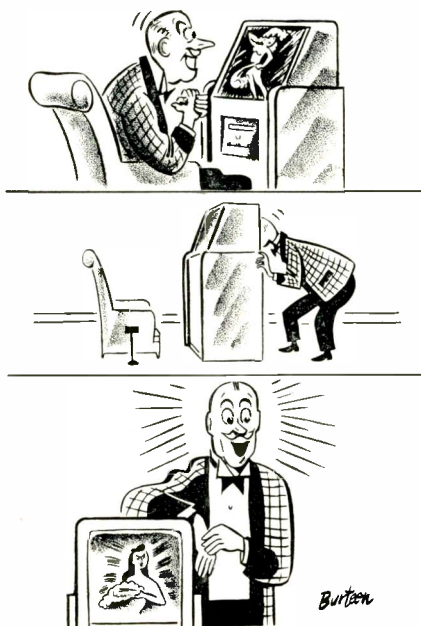
A home console model with direct-view television, FM, AM and short wave radio as well as automatic record-changing phonograph is in production now. Another all-inclusive home console model has projection television which yields a 21¼ by 16-inch television picture is now ready for production.

### Bendix Increases Video Output

Major changes are being made in the layout of Bendix Radio's Baltimore plant to accommodate full-scale production of television receivers says W. P. Hilliard, general manager. Bendix Radio plans heavy production of at least two television receiver models in 1948.

"Television will increase the facilities devoted to consumer radio products, utilizing techniques previously proved on VHF (very high frequency) communications radio," he stated. "Key

*(Continued on page 34)*



# MASTER TV ANTENNAS FOR MULTI-SET

by IRA KAMEN

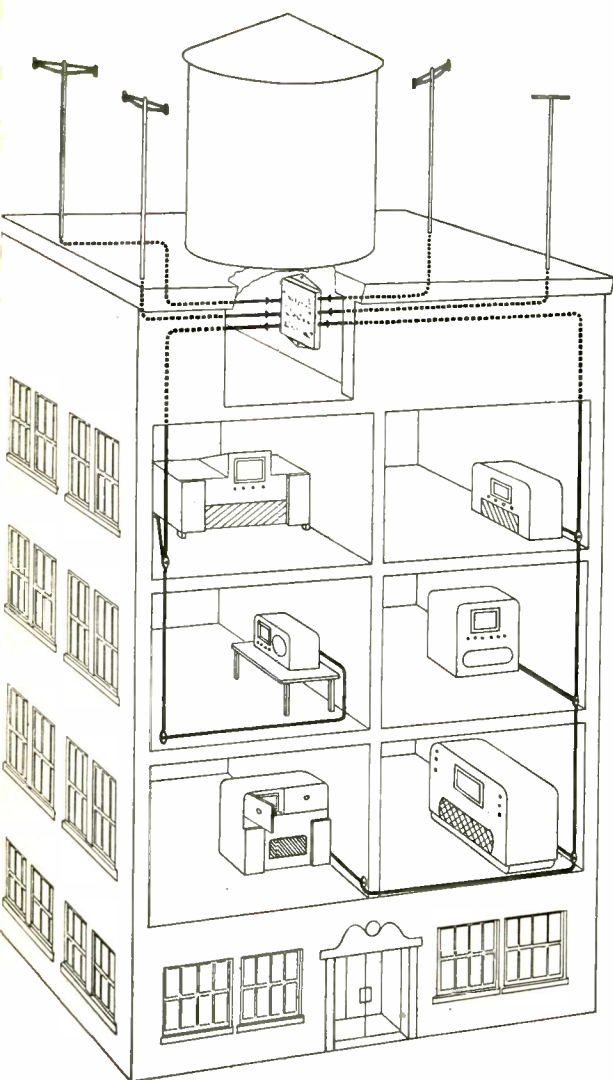


Fig. 1—The main elements of a Master Antenna System with the dipoles leading into the master amplifier.

**M**ASTER antennas are a permanent necessity for television reception in multiple dwellings. It is not possible that indoor television antennas will ever supersede the master antennas on the premise that such violates a fundamental phenomenon in physics.

The reason that the need for radio master antenna systems became *relatively* unimportant was because it was possible to increase the power of the radio stations so that the radio waves which bend and go through building structures made the loop antenna practical. This is not a future possibility in television, as television waves are fundamentally quasi-optical and will *not* bend. Television stations cannot increase their power above the present level as they are limited by the Federal Communications Commission. Any increase in power in New York would produce interferences with the neighboring stations in other cities. Therefore, this fundamental problem of reception in multiple dwellings can only be solved by a master antenna system. This is a basic law and will not be changed any more than will the Law of Gravity or the ability for two objects to occupy the same space at the same time.

There are many people in the real estate field who are hesitant about installing master antennas because they feel that perhaps there may be some new indoor antenna, developed on some "super-duper" principles, which will solve all the television reception problems—(these people refer to the atomic bomb development and say that anything is possible), *but*, no logical comparison can be made with television

waves and such developments as the atomic bomb. The atomic bomb was always a fundamental possibility ever since the discovery that all matter consists of atoms and that atoms were held together by the molecular forces applied by protons to electrons. Television waves are transmitted like light beams and, therefore, can only be picked-up where there is no reflecting surface (steel structures, hills, etc.) between the television receiver and its transmitted source. Indoor antennas are working only in those apartment buildings where it is possible "to stick your head out the window" and see the station. There are locations on Central Park West, Riverside Drive, Brooklyn, and Long Island Sound in New York, where people have front apartments which are more or less facing some of the transmitters and may pick-up television without a roof antenna. We know of cases where they pick-up two out of the present three stations and perhaps they may not be able to pick-up the additional four channels. The reception, of course, for these people would be greatly improved if they had an external antenna. Ninety percent of the tenants of apartment dwellings will never be able to get real satisfactory reception without a master antenna system installed in the building, especially if there are many video sets in operation in that building.

The television indoor antenna is simply a sales expedient for those television customers who want television now.

#### Deficiencies of Indoor Antennas

The television indoor antenna has the following defects as a practical perma-

# vs. INDOOR ANTENNAS APPLICATIONS

**Besides selling multi-dwelling TV installations, Service Dealers also employ Master Antenna systems in order to most efficiently demonstrate various types of receivers on their own sales floors**

nant television installation unit:

A. Most of the presently installed indoor antennas will have severe attenuation when the higher television channels are transmitting.

B. Human body capacity changes picture contrast when any person in the room gets close to the indoor antenna.

C. Summer effect—the placement of screens in the window affect and sometimes mar the operation of an indoor antenna installed in the fall, winter and spring.

D. High noise to signal ratio is present in many indoor antenna installations due to the high attenuation which results from the dielectric losses of an inside television antenna installation and the inefficient type of antenna which must be installed in an apartment under a rug or in a closet. This in-

efficient indoor antenna installation (which is at its lowest efficiency from channels 7-13) makes it necessary to advance the contrast (gain) control to a point where the noise in the area may be amplified to a level where the picture shows background noise. Most customers at this stage of television, cannot qualify the quality of their reception and accept a noisy picture without complaint.

E. Each installation is a costly experiment and the best that can be hoped for, in most cases, is a compromise.

The author conducted many experiments to save television receiver sales for DuMont Teleset, dealers in New York City apartment buildings. Only one of five indoor antenna surveys could be installed. Of this group, where installations were made, approximately 40% of the television customers finally objected to some of the previously mentioned defects and demanded their money back when they could not obtain comparable reception on all stations like their friends residing in private homes.

It is unfair to compare reception of a single television indoor, or for that matter, outdoor, antenna with a master antenna system; for the master antenna system provides the television receiver effectively with a highly efficient antenna for *each* station while the single indoor and outdoor antenna is a

compromise antenna adjustment for all stations.

Where television indoor installations are controlled by television receiver manufacturers' service companies, poor indoor installations are not "sold" to the television customer. Too much is at stake; too much irreparable damage can be caused the whole field of television; the good name of the television manufacturers and the successful business of the television dealers by only a few ill-conceived indoor antenna installations by "sales-hungry" operations during this initial stage of television promotion.

Television "Master Antenna" systems have completely solved the complex problems involved in the simultaneous operation of many television receivers from a single antenna array.

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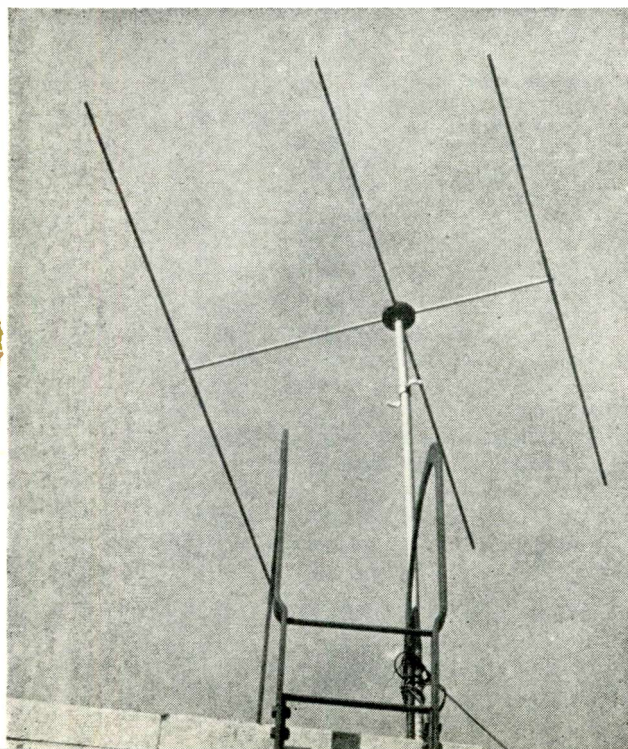


Fig. 2—(left)—A directional array cut for single channel operation.

Fig. 3—(right)—Pre-tuned r-f booster amplifier that rejects i-f interference.

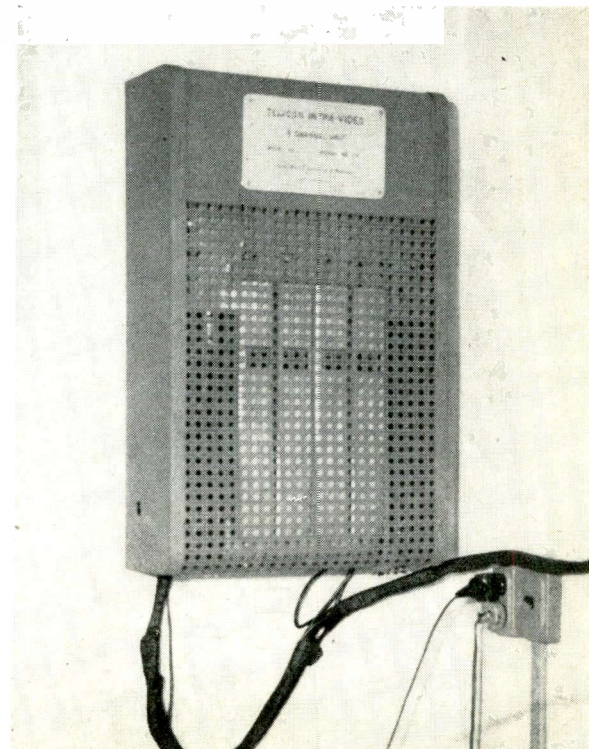




Fig. 4—The 4-prong outlet has resistive network.

### Problems Solved by "Master Antennas"

The Master Antenna System shown in Fig. 1, solves the five-fold multiple dwelling reception problem in the following manner:

*Problem 1.* Ghost-free pictures.

*Solution 1.* Individual directional array for each television channel that can be adjusted to discriminate against transmission ghosts and cancel out reflections from structures behind the antenna. Fig. 2 is a directional array cut for single channel operation.

*Problem 2.* Strong, interference free signals for all television receivers.

*Solution 2.* Pretuned r-f booster amplifiers which reject i-f interference on the antennas and amplifies the signal on each antenna to a level where there

is sufficient energy to operate the least sensitive television receiver through the 30 db. attenuation in each outlet. (Fig. 3 with cover on, and Fig. 6 with cover removed, show the booster amplifier.)

*Problem 3.* Television receiver oscillator reradiation.

*Solution 3.* The 30 db. attenuation in each television receiver outlet provides a minimum of 60 db. attenuation between any two television receivers connected to the Master Antenna System shown in Fig. 1.

*Problem 4.* Connection of all television receivers to System without altering receiver or outlet.

*Solution 4.* Resistive network in each 4 prong outlet (see Fig. 4) permits matching of 300-ohm balanced and 70-ohm unbalanced television receiver



Fig. 5—The author demonstrates how simple it is to connect the TV receiver to line that connects to outlet.

inputs to the System. Simplicity of connecting television receiver to Master Antenna System outlet is shown in Fig. 5.

*Problem 5.* Adjustment of wide range of signal levels from television stations.

*Solution 5.* A screw driver gain control is provided over each booster amplifier strip (see Fig. 6) so that the signal level for each station can be adjusted equal. Booster amplifiers are removable with Jones connectors. This permits quick service of amplifiers which are out of adjustment.

The most important requirement for a master antenna is that it must furnish a clear picture, as completely free from ghosts as is possible. All other requirements are secondary to this, except for noise considerations.

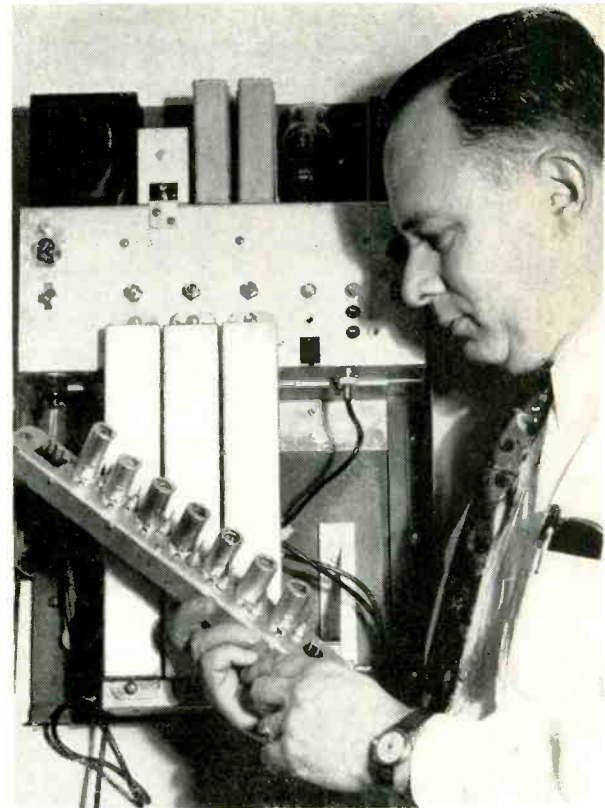


Fig. 6—Pre-tuned booster amplifier, as shown in Fig. 3, with cover removed so adjustments can be made.

### Installation Practice

The proper antenna orientation requires the work of two men with a good 400 line definition television receiver. The antenna is wired to an RG-58/U coaxial cable, with sufficient slack on the roof to allow the antenna to be moved over the whole roof. The test receiver should be located where the picture is shielded from glaring lights. Sound powered telephone communication must be provided between antenna and receiver.

We begin tests with the antenna in the location most convenient, for a practical installation and aim the director element of the antenna towards

[Continued on page 34]

# AUDIO EXTRACTOR

## For Signal Generators

by RUFUS P. TURNER

**An easy-to-build miniature detector unit which may be used to extract an a-f test signal from the modulated output of a signal generator. Serves also as a simple batteryless r-f and a-f signal tracer.**

**A**LTHOUGH most of the popular test oscillators and signal generators come equipped with an audio output jack, quite a few of these instruments employed by radio servicemen and laboratorians provide no means for using the 400-cycle modulating signal separately. This is an important lack, inasmuch as the 400-cycle signal voltage is very handy for checking the audio channel of a radio receiver and for quick-checking P. A. amplifiers.

It is a comparatively easy job to tap the modulator output and to install an audio output jack on the front panel of the signal generator. However, few owners of test equipment are inclined to do work of this sort on their oscillators. And this is a wise attitude, since the jack hole is apt to become a source of r-f signal leakage.

A more efficient and convenient method consists of extracting the desired audio signal from the r-f output of the signal generator. This requires no tampering with the instrument circuits. A simple arrangement for this purpose is a shunt-connected diode detector circuit such as is shown in Fig. 1. This external unit is connected to the r-f output terminals of the signal generator and the audio signal is delivered by its own output terminals.

All of the components employed are small-sized and the entire detector unit

accordingly may be mounted in a midget case. The latter may be a metal shield box or can provided with four binding posts, and need not be larger than about 2½" long, 1½" wide, and ¾" high. Only the two binding posts marked HIGH (See Fig. 1) need to be insulated from the can.

Operation of the external detector (extractor) is simple. The modulated r-f output of the signal generator is applied to the two input terminals. Capacitor  $C_1$ , which is the detector peak capacitor, serves also to isolate the unit from any d-c components which might possibly be delivered by the signal generator. By employing a 1N34 crystal diode as the detector, no power supply will be required. The 1N34 delivers audio output voltage across load resistor  $R$  and load capacitor  $C_2$ . The 85-millihenry radio-frequency choke,  $RFC$ , removes any r.f. which might tend to flow into resistor  $R$  through capacitor  $C_1$ . The audio voltage is coupled out of the detector circuit through the 0.1-ufd. capacitor,  $C_3$ .

Use of the unit is entirely straightforward. Connect the signal generator output (r.f.) terminals to the detector input terminals and advance the attenuator in the signal generator to its full-output setting. Be sure that the grounded ("low") terminal of the generator is connected to the GROUND terminal of the detector. Set the generator controls to deliver a modulated signal, and connect the two detector output terminals to the a-f circuit or device under test. Be sure that the detector output terminal marked GROUND is connected to the grounded (B-minus) side of the device under test. See Fig. 2A.

When testing audio amplifiers, the signal generator dial may be set to any frequency. However, when testing the audio channel of a radio receiver, it is advisable to set the generator to a fre-

quency at least 2 to 3 times higher than that to which the receiver dial is set, in order to guard against any accidental r-f pickup by the receiver. See Fig. 2B.

Most signal generators employed in radio servicing do not deliver more than about 0.1 volt r.f. at their low output terminals nor more than about 1 volt at their high output terminals. However, when either one of these r-f voltages is fed into the external detector, the latter will deliver an audio signal of sufficient strength for most a-f testing in equipment up to and including loudspeakers.

An external detector unit of the type just described has a number of uses

[Continued on page 32]

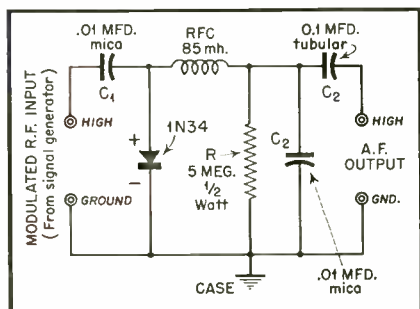


Fig. 1—A shunt-connected diode circuit

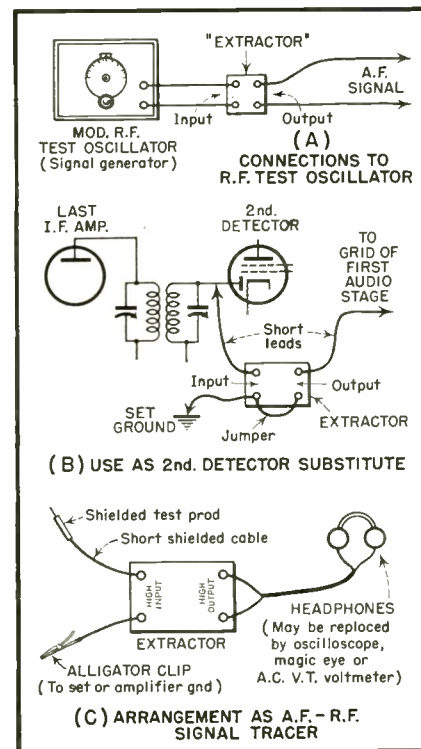


Fig. 2—A, B and C

# TELEVISION KIT

by S. L. MARSHALL

**T**HE alignment procedures of various representative television kits are presented in this article together with *additional* information designed to clarify the operations performed. Wherever possible, illustrations are included on which are indicated the points at which the various adjustments are made. To the serviceman this information is important in evaluating the signals he obtains as each adjustment is made.

## 1.—Dynamic Television Associates 7" Kit Signal Generator Alignment

### Sound and I.F. Alignment

The alignment procedure for this kit has been simplified to the point where it is no more difficult than the procedure for aligning a superheterodyne receiver. The kit may be aligned with a signal generator or a signal from a television station. The procedure, involving the use of a signal generator will be given first, following which the procedure for alignment without a signal generator will be given.

Equipment necessary: A good signal generator, and an insulated screw driver of the fibre or polystyrene type.

#### Procedure:

1. Remove 6C4 tube
2. Open trimmers on discriminator i-f transformer (points A and B, *Fig. 1*). Do not open trimmers to a point where they flop about, otherwise the receiver will behave erratically.
3. Connect signal generator leads between the grid (4) of the 6AC7 sound i-f amplifier tube, and ground. For this purpose it is advisable to use a tube base pin connection such as the one shown in *Fig. 2*, and to attach the hot lead of the signal generator to this connection. This will prevent the necessity of turning over the chassis in order to make the necessary connections.
4. Use low generator signal. Turn volume control of receiver to maximum. Contrast control is set approximately to half way position.
5. Turn signal generator to 21.7 mc. modulated R.F.
6. Peak discriminator primary trimmer (A) for loudest signal. If discriminator transformer has been properly mounted, primary trimmer will be the one which is closest to the front of the receiver.
7. The secondary of the discriminator transformer is not adjusted at this

time. Peak sound coil (C) for maximum signal.

*Note:* Peak for the loudest and clearest signal in every case. If feedback occurs this may produce a maximum signal; however, being distorted it is an undesired signal, and the adjustment is continued until the signal is undistorted even though this corresponds to lower signal amplitude.

8. Place signal generator leads between mixer grid (No. 4) and ground. Use tube pin connection shown in *Fig. 2* in this test also if turning over of chassis is to be avoided. Peak sound coil (C) for maximum output.

9. Open the trimmers on the Mixer—1st Video i-f transformer (D) and on the 2nd Video i-f transformer (E) all the way out. (Observe precautions in procedure No. 2). These settings have been found to be correct for effective adjacent sound channel attenuation and no further adjustments at these points are necessary.

10. Turn trimmer on secondary of the discriminator transformer (point B) for minimum sound. This dip in sound output will occur between two loud and sharp peaks. One of these peaks will occur with more trimmer capacitance than the other. Be sure to trim for minimum or no sound between these two points. This, of course corresponds to the null position of the "S" curve (see *Fig. 3*) which is characteristic of balanced discriminator detectors for F.M.

11. With signal generator leads still connected to the mixer grid and ground, several light and dark horizontal bars should be visible on the screen. Turn 3rd Video i-f trimmer (F) until these bars diminish in brilliancy or disappear entirely. This adjusts the associated station sound channel traps so that no interference from this source will mar the quality of the picture.

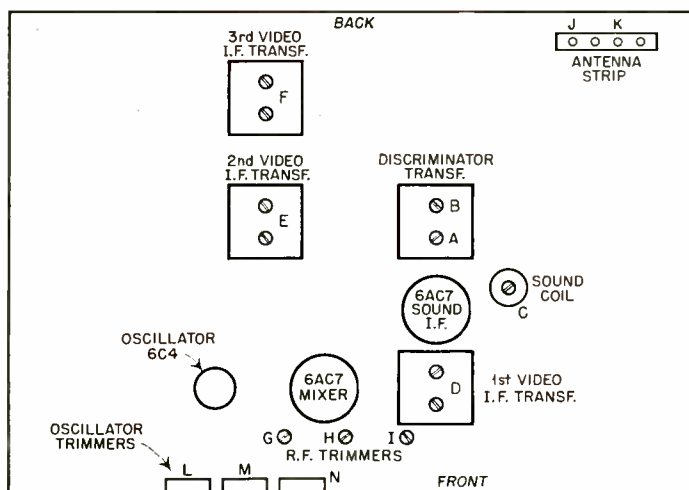
The sound and video alignment is now completed.

### Oscillator and R.F. Alignment

#### Procedure:

1. Open antenna trimmers (G, H, I) approximately two-thirds of the way out.
2. Turn bandswitch to the first position corresponding to channels 1 or 2.
3. Return 6C4 oscillator tube to its socket.
4. Connect signal generator leads to antenna terminals of the receiver. These are points J and K.
5. If Channel 1 is being used in your area, adjust signal generator to 49.75 mc. If Channel 2 is being used in your area, adjust signal generator to 59.75 mc. If generator does not reach these frequencies on fundamentals, a second or third harmonic may be used. Divide above numbers by two or three, as the case may be, and set generator to resultant frequency).
6. Turn oscillator trimmer (L) slowly until a dip between two peaks occurs in sound output. This dip can be

Fig. 1—Top view of Dynamic TV set.



# ALIGNMENT PROCEDURES

## Alignment procedures of various representative TV kits.

understood if we will recall that at the sound carrier frequency the discriminator output is zero. The signals heard on each side of this point result from the deviation frequencies produced by mistuning of the signal generator.

7. Turn r-f trimmer (G) until a dip between two peaks again occurs. This peak may not be very pronounced.

8. Turn bandswitch to the second position (Channels 3 or 4).

9. If Channel 3 is being used in your locality, adjust signal generator to 65.75 mc. If Channel 4 is being used in your locality, adjust signal generator to 71.75 mc. Use of harmonics applies as explained in Paragraph 5, above.

10. Turn oscillator (M) and r-f trimmers (H) for a dip between two points in sound output.

11. Turn bandswitch to third position (Channels 5 or 6).

12. If Channel 5 is being used in your area, adjust signal generator to 81.75 mc. If Channel 6 is being used in your area adjust signal generator to 87.75 mc. Use of harmonics applies as explained in Paragraph 5.

13. Turn oscillator (N) and r-f trimmers (I) for a dip between two peaks in sound output.

The receiver alignment is now complete and the receiver is now ready for operation.

### Alignment Procedure Without the Use of a Signal Generator

Procedure:

1. Open discriminator primary trimmer (A) all the way out, and discriminator secondary trimmer (B) approximately half-way out.

2. Turn sound coil slug (C) approximately half-way in.

3. Open r-f trimmers (G, H, I) approximately two thirds of the way out.

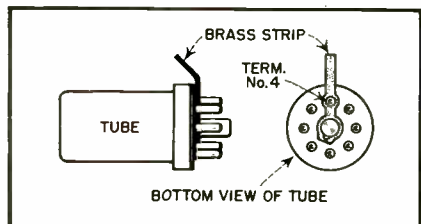


Fig. 2—Attach brass strip to base of tube for testing and alignment.

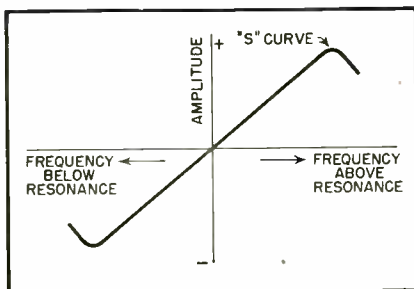


Fig. 3—Amplitude of FM signal produced in output of balanced discriminator.

4. Open 1st Video i-f trimmers (D) and 2nd Video i-f trimmers (E) all the way out.

5. Turn 3rd Video i-f trimmers (F) three full turns from a completely closed position.

6. Check with your local newspaper to make certain that a program or test pattern is being transmitted.

7. Turn bandswitch to position which corresponds to the frequency of the station transmitting a signal or test pattern.

8. Connect a good television antenna to the receiver antenna terminals.

9. Turn Contrast control up half way. Volume control on full.

10. Turn Brightness control until a raster is clearly visible.

11. Turn Focus control until the fine lines which make up the raster are clean cut and clearly visible.

12. Turn Oscillator trimmer (I, M, or N) until a signal appears on the screen. If a series of broken horizontal lines appear, adjust the horizontal hold control until the picture is clearly visible. If the picture runs in a vertical direction, adjust the vertical hold control until a stationary image appears.

13. Adjust r-f trimmer (C, H, or I) for clearest picture and loudest sound.

14. Adjust sound coil slug (C) and discriminator trimmers (A and B) for loudest and clearest sound.

15. If horizontal lines move through the picture, concurring with the sound, this condition is known as "sound on picture," and may be eliminated by turning the 3rd Video i-f trimmer (F) with an insulated screw driver until this condition disappears.

16. If more than one station is in operation in your area, the oscillator

and r-f trimmers that correspond to these frequencies are adjusted as explained in paragraphs 12 and 13 in this section.

### 2. Transvision 7" kit—Signal Generator Alignment

#### Sound I.F. Alignment

The adjustments in the sound and video i-f transformers in this receiver are designed to obtain maximum sound output in sound section, and maximum adjacent and associated channel sound rejection. Alignment may be accomplished with or without a signal generator. A description of both methods follow.

Procedure:

1. Remove the oscillator tube 6C4 from its socket, (see Fig. 4) and attach a signal generator to the antenna terminals (A and B). Under these conditions a rather large signal generator output will be necessary, in the order of a tenth of a volt. Apply a signal of 21.9 mc. (sound I. F.) across the antenna terminals with enough signal strength to form definite bars across the screen of the picture tube.

2. Tune the sound trap trimmer screw (C) which is on the top picture i-f transformer 175 (No. 2) to give the least brightness or least output to the picture tube grid. This indicates that the sound trap is rejecting the sound frequencies from the picture i-f cir-

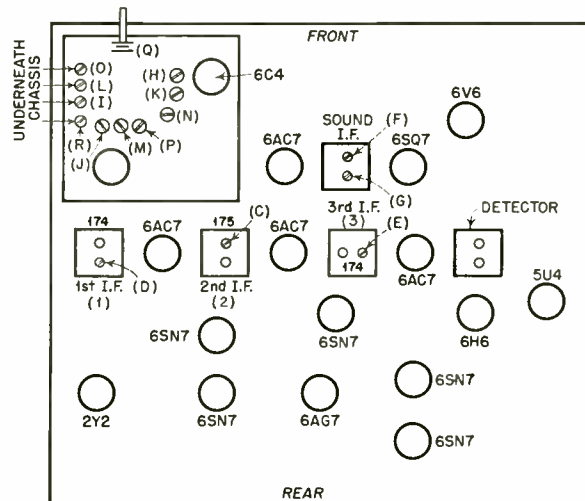


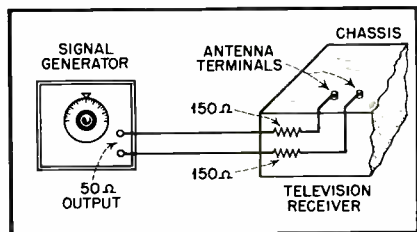
Fig. 4—Top view of Transvision 7" kit, tubes, i-f transformers and trimmers.

cuits. Set the signal generator at 27.9 mc. and repeat as above, adjusting trimmer screw (*D*) and on (*E*) picture tube i-f transformers 174 which are the first and third i-f transformers. This procedure will adjust the traps at each end of the picture pass band.

3. To set the sound i-f frequency, return the signal generator to 21.9 mc. and adjust trimmer screws (*F*) and (*G*) the sound i-f transformer for maximum output in the loud speaker.

#### Adjustment of the R.F. Unit

1. Replace oscillator tube; turn bandswitch to highest frequency band or full counter clockwise rotation of bandswitch. Set signal generator to frequency of sound channel on highest frequency band, i. e., 81.75 mc. for 76-82 mc. band. This adjustment must be done with an accurately calibrated signal generator with a 300-ohm termination to the antenna terminals. If the signal generator's impedance is 50 ohms, connect to antenna terminals through a 150-ohm resistor to each terminal, as shown in *Fig. 5*. This will approximate the antenna terminal impedance.



**Fig. 5—Method of balancing a 50 ohm signal generator to a 300 ohm input TV set.**

2. Under these conditions tune main oscillator trimmer (*H*) to give sound output on the sound channel frequency. **CAUTION:** Be sure to start with the silver half-moon on the oscillator trimmer (*H*) nearest the oscillator tube. This corresponds to the highest frequency to which the oscillator can be tuned.

3. Set signal generator 1.5 mc. inside the lower edge of the band, i. e., 77.5 mc. on the 76-82 mc. band. Adjust antenna trimmer (*I*) and grid coil (*J*) for maximum output to the picture tube, i. e., brightest bars if 400-cycle tone modulation is used. Use only enough signal for the bars to appear barely visible.

4. Set signal generator to sound frequency of next lowest band and adjust oscillator trimmer (*K*) for maximum sound output. Repeat as above for antenna coil (*L*) and grid coil (*M*).

5. Repeat above for band *C*; adjusting oscillator trimmer (*N*), antenna trimmer (*O*) and grid coil (*P*). **CAUTION:** In all oscillator adjustments be sure the sound sensitivity trimmer (*Q*) is in the half-open position.

#### Adjustment of Band Pass Trimmer

1. Any adjustment of the band pass trimmer (*R*) should be made with a great deal of caution. Set the bandswitch on the highest frequency band.

2. Set the signal generator to the sound channel—21.9 mc. Carefully adjust band pass trimmer (*R*) for maximum sound output after all other adjustments have been made.

This completes the signal generator alignment of the receiver.

#### Alignment Procedure Without the Use of a Signal Generator

It is possible to completely align a Transvision Television Kit by visual means, provided that the station is broadcasting a test pattern on the desired channels. To do this the following procedure should be followed:

1. All tuning and adjusting must be done when the station is transmitting a test pattern only.

2. Loosen trimmer screws on picture i-f traps (*D*) and (*E*), being careful not to loosen to the point where the screw may fall out. Tighten the trimmer screw on i-f trap (*C*) until the screw driver feels tight. This provides maximum bandwidth for the picture circuit.

3. Before making the following adjustment observe that the silver half-moon (with the solder connection on top of it) of the oscillator trimmer (*H*) is on the side adjacent to the oscillator tube 6C4. Now turn to the first position on the bandswitch, which is the one to the extreme left on the switch. This corresponds to the highest frequency setting. Set the sound sensitivity trimmer (*Q*) to a half-way position. This is where the movable plates are half-engaged with the fixed plates.

**Note:** In all of the following adjustments the contrast control should be set to the lowest point possible; just above the position where the picture begins to tear from lack of synchronization.

4. Using an insulated screw driver tune oscillator trimmer (*H*) for maximum vertical detail. This corresponds to the minimum capacity setting or highest frequency setting that will still admit the picture from the desired station.

**Note:** This adjustment does not correspond to the brightest picture obtainable but does correspond to the clearest picture with the sharpest detail as shown on the vertical wedges of the test pattern. For close adjustment of this point the sound sensitivity trimmer is used.

5. Now adjust antenna trimmer (*I*) and grid coil (*J*) for brightest picture, readjusting the oscillator trimmer for best details if necessary.

6. Loosen trimmer screw on i-f trap (*C*) and watch the picture carefully for

the point where the detail begins to fade. The proper setting of this screw is just short of this point.

7. Adjust both trimmers (*F*) and (*G*) on the sound i-f. for maximum sound output.

8. Readjust trimmer (*C*) on i-f trap for maximum sound output. If picture is affected adjust for the best compromise.

9. Tighten trimmers (*D*) and (*E*) on i-f traps to a point where the picture begins to get dim, then back off about  $\frac{1}{8}$  of a turn to the point where the picture is the sharpest.

10. This completes the alignment of the Transvision Set on the highest frequency setting.

11. For alignment of the second band turn to the second position of the bandswitch, which is the second highest in frequency, or one position to the right of the extreme left. Tune oscillator trimmer (*K*), antenna trimmer (*L*), and grid coil (*M*) for clearest detail of (*K*) and maximum brightness of (*L*) and (*M*).

12. For alignment of the third band turn to the third position of the bandswitch which is the third highest in frequency, or two positions to the right of the extreme left. Tune oscillator trimmer (*N*) for maximum detail, and antenna trimmer (*O*) and grid coil (*P*) for maximum brightness.

13. It is generally not recommended to adjust the bandwidth trimmer (*R*), however, if necessary the adjustment should be made carefully with the bandswitch set at the highest frequency position. Do not turn this trimmer very far in either direction from its initial position. Adjust this trimmer for best sound output

#### Use Neon Glow Lamps To Make Small Capacity Condenser Measurements

It is a simple matter to measure the various condensers in use from .1  $\mu$ f and up; but when one wants to measure the smaller ones, such as .00025  $\mu$ f it is a difficult task unless a capacity bridge or grid dip meter which is calibrated for such work is available. To get around this difficulty, use neon glow lamps with ratings of a quarter watt, one watt and two watts connected across the 110 volt a-c line with a pair of test probes in series with the lamp. These three sizes of lamps will cover the usual capacity range needed in service work. To use this method, have a capacity block consisting of enough small condensers to cover the desired range. By noting the brilliancy of the light when the unknown condenser is under test and comparing it with a condenser of known value, one can vary easily determine the value of the unknown.

by Albert Loisch



# The "260" Volt-Ohm-Milliammeter

**T**HE electrical circuit of the Simpson model 260 volt-ohm-milliammeter is designed to provide, in a small, compact and yet rugged instrument, the high sensitivity required for locating and testing troubles in all types of AM, FM and television circuits. Accuracy is 3% d.c. and 5% a.c. of full scale deflection. The instrument's schematic is shown as Fig. 1.

## Measurements

D-C voltage is measured by applying the unknown voltage to the meter through suitable internal series resistors. The meter has a full scale sensitivity of 50 ma at 100 uv with an internal resistance of 2,000 ohms, giving the instrument an overall sensitivity of 20,000 ohms per volt.

A-C voltage measurements, including output and decibel readings, are made possible by the use of an internal copper oxide rectifier connected in series with the meter. A precision wire-wound shunt resistor is connected in parallel with the meter resulting in a sensitivity of 1,000 ohms per volt.

D-C resistance is measured by the use of suitable internal series and shunt resistors in series with a battery to give accurate scale deflection of the meter when an unknown resistance is to be measured. Current in d-c circuits is measured by the use of internal shunts so that the maximum current in each range will produce a full scale deflection of the meter.

## Measurement Ranges:

Ranges: 0-2.5; 0-10; 0-50; 0-250; 0-1,000; 0-5,000 volts at 20,000 ohms per d-c volt sensitivity and 1,000 ohms per a-c volt sensitivity.

A-F output voltage: 0-2.5; 0-10; 0-50; 0-250; 0-1,000 volts at .1  $\mu$ f internal series condenser.

D-C resistance: 0-2,000 ohms (12 ohms center); 0-200,000 ohms (1,200 ohms center); 0-20 megs (120,000 ohms center).

Current in d-c circuits: 100 ma at 250 uv; 10 ma at 248.75 uv; 100 ma at 249.88 uv; 500 ma at 249.98 uv; 10 amps at 249.99 uv.

## Applications

The high sensitivity of the instrument makes it suitable for all of the applica-

## Describing its characteristics and ability to be used for extra ordinary test purposes

tions of a lower sensitivity meter but in addition makes it adaptable to many special uses. For example, in measuring grid current, the model 260 with its 100 microampere scale is sensitive enough to measure grid currents of many tubes. A readable value as low as 1 ma can be obtained.

## FM Alignment

By opening the load resistor circuit of the limiter in an FM receiver and inserting the model 260 as a microammeter in series, a reading may be obtained for i-f alignment purposes. Adjust the circuit for maximum indication. Manufacturers' alignment instructions should be consulted for exact procedure.

## AVC Diode Circuits

An ordinary low sensitivity meter cannot be used across an AVC network due to the low resistance altering the constants of the circuits. But this instrument requires so little current that sufficient indication can be obtained to determine if the AVC circuit is functioning.

## Checking Bias of Power Detector

A power detector uses a high resistance cathode resistor. Thus a meter having very high sensitivity is essential to obtain a reading of the bias voltage on such a tube.

## Used as a Condenser Tester

Condensers can be tested for shorts and leakage with the model 260 by using the Rx10,000 range. A shorted condenser will cause a large deflection of the pointer of the ohmmeter and inversely a condenser with a high leakage will show a partial deflection. Any condenser, other than an electrolytic, will normally cause a slight deflection of the pointer until the condenser becomes charged, when the pointer will return to zero. But if the initial deflection is not present, it probably indicates an open lead. The resistance of a good paper condenser should be above 50 megs per microfarad and that of mica condensers above 100 megs per  $\mu$ mf. This resistance varies inversely according to the size of the condenser, and is so high that it will not register on the ohmmeter.

*Continued on page 32*

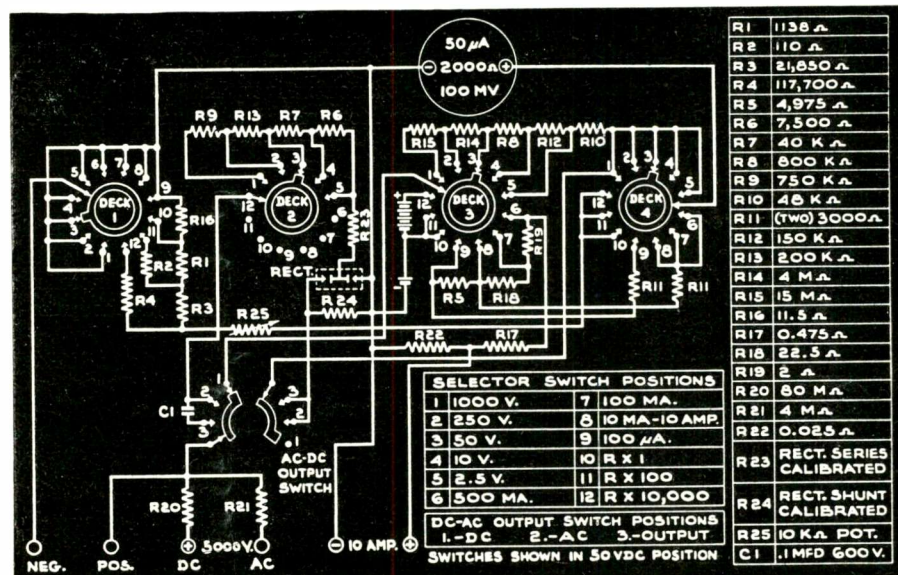


Figure 1

# 70 VOLT LOUD SPEAKER

by C. A. TUTHILL

**W**HETHER we visit the United Nations, the Westchester Country Club, or the Jersey City Freight Yards, we discover p-a or sound re-inforcement installations indispensable and efficient expeditors of daily operations. For those engineers whose business it is to install these systems, a new analogy concerning loudspeaker feeder layouts deserves careful study. It is called the 70 Volt Loudspeaker Distribution Line. Emphasis upon the internal and external voltages of the output stage of the driving amplifier is pointed up in equal importance with impedance matching. The result is high quality distortion-proof flexibility of projection from a single power amplifier driving a 70 volt line auto-transformer coupled to conventional speakers.

Referring to *Fig. 1*, let us consider the meaning of an amplifier's power rating. It is designed to deliver its rated power ( $P$ ) into a particular known load impedance ( $L$ ) without excessive distortion. Harmonics generated within the amplifier appear as distortion at the load or loudspeaker. If the amount of distortion is held to 1%, the voltage across the load of the unwanted harmonics is equal to 1% of the total voltage of the desired signal or program across that same load.

As power drawn from the amplifier is increased the percentage of harmonic distortion is increased—slowly at low levels but rapidly as the overload point is approached. When the power in ( $L$ ) *Fig. 1* equals the rated power output of the amplifier we have the condition where it is delivering the maximum of which it is capable without danger of distortion. The more the rated power of the amplifier is exceeded, the greater will be the upward swing of distortion.

Referring back to *Fig. 1* we are reminded that the power amplifier's output stage generates a voltage ( $e$ ). As the level from the oscillator feeding is increased the voltage generated internally at ( $e$ ) increases as does the voltage ( $V$ ) across the load.

Here are three facts to remember:—

1. When the power in ( $L$ ) equals the rated power in the amplifier, ( $e$ ) has a definite value which must not be exceeded if overloading and distortion are to be avoided.

2. The value of ( $e$ ) depends upon

**A system in which emphasis upon internal and external voltages of the output stage of the driving amplifier is pointed up in equal importance with impedance matching**

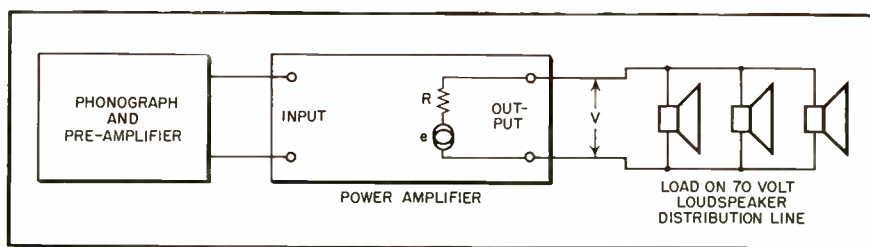


Figure 2

how hard the amplifier is driven by the oscillator and is not affected by any changes which may be made in the load impedance ( $L$ ).

3. The value of the voltage ( $V$ ) depends on the value of ( $e$ ) and also upon the value of the load impedance employed.

Thus far it has been assumed that ( $L$ ) was the rated load impedance of the amplifier and that the power ( $P$ ) in the load was equal to the rated power of the amplifier. Under these conditions,

$$P = \frac{V^2}{L} = \text{rated power of the amplifier.}$$

The value of ( $V$ ) under this condition is less than ( $e$ ) because of the drop in the generator resistance ( $R$ ), that is

$$V = e \frac{L}{R \text{ plus } L}$$

Suppose now that the drive on the amplifier remains constant, but the load impedance is increased to ( $2L$ ). The generator voltage ( $e$ ) remains the same, but ( $V$ ) will increase to

$$V = \frac{2L}{R \text{ plus } 2L}$$

As the load impedance is increased still more, say to ( $5L$ ) or ( $10L$ ), the value of ( $V$ ) will continue to increase, but will never get as large as the generator voltage ( $e$ ).

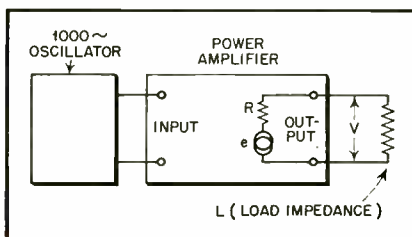


Figure 1

It is characteristic of well designed amplifiers that they will operate satisfactorily into any impedance higher than the rated load impedance, as long as the drive on the amplifier, and hence the value of ( $e$ ), is not increased above the value for rated power into rated load impedance. However, the power drawn from the amplifier with a fixed drive will decrease as the load impedance is increased, even though the voltage ( $V$ ) rises.

This characteristic is very helpful when a number of loudspeakers are to be operated from the same amplifier. Suppose the load impedance ( $L$ ) is replaced by a number of loudspeakers connected in parallel, the combined impedance of which is equal to ( $L$ ), and the amplifier driven by the oscillator at a level which causes rated power from the output. Now suppose that half of the loudspeakers are disconnected. The impedance of the load has increased to ( $2L$ ), but those loudspeakers still connected will continue to operate without any increase in distortion and at somewhat increased volume because of the rise in the voltage ( $V$ ). Similarly any number of speakers may be disconnected without any effect except the change in voltage ( $V$ ), which will increase but will never exceed the value of ( $e$ ).

Let us consider the effect of changes in ( $V$ ) on the volume from the remaining loudspeakers. In modern amplifiers, the internal output impedance ( $R$ ) of the amplifier is seldom higher than one-half the value of the rated load impedance ( $L$ ), and in amplifiers with good feed-back circuits it is often much lower. Assume that ( $R$ ) equals one-half ( $L$ ).

# DISTRIBUTION LINE

Since  $V = e \frac{L}{R \text{ plus } L}$  and  $L = 2R$   
 Then  $V = e \frac{2R}{R \text{ plus } 2R} = e \frac{2R}{3R} = \frac{2}{3}e$   
 or (e) equals 1.5 V

## Program Replacing Tone

If a program replaces the oscillator, voltages (e) and (V) will vary with the program. By adjusting the level so that maximum peak voltages equal the preceding single frequency voltage for rated power, distortion will be avoided. And if all loudspeakers be so connected that their load impedance is equal to the rated load impedance, the voltage (V) on the maximum peaks will be 70 volts.

## Loudspeaker Connection

If a loudspeaker is to be used on a 70 volt LSD line, usually a transformer must be associated with the speaker in order to procure impedance of a proper value. If the speaker be rated at 16 watts, the proper impedance will be found to be 312 ohms by dividing our factor of 5000 by 16 watts. It was previously pointed out that when these 70-volt lines are employed, the rated power multiplied by the rated load impedance equals 5000. In this example, if the 16 watt speaker has an impedance of 4 ohms, we need a transformer having a ratio of 312 : 4. Then if a single frequency at 70 volts or a program whose peaks are 70 volts be applied to the 312-ohm primary, the speaker across its 4-ohm secondary will draw 16 watts of power. Such a combine of speaker and transformer may be used as one of the loudspeakers in Fig. 2, provided the sum of the power required for all the loudspeakers used does not exceed the power rating of the amplifier.

As another example—if we desire less volume and decide 4 watts is sufficient, 5000/4 equals 1250 ohms. Here we need a transformer with a ratio of 1250 : 4. For flexibility then, auto-transformers are available and are employed in general practice.

## System Layout—Auto-Transformers

In order that the installation of these 70-volt LSD lines may lend themselves freely to various loudspeaker arrays, three auto-transformers have been made available. The 25A is tapped in 3db steps to handle powers ranging from 0.25 watts to a maximum of 4.0 watts. The 26A also tapped in 3db steps handles power from 0.25 thru 16 watts. Both transformers handle 4 or 8-ohm

Location	Power Req.	Trans. Type	Power Tap	Line Imp.
Auditorium	15 Watt	26 A	16 Watt	312 ohms
Overflow	4 Watt	25 A	4 Watt	1250 ohms
Monitor	1 Watt	25 A	1 Watt	5000 ohms
Office	1 Watt	25 A	1 Watt	5000 ohms
Office	1 Watt	25 A	1 Watt	5000 ohms

speakers. The larger 27A reduces 3db per step from a maximum power of 64 watts for a 4-ohm speaker on down to a single watt output, (Further details in Table I). Facing proper impedances their transmission loss is less than 0.6 db while they cover from 50 through 15,000 cycles.

Assume that we are to feed an auditorium requiring one 15-watt speaker, an overflow room requiring 4 watts. We also wish to feed a monitoring room and two nearby offices each requiring its own speaker at one watt of power. All speakers involved are of 4-ohm impedance. In this case a line from the 70-volt amplifier output is connected to the 16-watt terminals of a 26A auto-transformer and then multiplied to the 4-watt taps of a 25A in the overflow room and to the one-watt terminals of the other three transformers in the other rooms. An amplifier capable of handling 23 watts is required. Table I gives further details.

In a second case music is to be distributed to clerical workers throughout two large offices as well as to one private office. One room requires 10 loudspeakers at 2 watts each. Another needs 40 at 1 watt each. The boss likes it loud in his private office so 8 watts with a volume control are assigned to him. A larger amplifier is needed since the required power becomes 20 plus 40 plus 8 for a total of 68 watts. The 8-watt tap of a 26A trans-

former serves the boss. The first larger room is served from the 2-watt tap of a 25A at each speaker while the third room is also fed from 25As tapped for one watt. All transformers are paralleled to the 70 volt amplifier output. Details of this example are tabulated in Table II.

In the above discussion a factor of 5000 was divided by the power to determine impedance based on the formula,

$$P = \frac{V^2}{L} \text{ Where } P = \text{Power}; V = \text{Voltage}; L = \text{Impedance.}$$

To be strictly correct 4900 should be used since it is the square of 70 (volts). However the error is negligible. Were the voltage the square root of 5000, it would be 70.7 volts, or a difference of about 1%. This error amounts to about 0.1 decibel.

This shows that the maximum rise in voltage across the remaining loudspeakers is never greater than 1.5 to 1.0 which means a maximum increase in level of only 3.6 db. This is small enough that no substitute loads are necessary when some loudspeakers are disconnected. If (R) is as low as one-quarter of (L), this change reduces to less than 2 db.

## Meaning of 70 Volt Loudspeaker Distribution Line

Referring back to Fig 1, assume that  
 [Continued on page 32]

Location	Power Req.	Trans. Type	Power Tap	Line Imp.
1st Large Office	10 at 2 Watts each	Ten 25 A	2 Watt	2500 ohms Each
2nd Large Office	40 at 1 Watt Each	Forty 25 A	1 Watt	5000 ohms Each
Private Office	8 Watts	26 A	6 Watt	625 ohms

# CIRCUIT COURT

## Silvertone Models 7115-6-7

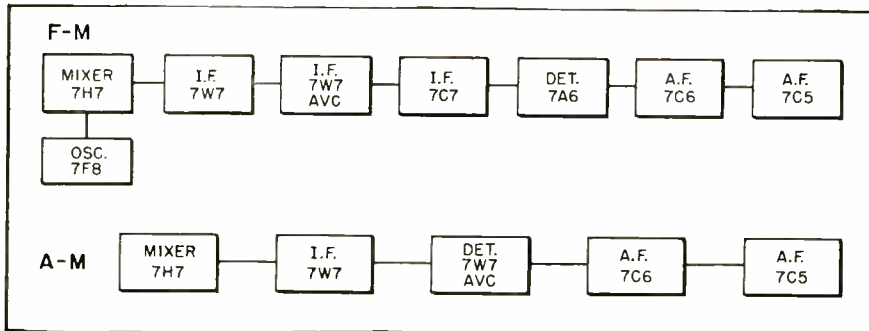
This nine tube FM-AM instrument includes, or has provision for phono input and recorder output. Built-in broadcast band loop and folded dipole FM antennas are included.

Block diagrams are shown for operation in the AM and FM ranges. The 7H7 mixer tube is common to both ranges and handswitching is provided for in the grid circuit. A stage of tuned pre-selection is found ahead of the tuned grid circuit on the FM band.

The oscillator, previously described, uses a dual triode type 7F8. One section of the tube acts as a Hartley oscillator for the broadcast band. The other section functions as a Colpitts oscillator for the FM band. The only switching is in the "B" supply lead.

The mixer output, 455 kc on AM and 10.7 mc on FM, is developed across a series of transformers and is amplified in a 7W7 stage. The only switching is in the secondary of the first set of transformers. Following this IF stage is another 7W7. On FM, this stage serves as another IF stage and develops AVC voltage. On AM, the tube serves as the second detector and AVC rectifier.

The audio voltage is further amplified in the 7C6 and 7C5 stages for AM reception. Additional gain is provided on FM by another i-f stage, this one using a 7C7 tube. The output of this stage drives the 7A6 ratio detector. The audio stages are common to both bands.

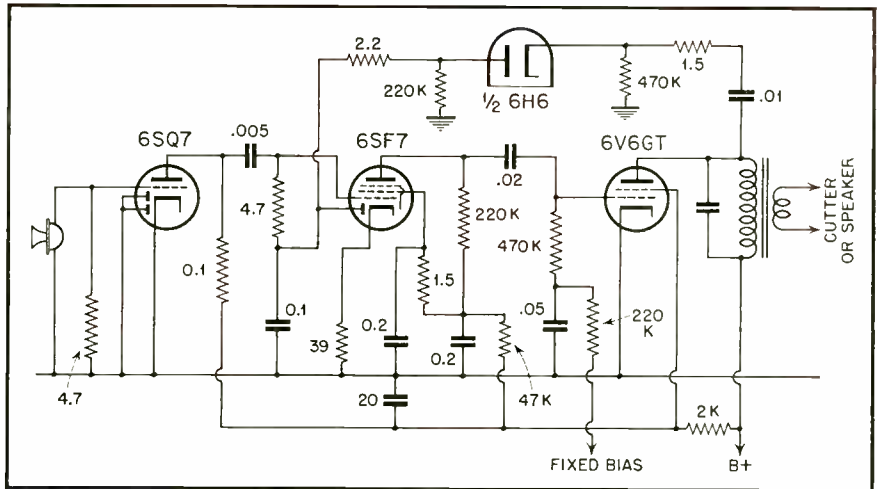


## Packard-Bell Model 861 Phonocord

This 8 tube instrument provides a multiplicity of services, including:

1. Radio reception (standard broadcast, only).
2. Radio recording.
3. Microphone recording.
4. Public address amplification.
5. Record reproduction (with automatic changer).

A group of block diagrams, indicating the tubes employed for each function, is shown. The set uses a low-impedance loop antenna and a PM speaker, 10"



Schematic of Packard-Bell Model 861

diameter, to provide a maximum output of 5 watts.

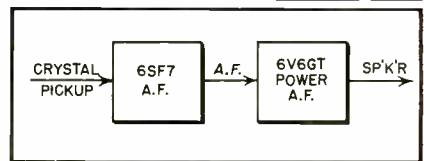
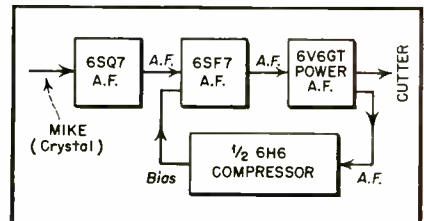
In the radio reception position the layout is fairly conventional, with a tuned r-f stage (6SK7) feeding a 6SA7 converter. A three gang condenser tunes the several circuits. The 455 kc i-f amplifier uses another 6SK7 tube. The output of this stage is rectified in one-half of a 6H6 dual diode. AVC voltage is developed in the same stage.

The audio output of the 6H6 is amplified by the pentode portion of a 6SF7. The diode element of this tube is operative in this function. Further audio amplification, and power output, takes place in the 6V6GT stage.

When recording is done from the air the circuit remains the same except that the other half of the 6H6 tube becomes a compressor. Action results from the rectification of a portion of the audio output, taken from the 6V6 plate,

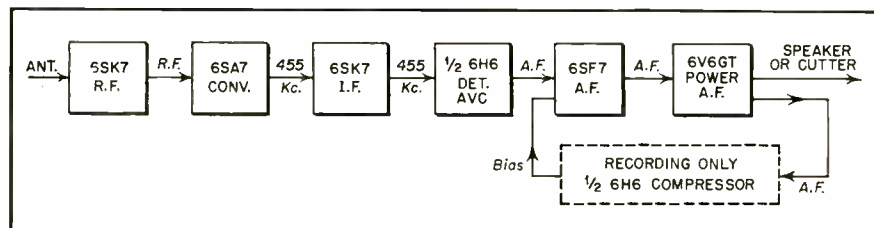
in the 6H6. The negative voltage developed therein is applied to the grid of the 6SF7 first audio tube as variable bias. A magnetic cutter is actuated by the output transformer, in place of the speaker. The likelihood of overloading the power stage or overcutting the disc is minimized by the compressor action.

In recording from the microphone, an additional stage of amplification is introduced ahead of the 6SF7. This



stage employs a 6SQ7 triode section. A crystal microphone is used. The compressor circuit is in operation during this function also. By substituting the speaker for the cutter, the public address feature is accomplished.

Record reproduction is effected via the 6SF7 and 6V6 stages. A crystal pick-up is used.



Block diagram of Packard-Bell Model 861

# TECHNICAL QUIZ NO. 4

*Subject: Television*

## BEFORE ANSWERING THE QUESTIONS—READ THESE RULES:

There are 25 questions. After each question, preceded by a letter *a*, *b* or *c* are optional answers. In each case one answer is basically correct. You are only allowed 20 minutes time in which to mark the letter *a*, *b* or *c* which you believe represents the correct answer.

For each correct answer to a question you are credited with 4 percentage points. Thus 23 correct answers would give you 92% or 17 correct answers would rate you 68% on the examination. Answers to the questions are given on Page 33.

**RATINGS FOLLOW:** 100% = Perfect, 90% = Excellent, 80% = Good, 70% = Fair, 60% = Passing  
Any score below 55% is failure. Tests must be completed within 20 minutes.

How much do you know about TV? Listed below are a number of questions, each of which has but one correct answer. The accuracy of your answers, and the relative speed with which you can complete this quiz is a measure of your theoretical knowledge and practical experience.

### QUESTIONS 1 to 6

- The low frequency side band energy content in the transmitted wave of a vestigial side-band signal is:
  - Equal to the energy content of the high frequency side bands.
  - Greater than the energy content of the high frequency side bands.
  - Less than the energy content of the high frequency side bands.
- Vestigial side-band transmission requires aligning the I.F. so that the carrier frequency response is:
  - Equal to the high video frequency response.
  - Twice the value of the high video frequency response.
  - One-half the value of the high video frequency response.
- The approximate gain of a video i-f stage is:
  - 2
  - 10
  - 50
- When stagger tuning the i-f stages of a television receiver:
  - It is absolutely necessary to use a sweep frequency generator in conjunction with an oscilloscope.
  - All that is necessary is to peak the i-f transformers at their separate designated frequencies, using a conventional sig-

nal generator and an output meter.

- The first and third i-f transformers are adjusted, followed by the second and fourth, using any appropriate aligning instruments.

5. The adjacent channel sound trap in a receiver with the video I.F.s set at 25.75 mc is:

- 27.25 mc.
- 26.00 mc.
- 21.25 mc.

### QUESTIONS 6 to 11

6. The associated sound channel trap in a receiver with the video I.F.s set at 25.75 mc is:

- 27.25 mc.
- 26.00 mc.
- 2.25 mc.

7. Increasing the i-f frequency in a television receiver:

- Has no effect on image frequency rejection.
- Increases image frequency rejection.
- Reduces image frequency rejection.

8. Most commercial television receivers require at least a \_\_\_\_\_ signal for good operation.

- 50 microvolt signal.
- 500 microvolt signal.
- 1000 microvolt signal.

9. A good overall video i-f band width is:

- 2 mc.
- 4 mc.
- 6 mc.

10. Marker frequencies are designed to:

- Indicate the position of a par-

ticular i-f frequency on a scope for purposes of adjustment at that frequency.

- Mark off the upper and lower frequencies of a 6 mc band on the scope.
- Indicate the position of the adjacent channel sound frequencies on a scope.

### QUESTIONS 11 to 16

11. In stagger-tuned television i-f circuits, the i-f transformers are:

- Single-tuned coils.
- Double-tuned coils.
- Triple-tuned coils.

12. The effect of narrow band television i-f transformers is less noticeable

- Large size cathode ray tube.
- Smaller cathode ray tubes.
- Cathode ray tubes using an ion trap.

13. The i-f frequency of a TV receiver is 25.75 mc. One of its adjacent channel traps is tuned to 19.75 mc. This adjacent channel is located in:

- The channel above the one to which the receiver is tuned.
- The channel below the one to which the receiver is tuned.
- Neither above or below the channel to which the receiver is tuned.

14. The capacitance in the tuning circuit of an i-f transformer is usually determined by:

- A fixed trimmer condenser across the coil.
- A variable trimmer condenser across the coil.
- The distributed capacity of the circuit and the input capacitance of the tube.

[Continued on page 30]

# SHOP NOTES

Write up any "tricks-of-the-trade" in radio servicing that you have discovered. We pay from \$1 to \$5 for such previously unpublished "SHOP NOTES" found acceptable. Send your data to "Shop Notes Editor".

## Locating Ignition Noise

By connecting an r-f coil across a set of headphones and using same as an exploring coil, it is a simple matter to locate ignition noises, etc. in car installations. By holding the coil close to the various wires under the dash, the ones causing the trouble can soon be located, and the annoyance eliminated by the use of a filter.

## How to Measure the Effective Impedance of an Output Transformer

To measure the effective impedance of an output transformer in an amplifier, for load matching purposes only, connect an output meter across the unloaded secondary of the transformer and make a reading in decibels (DB).

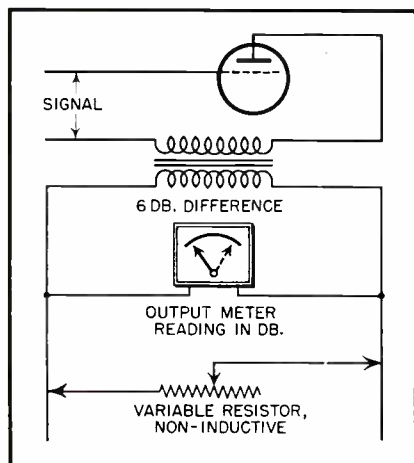


Figure 1

Then place a non-inductive load (resistor) across the output and vary its value until the output reading obtained, is 6 DB lower than the unloaded reading. (See figure a.) The d-c resistance of this resistor, measured with an ohmmeter, equals the effective impedance of the transformer.

## Auto Pack Ear-Tests

Auto-radio vibrators are divided into two general classes, synchronous and non-synchronous. Failure is about equally common in both types but the non-synchronous devices are most easily repaired. It is, however, generally best to replace them if the customer can pay since it is rarely possible for the serviceman to restore the original finish to the contact points and obtain accurate spacing of the reeds. In the great majority of sets using synchronous vibrators no station signal, accompanied by a

growling hum, is a sign of a shorted vibrator by-pass condenser. No sound at all except the mechanical buzz of the vibrator may indicate an open circuit in the vibrator output or, in some instances, an open or shorted filter condenser.

An uneven, rippling hum accompanying the station signal, is indicative either of a poorly adjusted (synchronized) vibrator or an open filter. A crackling, sparking noise with the signal is generally due to arcing contacts, or arcing in the by-pass condenser or at its terminals. Sometimes, too, this same noise is due to poor grounding of the vibrator shield.

A loud, clattering, mechanical vibrator noise is generally due to mal-adjustment of the vibrator. These sounds are sometimes heard in combination. In both synchronous and non-synchronous types the most usual trouble is the burned or jammed starting or "A" contact, resulting in burned out fuses.

Non-synchronous vibrators, if not troubled with the above symptoms, generally are subject to only three or four major ills. Hash is caused by a leaky rectifier tube plate by-pass or an open in this condenser. Very low volume, accompanied by a hum, is caused by a short or very low resistance short in the same condenser.

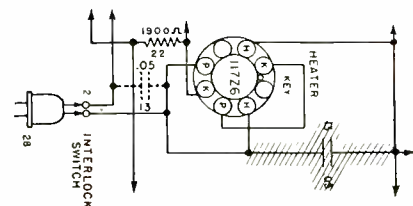
Good volume, with a little hum, is due to loss of filter capacity. Poor adjustment of contacts results in the vibrator drawing more current than it should and, in excess vibrator noise, both mechanical and electrical. In the cheaper types of non-synchronous devices, improper adjustment results in soldered leads melting off on account of the heat, and in burned reeds, around the contacts. In both types, individual makes give certain peculiar troubles. In sets using dynamotors, or motor generators very little trouble is encountered as a rule with power supplies.

Sometimes poor grounding of the generator produces grief. If the generator is not grounded to the same point as the set ground there sometimes is a generator whine, generally high-pitched, received through the speaker. If the generator polarity is reversed the output voltage will be reversed and the generator will labor, running about one-half its normal speed. Too much lubrication is poison to a generator. Just enough should be used to keep the wick saturated. A light vasoline will do the

trick nicely. When cleaning a generator be careful to get brushes back correctly. There is a difference in resistance between "A" side and "B" side brushes of some jobs.

## Crosley Models 56P and 56PB

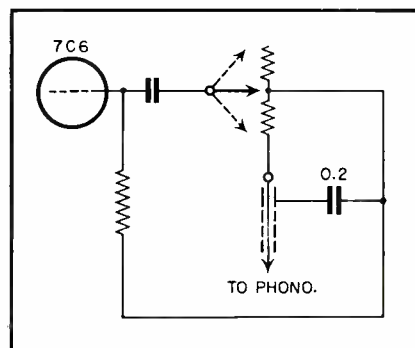
Some of the models 56PA and 56PB are more efficient on power line operation than they are on battery operation. This condition may exist in certain areas, even though the batteries are in good condition.



If a condition of this nature is encountered in your area, it is suggested that one lead wire of the .05 mfd. condenser, which is item number 13 in the schematic, should be disconnected from the terminal strip. This lead wire should be extended, covered with sleeving, and attached to the red wire in the interlock switch.

## Philco Hum (Model 46-1203)

On Philco 46-1203 combinations, increased hum as the phono volume control is advanced (although the radio section works normally), is due to a



partial or complete open isolating condenser placed between the shielded phono lead and common ground. (Part number 30-4594 .2  $\mu$ f). At first the cause of hum is difficult to detect since it sounds like an over-sensitive crystal.

## Use Sign-Flasher for Locating Intermittents

Most intermittent sets have a habit of operating properly when on the test bench in the shop. Cases of this type can be exasperating. It is almost impossible to locate and remedy the trouble in some of them unless they are watched vigilantly and checked to extremes.

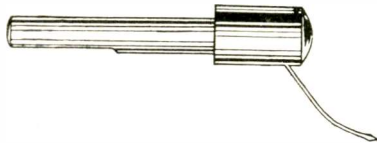
A common sign flasher may be used to advantage in breaking down defective and intermittent parts.

Connect the set to the power lines  
[Continued on page 31]

# NEW PRODUCTS

## New Nylon Needle

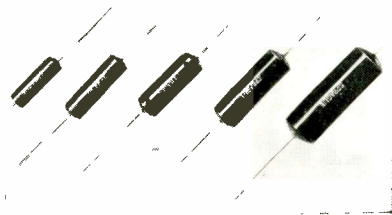
Duotone Company introduces a new Nylon needle that is shockproof. It cannot damage a record when dropped on it. Said to be completely "noiseless," the new needle gives exceptional



tonal fidelity because of the design wherein a secret precious metal tip is affixed to a spring steel shaft which in turn is mounted on the bumper. Full particulars may be had by writing the manufacturer at 799 Broadway, New York City.

## Phenolic Capacitors

Sprague Electric Co., North Adams, Mass. has announced a complete line of phenolic-molded paper tubular capacitors. The new units are highly heat-and moisture-resistant; are non-inflammable; are conservatively rated for operation from  $-40^{\circ}\text{C.}$  to  $+85^{\circ}\text{C.}$ , and are mechanically rugged.

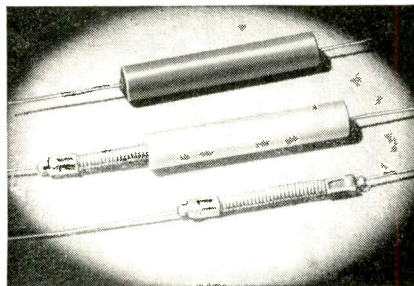


In most instances, the new molded tubulars are smaller than ordinary Sprague paper tubular capacitors of equal rating. Available are all popular capacities in 200, 400, 600, 1000 and 1600 volt types. Sprague Engineering Bulletin 210 containing complete details on the new development is available from the manufacturer.

## Ceramic-Cased Midget Wire-Wound Resistors

Inexpensive, ceramic-cased midget wire-wound resistors for tight spots and for facilitating point-to-point wiring, known as Greenohm Juniors, are announced by Clarostat Mfg. Co., Inc., 130 Clinton St., Brooklyn, N. Y. These resistors take the place of more cumbersome and costly bracket-mounted units, especially where space is at a premium.

This "junior" version of the well-known Greenohm power resistors, features a wire winding on fibre-glass core, with axial bare pigtail leads



climbed to the ends, placed in a steatite tube and thoroughly filled and sealed with exclusive Greenohm cold-setting inorganic cement. Since there is no organic material in this resistor, it will not blister, crack or change shape.

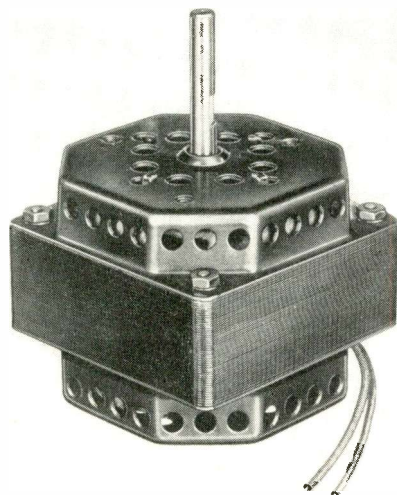
The standard Greenohm Junior Type C7GJ measures  $1\frac{3}{4}''$  long by  $\frac{5}{16}''$  dia., with  $2''$  leads. It is rated at 7 watts and, as with regular Greenohms, has exceptional heat dissipation for handling overloads. Available in values from practically zero to 5000 ohms max. Smaller Type C4GJ measures  $1''$  long by  $\frac{5}{16}''$  dia., and is rated at 4 watts, with maximum available resistance of 1000 ohms.

## G. I. Phono Motor

To meet the increased power requirements of wire and tape recording units, a new and improved RM-4 Smooth Power motor for general small motor applications is announced by The General Industries Company, Elyria, Ohio.

Originally introduced in 1939, the RM-4 motor long has been a standard unit in many different record-changer and recording assemblies, including General Industries' own combination recorder and record changer.

Features of the new model include the addition of a bottom motor cover,



totally enclosed magnetic circuit to insure low stray fields.

New scientific air intakes and dual aluminum fans to provide controlled forced air circulation, resulting in exceptionally cool running characteristics and low temperature rise.

The new RM-4 is a four pole, shaded pole induction motor, for 60-cycle AC operation at 115 volts, clockwise or counter-clockwise rotation, but is available for other voltages and frequencies.

The new motor is  $3\frac{3}{8}''$  square x  $2\frac{7}{8}''$  high. Overall height, including bearing housings, is  $3\frac{1}{8}''$ . Motor shaft is standard  $\frac{5}{16}''$  diameter. Shaft length of  $23\frac{32}''$  from main body of motor can be varied to fit specific requirements. Lead wires are  $12''$  long and are Underwriters' Approved. The motor weighs  $4\frac{1}{2}$  lbs.

## New FM Receptor

Meissner Manufacturing Division of Maguire Industries, Inc., Mt. Carmel, Ill., is introducing the Meissner model 8C FM receptor. A simple connection to any present AM radio, this unit permits full scale fidelity of FM reception.

Special features include new FM band, 88 to 108 Mc.; audio fidelity, flat within plus or minus 2db. from



50 to 15,000 CPS.; audio output, 3 volts R.M.S. at minimum useable signal input, 30% modulation, output voltages as high as 15 volts R.M.S. obtained without distortion; power supply, 105 to 125 volts, 50 or 60 cycle AC consumption, 35 watts; tube compliment, 2 type 6AG5, 2 type 6BA6, 2 type 6C4, 1 type 6AL5 and 1 type 6X5GT/G.

For further information write the manufacturer: Meissner Manufacturing Division of Maguire Industries, Mt. Carmel, Ill.

## New Cap Chest

A new combination kit of Olson "Akrad" Electrolytic Condensers known as the "CAP CHEST" is offered by Olson Radio Warehouse, Inc., 73E. Mill Street, Akron 8, Ohio. A selected assortment of 27 of the most popular 25V, 150V and 450V Condensers are packed in a handsome walnut finished

[Continued on page 31]

SPEAKERS

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## TECHNICAL QUIZ

[from page 27]

15. A TV receiver has a single r-f stage and a 25.75 mc i-f circuit. Image frequency interference from the FM band may be expected in channel.

- A. 6.
- B. 4.
- C. 2.

16. The number of adjacent and associated channel sound and video carrier frequencies that must be rejected in a well designed receiver is:

- A. 1.
- B. 2.
- C. 3.

17. A method of injecting a marker frequency in an alignment setup without loading the grid is:

- A. To feed the high side of the marker signal generator at the point where the sweep generator is connected to the receiver chassis and to connect the ground side of the signal generator to another point on the chassis.
- B. To couple the high side of the signal generator to the grid of the tube with a low value of capacitance.
- C. To couple the signal generator to the grid of the tube with suitable resistance network.

18. In aligning the i-f stages of a television receiver the transformers are aligned:

- A. At the same i-f frequency.
- B. At different i-f frequencies.
- C. To take into consideration the size of the picture.

19. Audio and video i-f rejection filters are:

- A. Never connected in series with the primary and secondary of the video i-f transformer.
- B. Never coupled indirectly to the primary or secondary of the video i-f transformers.
- C. Never connected on the input side of the mixer.

20. Separation of the video and audio I.F.'s usually takes place:

- A. In the stage immediately following the mixer.
- B. In the stage immediately preceding the second detector.
- C. By means of a separate tube element located in the mixer tube which feeds the sound i-f channel.

21. The separation frequency between the video and audio i-f carriers in cheaper receivers is:

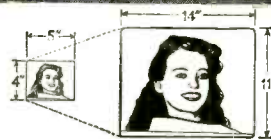
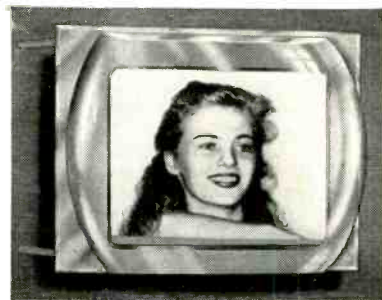
- A. 4.5 mc.
- B. 3 mc.
- C. 6 mc.

22. In television receivers the more

# TRANSVISION

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common variety of i-f transformers are:

- A. *Slug tuned.*
- B. *Air tuned.*
- C. *Ceramic tuned.*

23. The advantage to be gained by the use of single tuned i-f transformers over other types is:

- A. *Greater gain.*
- B. *Wider frequency response.*
- C. *Greater ease of alignment.*

24. The low gain characteristics of stages used in video circuits due to the circuit loading and the high frequencies used makes it necessary to use:

- A. *High transconductance tubes.*
- B. *Tubes with a high figure of merit.*
- C. *Tubes with a high amplification factor.*

25. Input capacitance, wiring and stray capacitance effects constitute a ——— portion of the total capacitance of a circuit at video frequencies.

- A. *Minor.*
- B. *Medium.*
- C. *Major.*

**FOR ANSWERS SEE PAGE 33**

## NEW PRODUCTS

[from page 29]

wood chest with six adjustable compartments. A hinged lid keeps the contents in clean, orderly array, and always ready for use.

## EDITORIAL

[from page 3]

that end for it will eliminate a certain number of technically incompetent servicemen and technicians.

### Alternatives to Licensing

Manufacturers of receivers, by designing and producing sets that are not so tightly and compactly assembled, thus simplifying the time required for repairs and replacement factor, would contribute greatly. The servicing profession itself, by establishing a Code of Ethics that would of necessity have to be governed and enforced by the industry could solve the problem. In all probability to accomplish this the industry would have to establish a National Association of Radio Technicians, (under which there would have to be Regional Branches), and in which membership would perforce have to be mandatory before one would be eligible to engage in radio repairing, even on a part-time basis.

This idea, a National Association, industry sponsored and governed, is in our present opinion, the most logical one upon which to deliberate. The existent local associations of radio servicemen, most of which accomplish great good, could and should be

used as the nucleus upon which to build such a national organization. There are many other sound ways in which the servicing industry can proceed in order to attain a position of prestige and recognition for competence and integrity. But it is a most complex problem and requires great deliberation. Let us hope that New York's Council does not rush into any hasty action. And let us, as an industry, not drop this mission of housecleaning until our goal has been reached.

## TRADE FLASHES

[from page 13]

for easy use and include Standard Series, Concert Series, Extended Range Single-Radiator Series, Coaxial Series, Bass Reflex Reproducers and Cabinets, and the Professional Series. The Professional Series includes such items as heavy-duty theatre equipment, Hypex and "S" Projectors, and Speechmaster Reproducers. Three pages are devoted to a listing of impedance matching transformers in both fixed and adjustable impedance designs.

In the back of the book is a comparison chart showing all Jensen models in their relative gap energy levels. Each band of gap energy is separated from the

next by 1.5 db. New Jensen models are shown side by side with their Alnico 3 predecessors to make selection easy for the purchaser.

Copies of Jensen catalog No. 1010 are obtainable from the company at 6601 S. Laramie Ave., Chicago 38, Ill.

## SHOP NOTES

[from page 28]

through a flasher button and let it run till things start happening. It is also a good idea to apply the same procedure on doubtful sets.

After finishing repairs for a critical customer, let the set run on the flasher for an hour or so.

### Locating Auto-Radio Noise

It is common practice when testing for noise in an auto-radio to disconnect the antenna to see whether the noise is picked up in the antenna system or in the chassis. This usually eliminates the noise, even though the antenna is not at fault. Noise induced by chassis pickup disappears also, thus there is no indication as to whether the noise is picked up by the antenna or chassis.

A better method of performing the above test is to disconnect the antenna and in its place connect a 4-foot piece of shielded lead. The inner conductor

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# TUBES

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1LN5	1.00	6X5	.60	27	.50
1N5	.60	6Y6	.60	30	.50
1R5	.60	7A8	.60	31	.50
1S5	.60	7B6	.60	35A5	.60
1T4	.60	7B7	.60	35L6	.50
2C26	.50	7C5	.60	35W4	.50
2C40	1.00	7C6	.60	35Z5	.60
3B24	1.00	7E5	.50	39/44	.50
5U4	.50	7F5	.50	50B5	.60
5Y3	.50	7F8	.95	50L6	.60
6A8	.60	7G7	.95	50X6	.75
6AC7	.75	7N7	.50	50Y6	.50
6AG5	.75	7Y4	.60	75	.50
6AL5	.50	12A6	.50	76	.50
6C4	.50	12AH7	.60	77	.50
6C5	.50	12AT6	.60	78	.50
6H6	.50	12BA6	.60	80	.50
6J5	.50	12BE6	.60	84/6Z4	.50
6J7	.60	12C8	.50	117L7	1.00
6K6	.50	12J5	.50	FM1000	1.10
6K7	.60	12SF7	.60	XXFM	.95
6S8	.50	12SG7	.60	XXL	.60
6SA7	.50	12SH7	.50	VR105	.60
6SD7	.50	12SK7	.50	VR150	.60
6SG7	.50	12SJ7	.50	826	1.00
6SH7	.50	12SN7	.50	954	.75
6SJ7	.50	12SQ7	.50	955	.75
6SK7	.50	12SR7	.50	956	.75
6SL7	.75	14A7	.75	9001	.75
6SN7	.50	14B6	.75	9003	.75
6SQ7	.50	14R7	.75	9006	.50

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should be shorted to the shield at the far end. If, when performing this test, noise does not disappear when the antenna is disconnected and the shielded lead substituted, it is a good indication that noise is resulting from chassis pickup, and not the antenna system. This can be corrected by grounding the chassis thoroughly, also by checking the cabinet cover for good contact with the rest of the chassis. Sometimes an r-f filter is necessary in the hot "A" lead.

### To Increase Resistor Values

Resistors that lack several hundred ohms in value can easily be brought up by piling or grinding a little off of one side between the two end caps. A little practice will make it possible for anyone to file a resistor of, for example, 500 ohms and bring it up to 600 or 700 ohms in value. Resistors too hard to file can be ground on an emery wheel.

### 70 VOLT SPEAKER DISTRIBUTION LINE

[from page 24]

the oscillator is adjusted so that the rated power from the amplifier is being delivered to rated load impedance ( $L$ ). If the amplifier has been designed for use with a 70 volt LSD line, it simply means that under the above condition the voltage ( $V$ ) is equal to 70 volts. If it is a 10-watt amplifier, the rated load impedance will be 500 ohms. Any 10-watt amplifier with a rated load impedance of 500 ohms is suitable for use with a 70 volt loudspeaker distribution line, if it is suitable for driving loudspeakers at all. Similarly a 50-watt amplifier with a rated load of 100-ohms impedance is suitable for use with a 70 volt LSD line. In general, any sound system amplifier may be used with a 70-volt line if its rated power multiplied by its rated load impedance is equal to 5000.

### AUDIO EXTRACTOR

[from page 19]

aside from ordinary audio spot-signal production which will suggest themselves to the ingenious radio serviceman. For example: it can be used to extract the audio envelope of any amplitude-modulated wave for oscillographic examination. It may be employed also as a substitution channel to pinch hit for a dead 2nd detector, and as a simple a-f and r-f signal tracer requiring no power supply. See Fig. 2C. In the latter application, high-impedance headphones may be employed as an indicator; or, if the user prefers, an oscilloscope, magic eye, or a-c vacuum tube voltmeter may be employed.

### THE 260 V-O-M

[from page 19]

When testing electrolytics, the positive jack should be connected to the positive terminal of the condenser. Otherwise the reading will be too high because of the high leakage in the reverse polarity. After connecting the test leads to the condenser, allow sufficient time for the pointer to reach its maximum resistance reading.

In general, a high grade, high voltage electrolytic condenser should read about .5 meg or above and a low voltage electrolytic by-pass should read above .1 meg. A more accurate test is to apply the rated polarizing d-c voltage to the condenser with a milliammeter in series. It should read about 0.1 ma per  $\mu$ f, the maximum for a useful unit being about 0.5 ma per  $\mu$ f. New electrolytics that have been idle for considerable time may show high leakage but after "aging" at their rated voltages for a few minutes will return to normal.

A rough test of comparative capacity

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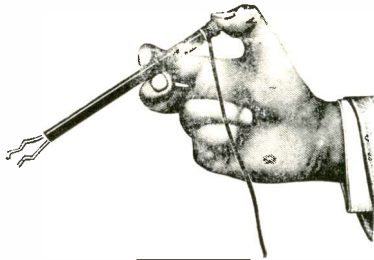
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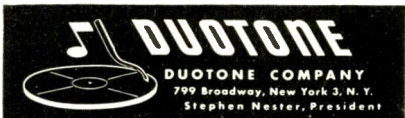
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Actually b-o-u-n-c-e the whole tone arm on a record without effect. A spring steel shaft and nylon elbow—that is the secret!

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of paper condensers can be made by connecting it as shown in Fig. 2. The larger the unknown condenser being

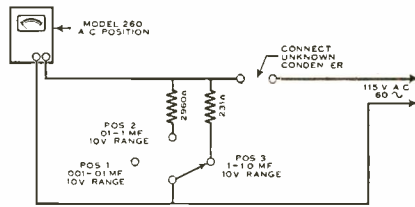


Figure 2

tested, the smaller its reactance and therefore the higher the reading will be on the a-c voltmeter. The accompanying Table 1 shows the approximate

Table 1

UNKNOWN CONDENSER MF.	METER RANGE	APPROXIMATE READING A.C. VOLTS
Pos. 1		
.001	10 V. A.C.	.6
.002	" "	1.1
.003	" "	1.5
.004	" "	1.9
.005	" "	2.5
.006	" "	3.0
.007	" "	3.6
.008	" "	4.0
.009	" "	4.4
.01	" "	4.8
Pos. 2		
.01	10 V. A.C.	1
.02	" "	2
.03	" "	3
.04	" "	4
.05	" "	5
.06	" "	6
.07	" "	7
.08	" "	8
.09	" "	9
.1	" "	10
Pos. 3		
.1	10 V. A.C.	1
.2	" "	2
.3	" "	3
.4	" "	4
.5	" "	5
.6	" "	6
.7	" "	7
.8	" "	8
.9	" "	9
1.0	" "	10

readings that will be obtained when testing condensers from .001  $\mu$ f to 1.0  $\mu$ f. Before connecting an unknown condenser for test, place the range selector switch of the model 260 in the "250 volt" position. Connect the con-

[Continued on next page]

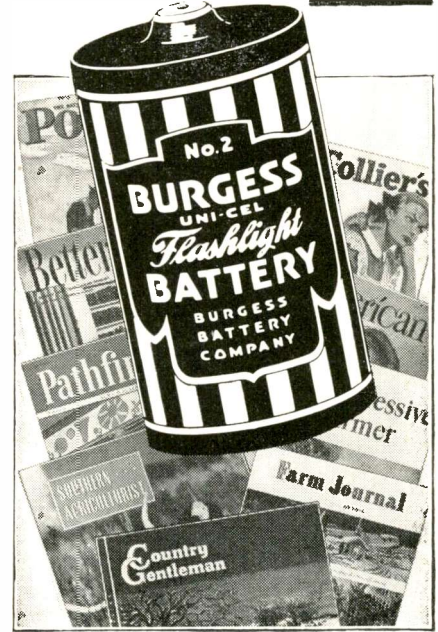
### TECHNICAL QUIZ No. 4 ANSWERS

Do NOT read or study these answers until you have finished marking down your answers to the "Quiz" given on page 27 of this issue. When that is done, compare your answers to these correct ones.

#### ANSWERS

- 1-B; 2-C; 3-B; 4-B; 5-A;  
6-C; 7-B; 8-B; 9-B; 10-A;  
11-A; 12-B; 13-A; 14-C; 15-C;  
16-C; 17-A; 18-B; 19-C; 20-A;  
21-B; 22-A; 23-C; 24-B; 25-C;

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denser, and if it shorted, the meter will read line voltage which would damage the meter if it were in the "10 volt" position. Do not try to test electrolytics in this way as only d.c. can be applied to them.

### MASTER vs. INDOOR TV ANTENNAS

[from page 18]

the transmitter. The test receiver is carefully adjusted to the transmitter's channel, and the test pattern observed for reflections. The transmitted image must be a standard test pattern, as this shows the interfering ghost images most

definitely. The man at the test receiver directs the man rotating the antenna on the method of making a careful adjustment. When a perfect picture is not found after a full 360 degree rotation, at the preferred location, the antenna must be moved to another position and the adjustment repeated. In complex signal areas, the entire roof may be covered without locating a perfect picture. Under these conditions a drawing of the roof, with a careful report of the signals found, assists in determining a final compromise position where the ghost mars the picture the least.

After the antenna for one channel has been found, the test procedure must be repeated for each of the other channels to be received. Care must be taken to avoid antenna interaction where the antennas must operate in close proximity. Tests must be made with all the antennas erected to make sure that no one antenna impairs another's signal.

The FM antenna location is not critical, except for checking that the antenna can pick-up signals from all directions.

In mounting the antennas, precautions should be taken to comply with all building regulations and electrical codes.

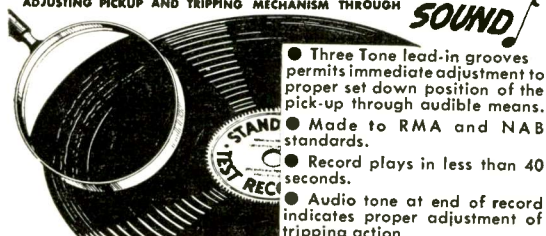
Master Antenna Systems as shown in Fig. 1, have been installed in several

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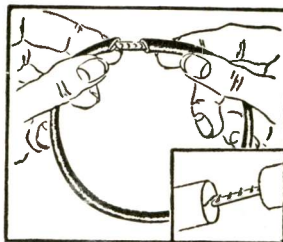
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Fig. 7—Master Antenna in store

New York City buildings—such as (15 East 91st Street and 47 East 87th Street; General Motors Building; Telicon and Intra-Video Laboratories at 851 Madison Avenue; John Wanamaker Dept. Store; L. Bamberger and Company, Newark, New Jersey; Abraham & Straus, Inc., Brooklyn; B. Gertz, Inc., Jamaica; Liberty Music Shops, New York City; and in other stores and dealer establishments either in New York or Philadelphia, Fig. 7, Raymond Rosen & Company, Inc., Philadelphia).

An engineering sample of the RCA Master Antennaplex System has been installed in the NBC Building.

The value of Intra-Video to a department store or dealer's Television Demonstration Center is obvious. Such a Master Antenna System permits the dealer to demonstrate all of the television receivers he is selling under the same operating conditions, allowing customers to make a fair comparison and choose the receiver desired.

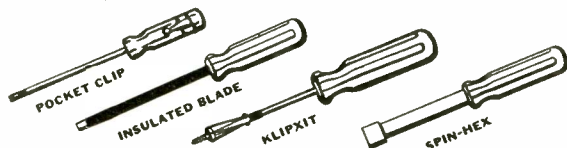
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173 TYPES AND SIZES



### NEW...Colored Spin-Hex Handle Caps

Developed by Vaco to end confusion of similar sizes, speed up production. Color of cap indicates size of driver.



### PORTENTS—19 18

[from page 15]

television personnel have been undergoing special training in both communications and research laboratory sections

"Since television uses VHF techniques, Bendix Radio is in no way foreign to the field. Radar work both

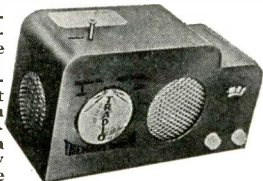


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for war production and on current GCA radar which we are building for use in landing planes 'blind' at airports essentially covers many of the problems of video or picture transmission. We are already well established in FM which is also used for the sound side of television," Hilliard explained.

"The Bendix research and development laboratory has been active in television since before the war's end and has contributed notable improvements in the use of extra bright tubes and automatic frequency and synchronization controls," he concluded.

In addition to its activities at the Baltimore home plant of the Bendix Radio Division, Bendix Aviation Corporation is further engaged in laboratory research in both its Detroit and Teterboro, New Jersey, laboratories. The latter has made big strides in projection optics, basis of large screen television. Hilliard pointed out that Bendix Radio was established in Baltimore to serve the needs of government agencies interested in aircraft radio and navigation aids, which it pioneered. The present air-conditioned factory and office quarters were built just prior to the war. They are among the largest and finest built solely for radio in the country. Bendix Radio has only recently occupied an addition comprising 100,000 square feet of "long line" production area.

Hilliard further commented that the board of directors of the Bendix Aviation Corporation recently reviewed and approved the full program of expansion into television. An aggressive sales program is now being developed under guidance of J. T. Dalton, general sales manager for radio and television, he concluded.

**Admiral TV Plans**

In preparation for the introduction of a "different" line of television receivers by Admiral Corporation in January, 1948, executives of Admiral distributors' service departments are taking a preliminary training course.

With a large proportion of all service calls on present television due to improper installations, the firm is making certain that every serviceman who installs one of its sets will be an expert. Ray Petersen, field service engineer is directing the course.

**Television "Beyond The Horizon"**

Expansion of television service to communities beyond the horizon, and even to homes in valleys cut off by mountains from the primary transmitting antenna, has been proven practicable by tests conducted by Station WBRE, of Wilkes-Barre, Pa.

Television signals picked up by a mountain-top antenna from the WNB

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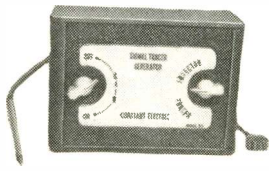
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PLUS a signal generator that delivers a strong A.F., I.F. AND R.F. signal, permitting the serviceman to align and trace any portion of receiver under test. Generator frequency 1000 cycles to 25 megacycles. Uses a multivibrator network.

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transmitter in New York, 105 miles away are being successfully amplified and carried by an RCA microwave television relay system to six television receivers at Kingston.

The Wilkes-Barre experiment constitutes a pioneer test of repeater-type television station operation, and one of the first in which microwave relay equipment has been used to carry television "over-the-hump" by beaming it from an elevated receiving antenna down to receivers or a rebroadcast transmitter in an area ringed by mountains.

### G-E Ups Video Output

Production has begun on General Electric's large screen television receiver and sets should begin to reach dealers in television cities within the next few weeks, I. J. Kaar, Manager of the Receiver Division at Electronics Park, has announced.

Model 901 projects an image 18 x 24 inches, almost 10 times the area of the picture produced by most television receivers now in use. In addition to television, this instrument includes AM, FM and shortwave radio and an automatic phonograph. The list price is \$2,250, plus installation.

Using a five-inch cathode ray tube, the image is reflected by means of the Schmidt optical system upon the reverse side of a translucent plastic screen.

### UST Opinion On Projection Video Models

The television table model of the future will be a projection receiver rather than one of direct-view, it was predicted by Hamilton Hoge, President of U. S. Television Mfg. Corp., recently. UST makes both direct-view and projection television receivers.

"The public wants larger television pictures at a lower price," Mr. Hoge declared. "The only way to get a larger picture by direct-view is to increase the size of the cathode ray tube. This naturally increases the cost of the set. In projection it is possible to decrease the size of the tube while getting large pictures. At present UST uses a five-inch tube to get pictures as large as 30 by 22 1/2 inches on its public place sets. A smaller tube will soon be used to do the same job. The potential cost reduction in projection television is great while in direct-view it is very slim."

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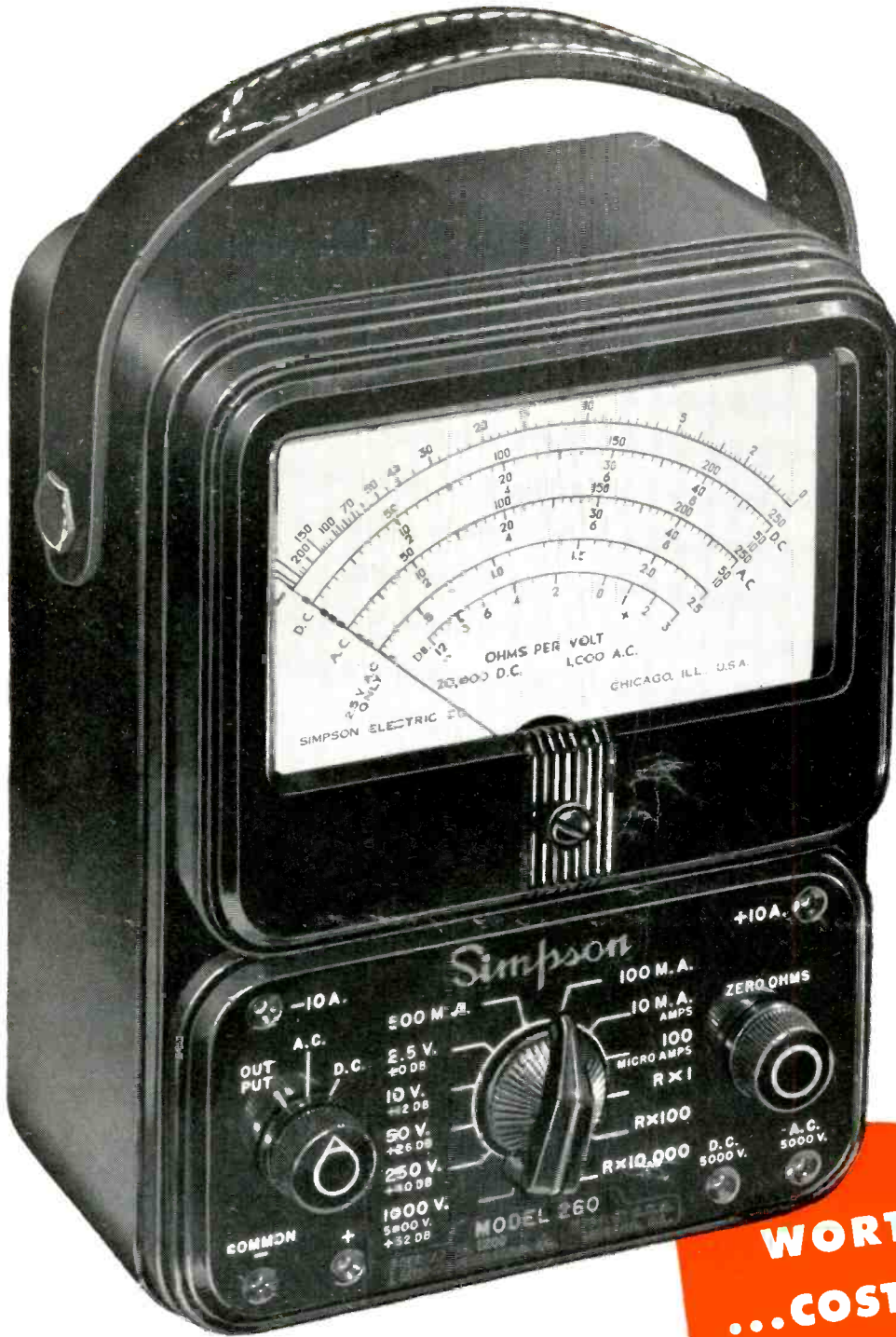
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**MODEL 260  
VOLT-OHM-MILLIAMMETER**

20,000 Ohms per Volt D.C.  
1,000 Ohms per Volt A.C.

Volts, A.C. and D.C.: 2.5, 10, 50, 250, 1000, 5000.

Milliamperes, D.C.: 10, 100, 500.  
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Both complete with test leads and  
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The price is the same. That means, of course, that your investment today buys even more in utility and the *staying* accuracy that distinguish this most popular high-sensitivity set tester in the world.

\*No other maker of test instruments provides anything to approach the completeness of the pocket-size 32-page Operator's Manual that accompanies Simpson Model 260. Illustrated with 12 circuit and schematic diagrams. Printed on tough map paper to withstand constant usage.

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So . . . *Push RCA Tubes and watch your business grow!* For full details on sales promotion displays, see your local RCA Tube Distributor today.

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