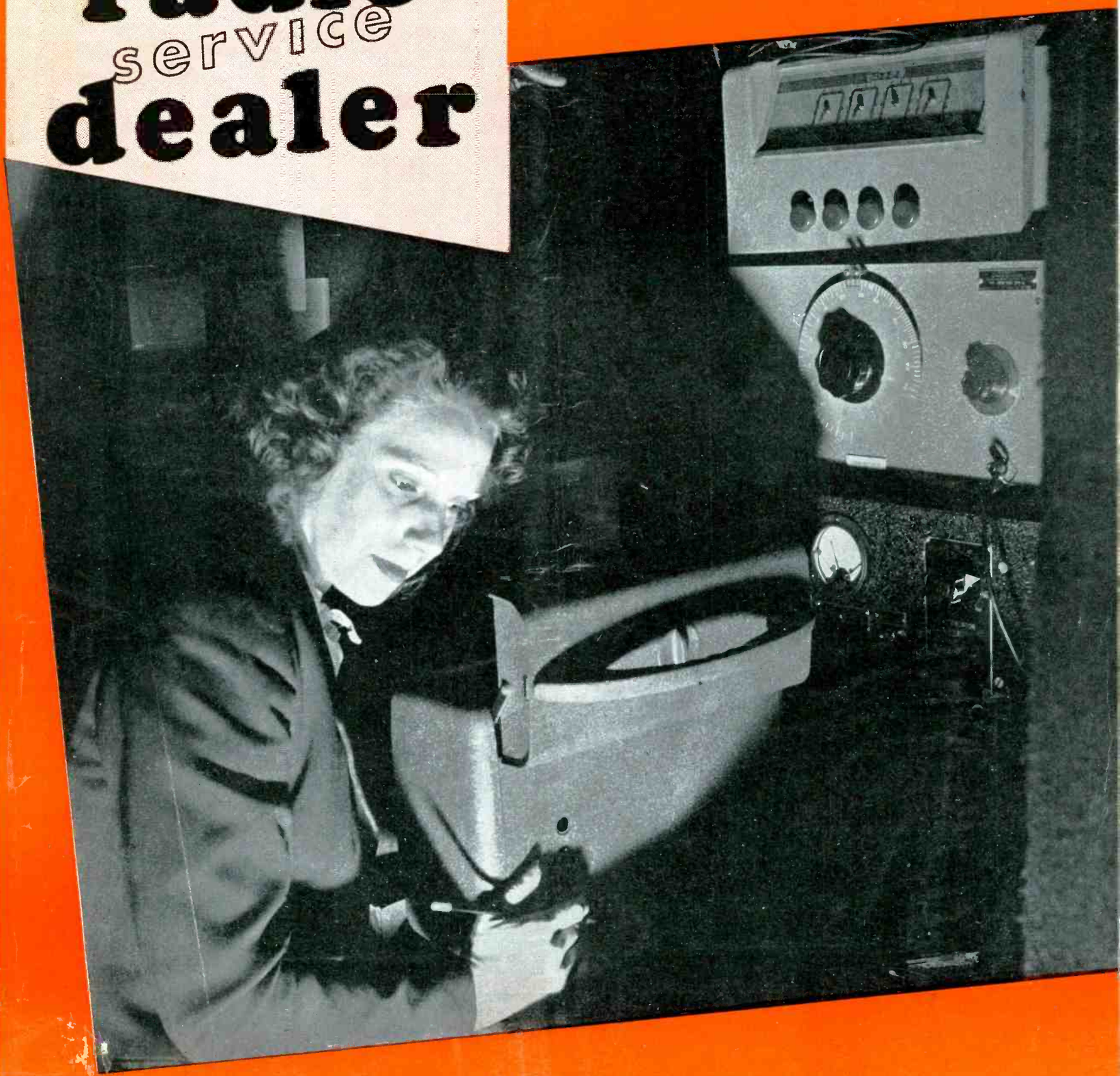
JUNE 1946

radio service dealer



In This Issue:

SERVICES FUTURE BUYERS

OHMMETERS, CONDENSER TESTERS, CAPACITANCE METERS

MODERN TUBE TESTING — II

TROUBLE SHOOTING

SYLVANIA NEWS
RADIO SERVICE EDITION

JUNE *Prepared by* SYLVANIA ELECTRIC PRODUCTS INC., Emporium, Pa. 1946

"CARRY THE TUBES THAT BUILD GOODWILL" IS THEME OF SYLVANIA TUBE QUALITY STORY

Carrying the *complete* line of Sylvania receiving tubes is one of the best ways to build goodwill for your business.

You can be sure of this because of the public's recognition of Sylvania's high quality. Extensive national advertising has helped promote this recognition — and *acceptance*. QUALITY CONTROL backs up this story of Sylvania quality.

Before Sylvania tubes can be shipped to your distributor, they must first pass a series of stiff tests conducted by an efficient Quality Control Department. Only those tubes that are proved to be electrically and mechanically perfect ever reach you.

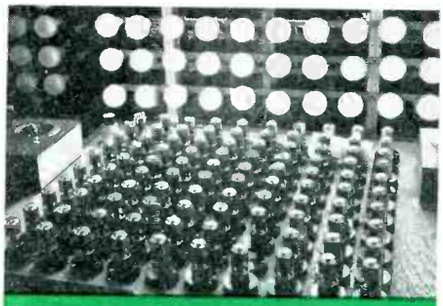
Sylvania makes its own tube parts — over forty-five million a month. Even the fine tungsten wire filaments for Sylvania tubes are *Sylvania-made* to safeguard the quality of this vital tube element.

As a result, Sylvania can keep a close check on every tube — from raw materials straight through to the finished product.

Remember the story of Sylvania quality! It is one reason why carrying Sylvania tubes means you will receive a lot extra in the way of *goodwill*.

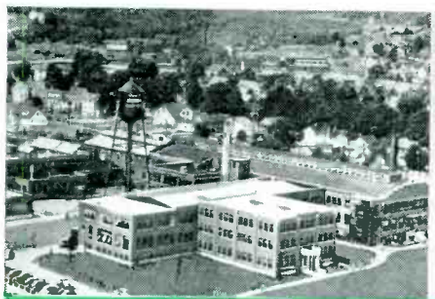
SEE YOUR SYLVANIA DISTRIBUTOR

For full information on the complete line of Sylvania receiving tubes — and the long list of valuable business and technical aids for you — call on your local distributor.

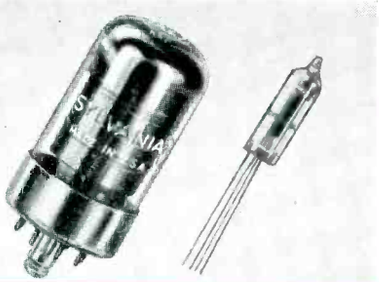


Completed tubes are being "aged" to stabilize characteristics. Then they get continuity, short and noise tests.

Tubes are here being given the Life Test — as cnother check on design, quality and dependable service.



Part of the Emporium, Pa., Tube Plant, where pleasant surroundings help keep employees tuned to quality workmanship.



Quality products—the Sylvania Lock-In tube, and the tiny T-3 tube of proximity fuze fame.

This operation gives a percentage of all previously tested tubes a thorough going-over—ust as a "double-check."

SYLVANIA ELECTRIC

Emporium, Pa.

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

BIGGEST in PLASTIC

Yes, they're the biggest one-piece molded plastic cabinets ever made in radio. And they're beautiful! Satin-smooth mahogany in color with plenty of eye-appeal. Here's convincing proof of Admiral leadership in producing the merchandise America wants.

Look at the features!
Compare the prices... from

Admiral

6RT41 Radio-Phonograph

Featuring new "childproof" record changer . . . plays up to 12 records automatically . . . featherlight tone-arm assures longer record life . . . may be moved at any time without damage to mechanism . . . improved multi-tube superhet circuit with beam power output, bass compensation, and automatic volume control, gives outstanding performance . . . easy-to-tune colorful plastic dial . . . PM dynamic speaker with Alnico No. 5 metal assures superb tone quality.

OPA CEILING PRICE ZONE 1 **$63.15**

OPA CEILING PRICE ZONE 1 **$47.30**

6RP48 Electric Phonograph

Featuring new "childproof" record changer (see 6RT41) . . . 3-tube amplifier with beam power output produces sufficient volume for use in schools, clubrooms, etc. . . . PM dynamic speaker with new Alnico No. 5 metal assures superb tone quality.

Admiral Corporation CHICAGO 47, ILL. • WORLD'S LARGEST MANUFACTURER OF RADIO-PHONOGRAPHS WITH AUTOMATIC RECORD CHANGERS

RCA Radio Batteries Are Radio-Engineered

To Give Your Customers Extra Listening Hours

RCA *Preferred-Type* Radio Batteries *do* have longer than average life—because they're *radio-engineered* for *extra listening hours.* Your customers get more for their money—you reap the reward of repeat sales.

That's one of the reasons why dealers and customers alike show preference for RCA *Preferred-Type* Radio Batteries. But there are other reasons, too:

RCA has concentrated production on types that will service over 90% of most battery-operated receivers. That means fewer types to stock.

What's more, people naturally turn to RCA for the best in radio. The RCA name, vividly displayed on batteries *and* tubes, brings more customers to your store.

For a fast-moving line packed with profits, hitch on to RCA *Preferred-Type* Radio Batteries. Get the complete details by filling in the coupon and mailing it to your RCA Tube Distributor today.

Listen to "THE RCA SHOW"
Sundays, 4:30 P.M., EDT, NBC Network

WATCH THIS FAMILY GROW

Mr. RCA Tube Distributor:

I want to know more about the line of RCA *Preferred-Type* Radio Batteries.

Name_____

Company_____

Address_____

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

radio service dealer

Member Audit Bureau of Circulations

Covers all phases of radio, phonograph, sound and electrical appliance merchandising and servicing

VOLUME 7 Number 6

JUNE, 1946

CONTENTS

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Your best customers know and

WATCH FOR OUR ADS IN THE SATURDAY EVENING POST

WATCH FOR OUR ADS IN THE SATURDAY EVENING POST
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People *pay attention*

prefer Post-advertised lines

When a manufacturer asks you to "watch for our ads in the Post," he's calling your attention to the *best* kind of local support.

For advertisements in the Post reach your *best* customers—the *leaders*, who are first to buy the new and better things.

And advertisements in the Post get attention. For people *like* to read ads in the Post—far more than in *any other magazine.*

when they see it in the POST

ANNOUNCING... the new

Yours for Bigger Profits

NOW, for the first time, with RCA's complete line of Package Sound, it's easy to tailor the equipment to fit the job, because all components are *matched* to work together for *top performance.*

And what's more—they all bear the RCA Seal . . . your guarantee of quality equipment and customer good will.

RCA Junior Velocity Microphone—MI-4036. Small, lightweight, bi-directional—for general use wherever high quality at low cost is required.

RCA Aeropressure Microphone—MI-6206. Adjustable for sharp or broad directional characteristics. Excellent outdoors—in interviews and mobile pickups.

MICROPHONES

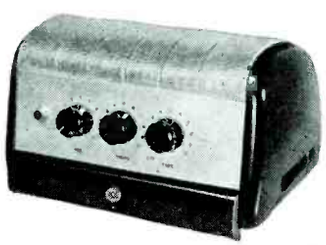
RCA Aerodynamic Microphone—MI-6226. Ideal for paging, close-talking announce work and portable use—insensitive to mechanical shock.

RCA Program Velocity Microphone—MI-12002. A brand-new velocity microphone of striking design—unusually small in size—very low in cost.

RCA Dynamic Announce Microphone—MI-12004. Unrivalled for its compact styling, unique appearance, high quality and low cost.

RCA Aerocrystal Microphone—MI-12006. For all announce applications requiring clear, crisp, intelligible speech. Will readily penetrate street and crowd noises.

AMPLIFIERS



RCA 6-Watt Amplifier. Low cost, high quality, amplifier—for small public address, paging, store demonstration, etc. For high impedance microphone and high or low impedance phonograph.

RCA 15-Watt Amplifier—MI-12295. Medium power, high gain—for small auditoriums, dance halls, etc. One microphone and two phonograph volume controls, tone control, separate ON-OFF switch.

RCA 25-Watt Amplifier—MI-12298. For night clubs, small hotels, garages, playgrounds, etc. Has two microphone and two phonograph volume controls, tone control, separate ON-OFF switch and pilot light.

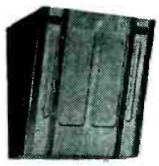
RCA Package Sound Line

...Better Business!!!

SPEAKERS
BAFFLES
HORNS

A quality line of PM Speakers with the new Alnico-V magnet for compactness and increased sensitivity. 6½", 8", and 12¼" sizes.

RCA Accordion Cone Speaker Mechanism MI-6234. The latest design. Better bass reproduction — smoother over-all response. 7" dia.



RCA Sloping Front Housings. Finished in walnut, for 8" and 12" speakers, ideal for hotels, offices, restaurants, stores, etc.

RCA 3½ Ft. Re-entrant Baffle —MI-6302. For speech reproduction over large areas with excellent directional characteristics.

RCA Wide Angle Baffles. Excellent baffles for sound truck or general outdoor use. For use with any 8" or 12" cone speakers.

RCA Narrow Beam Paging Baffles—MI-6311. For high level outdoor and indoor paging and speech reproduction over large areas.

TURNTABLES & RECORD PLAYERS

RCA 16" Turntable in Carrying Case—MI-12847. Dynamically balanced—turntable for standard or transcription records at 78 RPM, 33⅓ RPM, or variable speed. "Feather-touch" tone arm. For use with any RCA amplifier with high impedance input. In handsome black leatherette.

RCA Automatic Record Changer, in Carrying Case—MI-12848. Will play and change ten twelve-inch or twelve ten-inch records at one loading. Carrying case finished in beautiful gray fabrikoid. For operation with any RCA amplifier of high impedance input.

PORTABLE PUBLIC ADDRESS SYSTEMS

RCA 15-Watt Portable Public Address System. For audiences up to 2000. Lightweight—includes 15-Watt Amplifier, Junior Velocity Microphone and Stand, two 8" speakers, 85 feet of cable.

RCA 25-Watt Portable Public Address System. RCA 25-Watt Amplifier, Junior Velocity Microphone and Stand, two 12¼" speakers, and 85 feet of cable.

Get the story on the new RCA Package Sound Line *today*—see your RCA Distributor, or write direct to Sound Equipment Section, 88-F, Engineering Products Department, Radio Corporation of America, Camden, N. J.

SOUND EQUIPMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In & Around the Trade

Being a condensed digest of production, distribution and merchandising activities in the radio and appliance trade.

In Stromberg-Carlson's new quarterly dealer publication, "The Merchandiser", dealers get sales pointers, display ideas, engineering features of sales importance, news of company-generated sales promotion and advertising campaigns, a piece about the dollar-importance of keeping the servicing of radio receivers as a vital adjunct to dealer business. Above, Fred Anibal (right), company district merchandiser, gives a copy to A. C. Mares, radio buyer for Sibley, Lindsay & Curr, well known Rochester, N. Y., department store.

SLIGHT PRICE RISE FOR RADIOS

Radio receiving sets shipped by manufacturers on or after May 16, 1946, will cost consumers four to five per cent more, on the average, than they have been paying for earlier shipments. Any sets now in stock at retail stores or in the process of shipment remain subject to the former maximum prices.

The additional four or five cents on the dollar that consumers will pay for the new sets goes almost wholly to manufacturers, to cover wage and materials costs increases sustained since reconversion prices were set last fall. Distributors and dealers will neither gain nor lose, dollar-wise, on the new prices, which, on the average, are the old prices plus the dollar-and-cent amounts of the manufacturer's increases.

In order to effect this new pricing, the percentage margins formerly set up in the radio regulation have been somewhat lowered, since the old dollar profits will now be measured against new and slightly larger cost bases. *An exception is made for sets retailing under $21. On these the dealer will take his former percentage mark-up on the new cost, and thus enjoy a slightly larger dollar margin on sales.* This provision should encourage dealers to handle more of the relatively inexpensive sets, and so benefit consumers looking for sets in this price line. (Dealers are still waiting for the standard brand sets.)

The increase amounts to eight per cent at the manufacturing level. It is sufficient to return to producers all that is now allowable under the wage-price program. As before, manufacturers will calculate wholesale and retail prices, and preticket all units. Maximum prices of auto radios are not affected at any level of sale by this action.

OPA Discriminates Against Small Business

Dear Sir:

I am writing you in support of Mr. Drexal Mc. Cabe's letter in the May issue of your magazine. Also the article on the OPA.

Mr. Mc. Cabe's article is short and straight to the point and I feel that it expresses the sentiments of every radio service dealer in the nation. It has been the policy of OPA to completely ignore the small business man since 1942. The radio service man has had his margin of profit continually cut until we find ourselves facing bankruptcy. And the cause of this condition can be laid on the doorstep of OPA. I am not in favor of completely abolishing OPA and price control. But for the sake of the small business man OPA's discriminatory practice should be stopped as soon as possible.

The radio service dealers allowed themselves to be maneuvered into this position due to the fact that they have insisted on not forming a national organization. And this is not the last kick in the face that we will get if we don't do something about this condition very soon. If we had a large pressure group, such as the manufacturers have, or organized labor, Congress would not have allowed OPA to discriminate against us as they have. If we were to refuse to repair radios during the period of time that they are campaigning for reelection, they would be in a sad state.

I am glad to know that there are radio organizations springing up over the nation, we have one here, and I want to take this opportunity to appeal to all of the organizations and all of the radio service dealers that are not organized to take up this fight by joining or forming an organization. And at the same time bring pressure to bear on their Congressmen and Senators to correct the conditions mentioned earlier in this letter.

I will be glad to hear from anyone interested in our problems. And I would very much appreciate your printing of this letter in the next issue of the Radio Service Dealer.

R. L. Kirkley, Texas.

Try These Colors In Your Shop

John Meck, president of John Meck Industries, announces that a careful analysis of the production line at his Plymouth, Indiana, plant prompted the installation of a color dynamic paint system. This system is designed

[*see page* 10]

from RADIO NEWS

For the RECORD

BY THE EDITOR

MUCH has been said and reams have been written about the necessity for the service engineer to apply modern scientific techniques and sound business practices to assure his success in the post war era. It takes no crystal gazer to predict that with the tremendous increase in varieties of radio models the need will be acute for some new short cut to accurate well organized service data. In the past the serviceman needed information on the products of only 36 receiver manufacturers whereas more than 1000 models of 212 radio and phonograph manufacturers will soon be on the market.

One company has already taken cognizance of this complex problem and is producing a radically different, high efficiency technical reference service. The radio service engineer who acquires this service will be provided not only with exhaustive technical data on radio receivers but will have access to the knowledge of a board of 30 specialists in radio, radar and radio servicing to help him solve problems relating to parts selection, shop operation, promotion, accounting and business methods.

The forward thinking of this organization assures servicemen of a pipeline to the two springs of knowledge requisite to their business success; practical well organized technical information and sound business practices. O.R.

JUNE ISSUE RADIO NEWS

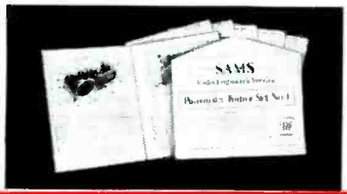
Here's YOUR problem

Here's OUR answer

Save Up to 50% in Servicing Time!

In Each PHOTOFACT FOLDER You Get:

- *From 2 to 12 clear photos of the chassis, identifying each component part for immediate checking or replacement.*
- *Complete specifications on each component, including manufacturer's part number, available replacement type or types and valuable installation notes.*
- *A keyed reference alignment procedure for the individual set, with adjustment frequencies and recommended standard connections.*
- *Complete voltage analysis of receiver.*
- *Complete resistance analysis of receiver.*
- *Complete stage gain measurement data.*
- *Schematic diagram.*



If you think it's going to be *easy* to service the 1,000 or more radio sets soon to come off production lines, read no further! The Sams PhotoFact* Service is designed for men who *know* there's a tough time ahead —who need and *want* better service information.

The Sams PhotoFact Service provides such information in the form of reliable, fact-filled, illustrated folders that can save as much as 50% of your servicing time. Every post-war radio is visualized in photographs . . . every part listed and numbered . . . every servicing shortcut and installation fact fully set down! No matter how complicated the set, or how new the components, you have the whole story right in front of you.

You get a set of from 30 to 50 PhotoFact Folders at a time. Each set of folders comes to you in a handy envelope at a cost of only $1.50 for each group. They cover all new receivers as they reach the market.

Think of it! An absolutely fool-proof visual method of giving you the exact information you want, where you want it, when you want it, for as little as three cents per new radio model! And every bit of information is compiled by experts from an examination of the actual receiver itself — *not from standard service data!* PhotoFact Folder Set No. 1 *is being published June 15.* Others will follow closely. Reserve yours now!

Also, Membership in

HOWARD W. SAMS INSTITUTE

Answers to hard service problems! Economical shop practices! How to get more customers! These and many other subjects covered by 30 top notch specialists! Complete facts with PhotoFact Set No. 1.

**Trade Mark Registered*

Cut This Out and Mail It to Your Distributor! If you do not know his name and address, send it directly to Howard W. Sams & Co., Inc. 2924 East Washington Street, Indianapolis 6, Indiana, and we will see that your nearest distributor gets it.

CHECK ONE SQUARE PLEASE PRINT

☐ Yes, by all means reserve every issue of the Sams PhotoFact Folder Service for me.

☐ Send complete information and reservation card.

☐ My (check) (money order) (cash) for $1.50 is enclosed for PhotoFact Folder Set No. 1. (Publication date, June 15, 1946). (If you send cash, be sure you use registered mail.)

Name_____ Address_____

City_____ Zone_____ State_____

Company Name_____

My Distributor's Name_____ City_____

HOWARD W. SAMS & CO., INC. RADIO PHOTOFACT SERVICE

In Trade

[*from page 8*]

to take full advantage of natural, as well as artificial, light and to minimize eye strain, at the same time increasing safety factors.

Engineers checking the specific problems of manufacture suggested the following color scheme: an *ivory ceiling,* with the ends of the room also painted in ivory; *sidewalls a light green;* all mobile equipment such as *trucks painted green* with *yellow stripes; aisles* painted on the floor, four feet wide, and painted *green with a yellow boundary stripe; and the floor itself is grey.* A four-foot circle of color is placed around each supporting post, as an accident-prevention measure. Tests indicate that the new light colors have considerably relieved eye strain, especially in small-part installation.

Gala house party marks opening of new Brooklyn radio plant of Electronic Corp. of America. Some of dealers present, l. to r. seated: F. R. Brachhold, Kresge's, Newark; Ed Cooper, Boutell's, Minneapolis; Jack Geartner, sales manager ECA radios; S. Rosenberg, American Furniture Associates, N. Y.; I. Mendelsohn, Jack Hartblay, Inc., N. Y.; Standing, W. Schneider, Hearns, N. Y.; H. Engelson, Michael, Easton; D. Reddaway, Kern Co., Detroit; J. Sigler Schuster's, Milwaukee; Hy Goodbinder, May Co., Baltimore; S. Lukina, People's Outfitting, Detroit.

Tele Sets This Summer

G. E. expects to make the first black and white television receivers available to the public in August or September in areas where stations are now operating or will soon be on the air. This model will use the ten-inch direct-view picture tube. It will also incorporate the standard broadcast band. No price was announced for the set but it is expected to be around $300. Other sets for black-and-white picture reception will follow shortly thereafter and will be of

[*see page 30*]

KEN-RAD
RADIO TUBES

SELL!

USE!

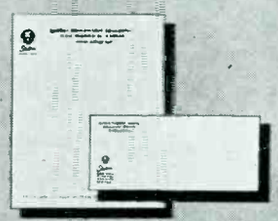
Display card, 21" by 32"

AUTHORIZED DEALER
KEN-RAD
RADIO TUBES

Wall Plaque

Decalcomania

Personalized blotters



Personalized stationery

Tube Characteristics book

All of the pieces shown above are in pleasing, effective colors. There also are numerous other Ken-Rad display and promotion items.

Promotion Aids Like These, Spell P-R-O-F-I-T-S for You as a Ken-Rad Tube Dealer

Ken-Rad doesn't expect you to "go it alone." Ken-Rad *helps you help yourself*—to a generous slice of the local market for radio tubes! For the asking, you can have colorful Ken-Rad display material that will stop tube buyers in stride, causing them to enter your store to *buy*. The large window-card and other pieces at the right are typical of the wide display selection. . . . Ken-Rad also makes it possible for you to keep in touch *by mail* with the hundreds of radio owners in your neighborhood who buy tubes. Imprinted blotters, letterhead and envelopes, other postage-borne items with your name, address, and message on them—these will work for you as canvassers who are never rebuffed. . . . The Ken-Rad franchise is powered for volume sales, to a market which Ken-Rad guides straight to your door. Increase your profits *the easy way* by handling Ken-Rad radio tubes!

176-E5-6650

● For pictures and descriptions of the Ken-Rad complete group of dealer aids, write for "Sales Helps" Folder ETR-4. It's free!

KEN-RAD
DIVISION OF GENERAL ELECTRIC COMPANY
OWENSBORO, KENTUCKY

with the publisher.....

Excuse It Please!

THE railroad strikes caused so much confusion and delay just after the close of the 1946 Radio Parts & Electronic Equipment Conference & Show that our plans to make the May issue of "RSD" a "show review" number had to be abandoned. Material we shipped from the Hotel Stevens was held up by the embargo on express. Although we have covered some of the show's highlights in this issue, others must necessarily be held up for the next.

All leading radio-electronic equipment and parts manufacturers had booths at the radio convention. Only a few were able to exhibit genuinely new "post-war lines" or products because up to showtime serious parts and material shortages prevented them from getting into production of even sample models.

Most new products shown had either no price tag at all or an "anticipated" price tag attached because either OPA had not yet given the items a price ceiling or, as in the majority of cases, the price authorized was so low in view of actual costs, the manufacturer was forced to hold production in abeyance, explaining to distributors that no deliveries would be promised until a more satisfactory price could be agreed upon with OPA.

On the whole, the show was the biggest and best of its kind ever held. Attendance expected to approximate 3,500 actually exceeded 7,500. All show committeemen rate a bow for a job done exceptionally well!

Geddes and Clough

RADIO output is approximately 40% of contemplated production according to Bond Geddes, executive vice-president of the RMA, purely because of OPA price controls. He is credited with stating that since V-J Day not a single radio tube has been sold at a profit. Going further, he opines that were the radio industry permitted free rein and no OPA restraints, within a 90-day period production would zoom to record heights and even then prices would probably not exceed 10% more than present ceilings at which levels the industry is practically stifled. We agree most emphatically!

H. W. Clough, president of the recently held industry conference and show, also urged an end of price controls stating that OPA confuses and retards the industry's progress because so far it has failed to assure all producers of being able to realize a profit on all items despite several blanket increases granted, many of which fall far short of genuine hardship needs in particular cases. Here is a typical instance: Set makers asked for a 20% price increase. OPA granted them 8%. But just before giving the 8% increase OPA granted tube manufacturers a 15.5% increase on tubes sold to set manufacturers as original equipment. Naturally that automatically cut down the relief margin supposed to accrue from the 8% allowed set makers. It's just typical of OPA's consistent policy of doing things the wrong way.

Simplifying Service

IT was rather apparent to old-timers at the "show" that most manufacturers have styled their lines in such a manner as to help the radio serviceman do his work more efficiently and in less time. Auto aerial lines are designed for faster installation. Test equipment to cover wider ranges, weighing less, being more compact, able to take greater punishment and perform more efficiently was in evidence. Trouble-shooting, generally the basis upon which most repair work hinges, had an apostle in the form of a brand new type of visual service that allows the repairman to make step-by-step checks from actual chassis photographs rather than from schematic drawings. This is surely an age of mechanization! Portable oscillographs, easy-to-mount dipole antennas, high fidelity communications receivers suitable for industrial application . . . these and many more postwar developments came to light. And yet, some of the best of the new developments were shown to a few of us "in strict confidence and not yet for publication" because the manufacturers simply aren't completely able to control their own destiny and go ahead with their plans while saddled with present government regulations and the resulting material shortages and other evils caused by one type of strike or another.

S. R. Lowan

Publisher

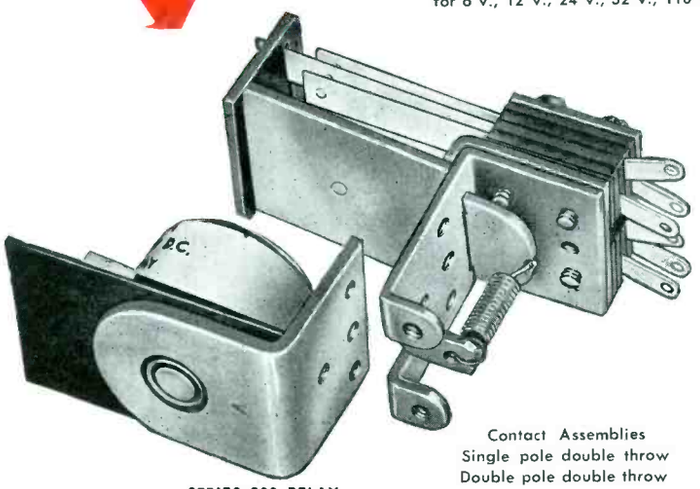
New! Series 200

A RELAY BY GUARDIAN with Interchangeable Coils

BUILT IN TWO PARTS

A. C. Coil Assemblies available for 6 v., 12 v., 24 v., 115 v.
D. C. Coil Assemblies available for 6 v., 12 v., 24 v., 32 v., 110 v.

★ Two basic parts—a coil assembly and a contact assembly — comprise this simple, yet versatile relay. The coil assembly consists of the coil and field piece. The contact assembly consists of switch blades, armature, return spring, and mounting bracket. The coil and contact assembly are easily aligned by two locator pins on the back end of the contact assembly which fit into two holes on the coil assembly. They are then rigidly held together with the two screws and lock washers. Assembly takes only a few seconds and requires no adjustment on factory built units.



SERIES 200 RELAY

Contact Assemblies
Single pole double throw
Double pole double throw

On Sale at Your nearest jobber NOW!

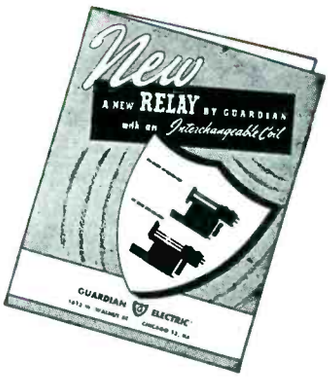
See it today! . . . this amazing new relay with interchangeable coils. See how you can operate it on any of nine different a-c or d-c voltages — simply by changing the coil. Ideal for experimenters, inventors, engineers.

TWO CONTACT ASSEMBLIES

The Series 200 is available with a single pole double throw, or a double pole double throw contact assembly. In addition, a set of Series 200 Contact Switch Parts, which you can buy separately, enables you to build dozens of other combinations. Instructions in each box.

NINE COIL ASSEMBLIES

Four a-c coils and five d-c coils are available. Interchangeability of coils enables you to operate the Series 200 relay on one voltage or current and change it over to operate on another type simply by changing coils.



Your jobber has this sensational new relay on sale now. Ask him about it. Or write for descriptive bulletin.

GUARDIAN ELECTRIC
1633-G W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN INDUSTRY

RESISTANCE RANGES RIGHT AT YOUR FINGERTIPS

EASY TO TELL AT A GLANCE!

HERE'S SOMETHING NEW—The RESIST-O-GUIDE, a practical aid in resistor range identification for every Radio Serviceman, Ham, Electrical Designer and Electronic Engineer.

To use the pocket size RESIST-O-GUIDE simply turn its three wheels to correspond with the color code on any composition-type resistor—the standard RMA range is automatically and accurately indicated. Readings are direct . . . no cumbersome calculations! Or, turn the wheels to indicate any desired standard range, and you are immediately shown the correct color coding.

The RESIST-O-GUIDE is convenient and accurate—and varnished for durability. To get the RESIST-O-GUIDE contact your IRC distributor—it's not sold elsewhere.

NEW...

HANDY...

QUICK...

ACCURATE...

THE
Resist-O-Guide
10c at all IRC Distributors

PREFERRED FOR PERFORMANCE
IRC
FIXED & VARIABLE RESISTORS

INTERNATIONAL RESISTANCE CO.

401 N. BROAD ST., PHILADELPHIA 8, PA.

Canadian Licensee: International Resistance Co., Ltd., Toronto

Servicing is KEY TO REPEAT SALES

"After the present temporary merchandise shortages competition will get keener among dealers and manufacturers. Servicing will be all important. . ."

by R. L. WHITE*

GOOD service is a goodwill builder. It is a potent sales tool for the established brand name manufacturers. We may spend millions of dollars on product advertising only to lose much of the goodwill by poor servicing. Others may get criticized for service failures but in the final analysis most of the blame falls on the maker of merchandise. This is true whether or not the servicing is within the period of a manufacturer's free service warrantee. But, because manufacturers operate nationally and servicing is local, they cannot handle service unaided. They must call upon others who also benefit.

The wholesale distributor does benefit from the goodwill resulting from good service but, generally speaking, the servicing of non-franchise items such as small appliances does not involve the distributor in any important way. But the distributor operating under an exclusive franchise should be much interested in service, should see that his territory has proper service facilities, that the dealers are educated, and possibly have limited stocks of parts available.

The Dealer's Part

Service is an important factor in building a successful business for the dealer. Sales, especially of the larger appliances, are often made because the customer has confidence that there will be service. If I were a dealer, I would be very much interested in giving good service as a goodwill builder and to encourage repeat sales. Besides being self-supporting, a well run service department can also be a very good sales builder.

It's not a simple question for the dealer even where he has an exclusive franchise. He is constantly under pressure to give free service, and, furthermore, his volume in many instances does not support a good service department. On the non-exclusive lines, the problem is even more difficult because the service is not tied to the sale and the dealer may be asked to service appliances sold by other dealers, sold by mail order or other long distant distribution. By and large, in the small towns and the farm areas, I do not see how the successful dealer is going to avoid helping out on this service problem.

In this connection, the manufacturer can take steps to provide service promptly by making prompt shipment of spare parts where needed. A great many appliances, particularly the small ones, come back to the factory for repair anyhow, and the prompt service is a great factor in goodwill. In my company, we have taken steps to improve postwar service by setting all of our service operations aside in a special building, where we carry repair parts, have facilities for plating, spinning, buffing, etc. When we discontinue a line or model, it is the responsibility of our service manager to see that adequate stocks of repair parts are made before the production facilities are dismantled.

Another responsibility of the manufacturer is to provide adequate service manuals including lists of repair parts and price lists and to see that the utilities and the dealers have this information. In our own company we plan, when we can get things running a little more smoothly, to have special men traveling from the factory to help our dealers in their service problems.

We are all aware of all of the alibis manufacturers have given for poor service in the past five years. The service requirements increased tremendously because of the fact that new goods were not available and this increased need for service came at a time when we could not get materials or labor for the purpose. I am afraid that we have at least another six months of such conditions ahead of us, but the competition is going to be extremely keen in the appliance field and service is going to be all important.

President, Landers, Frary & Clark. (Also president of National Electrical Manufacturers Association).

Based on an address before the recent annual meeting of Edison Electric Institute, New York City.

1946 RADIO PARTS SHOW A RECORD BREAKER

THE 1946 Radio Parts & Electronic Equipment Conference & Show was the most outstanding event in the history of the radio industry. Figures released by Kenneth C. Prince, general manager of the Show, reveal that 7,562 individuals registered for admission, and of these almost 2,500 were affiliated with distributing firms. The largest previous attendance at any trade show in this industry was 4,400.

More manufacturers exhibited their products than in any previous show. There were 169 manufacturing lines and 14 publications occupying booths. This represents an increase of 40% over the largest prior year.

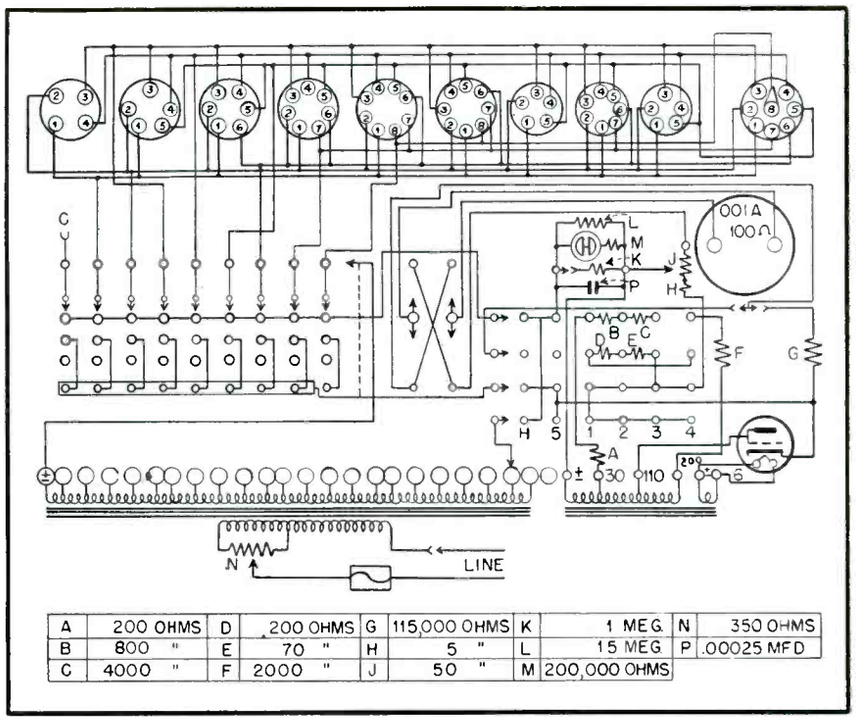
There is no estimate available of the volume of business which was done during the show because of the serious questions raised about material shortages, price controls and delivery stumbling blocks. However, conservative estimates indicate that 90% of the dollars of radio parts distributor purchasing power in the country was represented there.

PART TWO OF A SERIES

In a future article other types of commercial tube testers will be analyzed in detail.

•

MODERN TUBE TESTING



A	200 OHMS	D	200 OHMS	G	115,000 OHMS	K	1 MEG.	N	350 OHMS
B	800 "	E	70 "	H	5 "	L	15 MEG.	P	.00025 MFD
C	4000 "	F	2000 "	J	50 "	M	200,000 OHMS		

Figure 1. Simpson.

Commercial tube checkers described and illustrated here are applications of the basic principles detailed in the first article (April issue).

COMMERCIAL EMISSION TESTERS

IN the first of this series of articles various methods for testing tubes were outlined in a broad general manner. This part will specifically describe some of the commercial adaptations of the emission test. All manufacturers' designs are not covered but complete circuit analysis is given four of the units on which sufficient data could be obtained.

Simpson Model 305

Fig. 1 shows the complete wiring diagram of this device. Do not confuse the Model 305 with other models of tube testers in this manufacturer's line.

Separate sockets are provided for 4, 5, 6 and 7 prong, octal, loctal and miniature tube bases. A spare socket is also included. Each tube socket connection is brought to the individual slide switches shown in the left hand position of the diagram. The upper set of contacts in this group are not part of the slide switch circuit but represent a separate rotary switch with the moving contact designated by the arrow at the extreme right end of the row of contacts. This switch provides a means for connecting one side of the filament transformer to one side of the tube filament regardless of its location on the tube base.

The other end of the tube filament and cathode are connected to the desired filament tap by throwing the proper electrode slide switches to the lower position. The filament return circuit passes through the right hand switch on the deck next to the bottom, then through the bottom deck to the filament tap switch.

When testing a tube slide switches associated with the grid, plate and other active elements are moved to the upper position, thus connecting all of them together, or each element can be tested separately. The element circuit then passes to the top deck of the right hand switch through resistors A, BA, or CBA to the 30-volt transformer tap thus applying the proper tube load for the tubes being tested. In the fourth position of the switch the tube elements are connected through resistor F to the 200-volt tap on the plate transformer for special rectifier tests. The ± end of this transformer then connects to the arm of variable resistor J in one direction through H to the switch deck next to the bottom, thence to the bottom deck and one side of the filament; the other end of J passes through the double pole double throw meter reversing switch shown in the center of the diagram and then to one side of the meter.

The other side of the meter also goes through the meter reversing switch to the single pole double throw switch just below the meter. This switch when thrown to the right, connects the meter through resistor G to the rectifier tube in the lower right and in that position provides a means

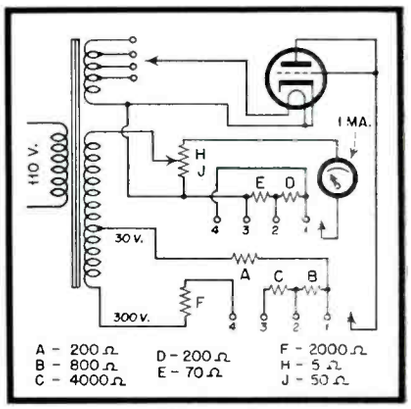
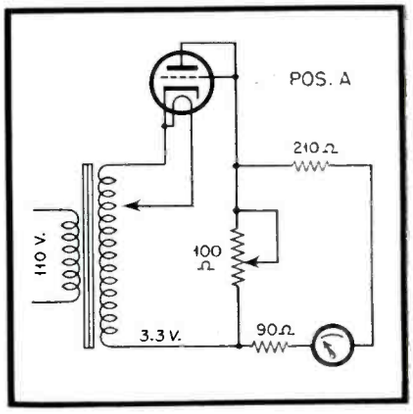


Figure 2

Figure 4



of reading the line voltage adjustment on the meter. When the switch is to the left the meter circuit connects through the switch deck next to the top either direct or through resistors D or DE to the H and the one side of the filament. Resistors D, E, H and J form a variable shunt around the meter for controlling the meter sensitivity.

A simplified representation of this circuit will be found in *Fig. 2*. Comparison with the circuit given in *Fig. 2* of the previous article (see page 34, April 1946 issue) will reveal identical conditions. In position #1 of the tap switch a tube load of 200 ohms results. In position #2 the total tube load is 1000 ohms. In position #3 the load is 5000 ohms and the test voltage is 30 volts as recommended by the RMA tube standardization committee for such types of testers. In position #4 a test potential of 200 volts and a load of 2000 ohms is used.

Neon short test circuit

The neon short test circuit in this device is interesting since it provides two different sensitivities. Referring to *Fig. 1* with the selector switch set to H or S the neon lamp is connected between various sections of the tube as determined by the electrode slide switches. Just below the neon lamp to the left of resistor K a single pole switch will be noted. With this switch open, resistor L is the only shunt on the lamp and, since it has a value of 15 megohms the lamp circuit responds to very small element leakage values. When the switch is closed the 1 megohm resistor K shunts the lamp to a sensitivity of much lower order. In most tube testers only the low sensitivity is furnished (as explained in the first article). Condenser P is used to filter the DC applied to the short test lamp.

Supreme Model 502

The diagram of the Supreme Emission Tube Tester alone was not readily available. Therefore *Fig. 3* shows the Supreme 502 Model including complete analyzer ranges, but for the purpose of these articles only the tube tester section will be studied.

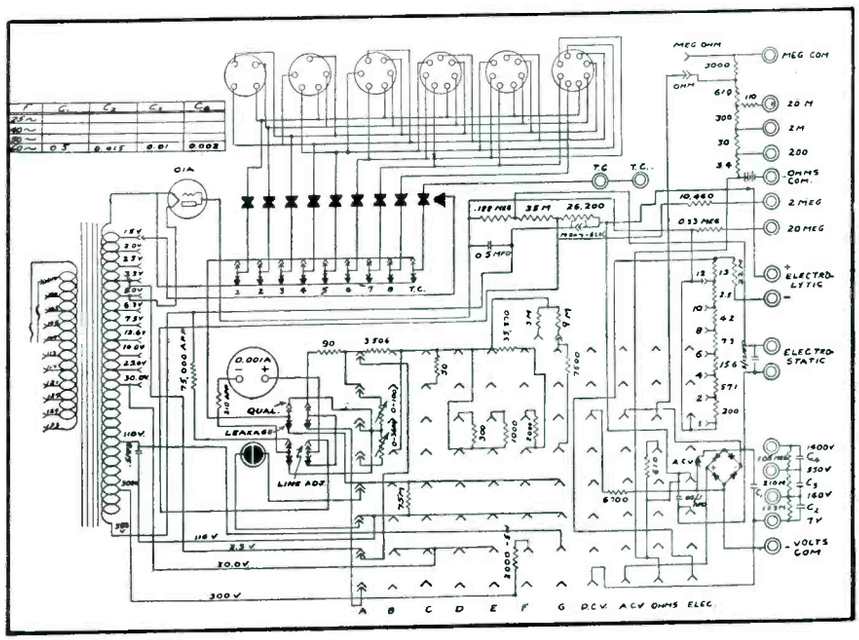


Figure 3. Supreme.

Do not confuse this tester with another model of different type now being offered by the same manufacturer.

This device is supplied with all standard tube sockets but no spares are included.

Referring to *Fig. 3*, the heavy black switch points just below the tube sockets represent one return circuit for the tube filament. The moving contact at the right of the group goes to the common end of the filament transformer. Each tube element then passes down to the nine double throw electrode switches, immediately below, which serve to connect all tube elements together for a total emission test. Elements can also be separated for single element tests if desired.

Generally three test voltages are used depending on the tube type. Note the 3.3, 30 and 300 volt taps on the transformer. The 110 volt tap shunted by the .5 mfd condenser is for short testing with the neon lamp and for a few special tube tests. Only one short test sensitivity is furnished. The 353 volt tap is not used for tube testing but powers the high ohmmeter ranges of the analyzer section.

The eight deck switch in positions A, B, C, D, E, F and G controls the various tube test circuits. The balance of the switch positions relate only to the volt ohmmeter ranges of the unit.

Begin with the lower deck which for identification purposes will be called Deck 1. This deck is not used for tube testing. Deck 2 Position A, applies 3.3 volts to the tube under test and is used for diodes. Positions B, C, D and E apply the 30 volt test potential for general tube types. Positions F and G apply 300 and 110 Volts respectively. Deck 3 and Deck 4 carry the neon lamp through the various tube testing positions.

Decks 5, 6, 7 and 8 provide the [*see page* 40]

Figure 5

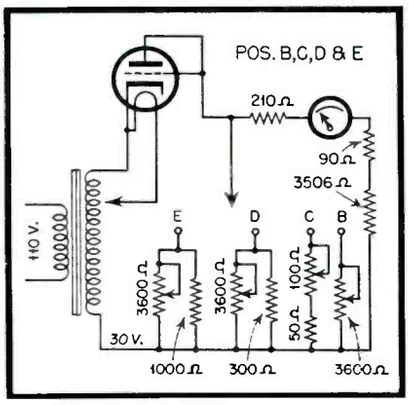


Figure 6

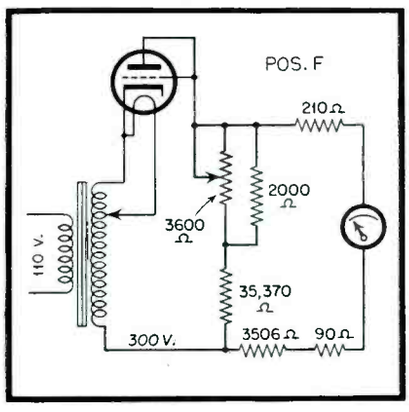
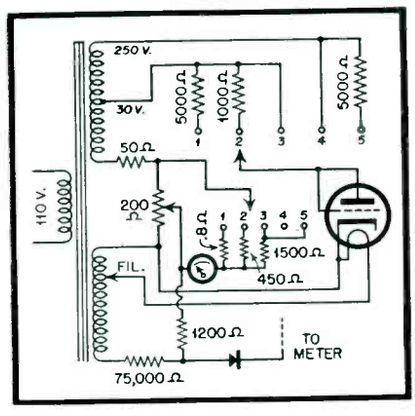


Figure 8



SHORT-CUTS IN TROUBLE-SHOOTING

Refresher pointers for speeding up your servicing work.

by J. P. HOLLISTER

SPEED in trouble-shooting is acquired through long experience and by following almost unconsciously a certain routine in localizing receiver troubles. While continuously on the job, this speed is retained, but if one gets out of practice there is bound to be a period of floundering around before getting back into the swing of things. With reconversion causing many who worked in war plants to return to their prewar work at the service bench, together with the ever-increasing number of newcomers, a discussion of the better methods of cutting down the time required to locate receiver troubles may help those who are trying to get back their former speed.

In general, the most efficient way to save time is to proceed from the most likely cause of the trouble, based on the symptoms, to the least likely. This presupposes that we know what are the weak spots in any given set model, but no one can know what the epidemic defects in all types of receivers are. However, there are many shortcuts which may be followed which are applicable to all receivers, some of the most useful of which are described in this article.

TYPES OF DEFECTS

All receiver troubles fall into a few categories; they may be inoperative, noisy, weak, operate intermittently or have excessive hum. The number of possible causes for each defect is high, but usually they boil down to just a few for any specific complaint. Often we can pretty well predict what the trouble is by simply analyzing the complaint. A familiar example is the odor of burnt tar which accompanies shorts in power transformers. We check the transformer first, when this is the complaint, and the easiest way to test for transformer shorts is with a wattmeter, or some other device which indicates the power or current consumption. If no such instrument is on hand, excessive power consumption will be indicated when the transformer heats up rapidly with all tubes removed.

Those sets which the customers say operate perfectly on Mondays, Wednesdays, and Fridays, but act up on other days (except when you call to test the set) are generally the most difficult to handle. But even these intermittents can be cured in less time by using tricks of the trade.

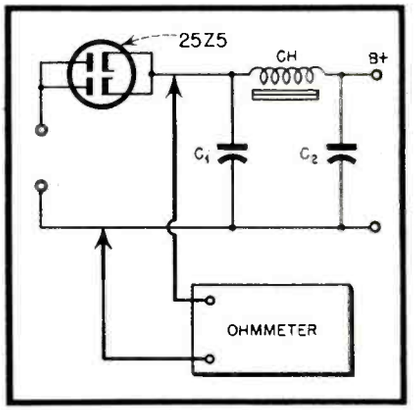
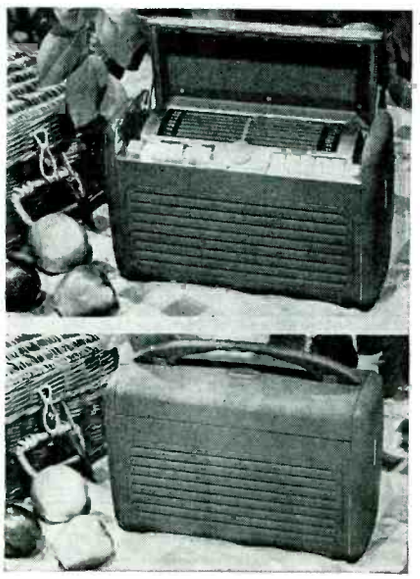
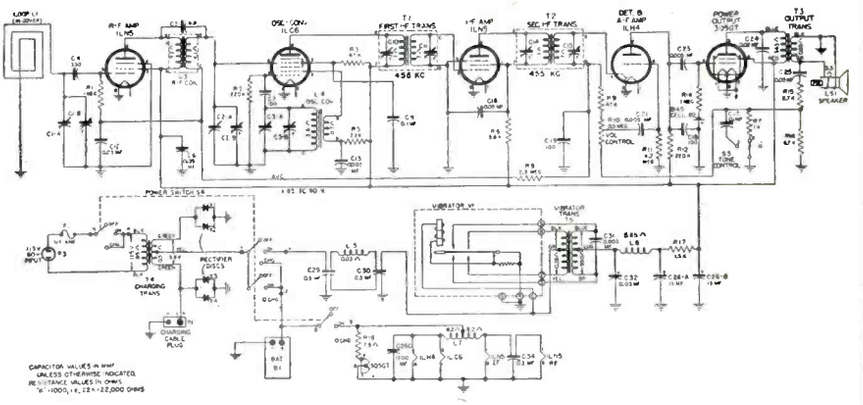


Figure 1

Noise, too, can cause headaches for the trouble-shooter. If the chassis is pulled before the installation is checked, quite frequently it will be found that the noise is caused by some trouble external to the set. The writer recalls cases where an electric light bulb which fitted loosely in a ceiling receptacle in a basement below the living room where the set was in-



COVER PHOTO: General Electric model 250 self-charging storage battery portable radio in final tests with sig. gen. and audio oscillator. 5 tubes; loop antenna; 540-1600 kc.; 5¼" Alnico speaker; wt. 20 lbs. This model is price-tagged $89.20; model 260, push-button plus shortwave, $121.85. Coming in July. Battery is rechargeable from 105-125 volt AC line; guaranteed for 18 months.



stalled, and arced when anyone walked across the floor above, caused noise in the receiver. Less obvious was another case where two BX cables crossed a beam in the basement. The cables were not firmly anchored and electrical noise was caused when vibration made the metal covering of the cables rub against each other.

INOPERATIVE RECEIVERS

Usually it is easier to locate the cause of breakdown in an inoperative receiver than in one which has a less obvious complaint. Because tube failures and filter condenser breakdowns are most common causes, these should be checked first. In a-c receivers, an ohmmeter test from a filament pin of the rectifier socket to ground will quickly indicate a filter condenser short. When the first section of the filter is shorted, the reading from the rectifier filament to ground will show a dead short; if the second section is shorted, then the resistance of the series resistor or filter choke will be included in the reading. In a-c/d-c sets, the same test should be applied, but from cathode of the rectifier to B minus. Often a breakdown of the first section of the filter will place such a heavy load on the rectifier tube that it, too, is destroyed.

In every case where the rectifier tube is "shot", it should be a rule never to make a replacement without first making the ohmmeter test outlined above. See Fig. 1. Customers who bring their tubes to the shop for test should be warned that a bad rectifier tube should not be replaced until the set has been checked.

A quick test to localize trouble in sets which are inoperative but which show hum is simply to work the volume control from maximum to minimum. There should be a slight increase in hum level as the volume control setting is advanced; if not, chances are the trouble is in some audio stage after the volume control, or in the power supply.

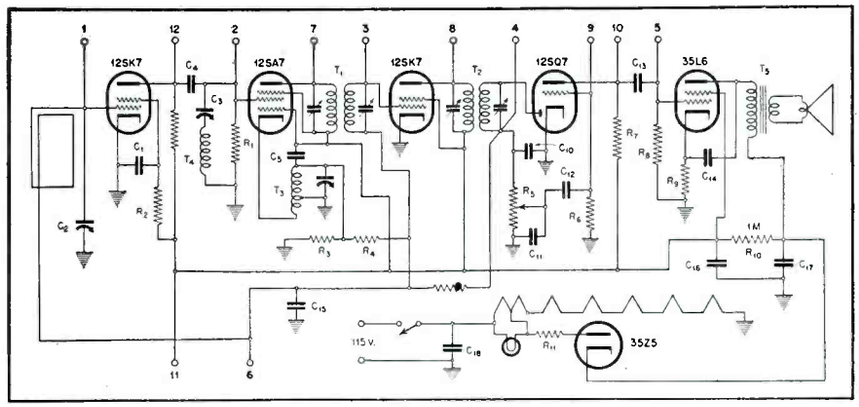


Figure 4

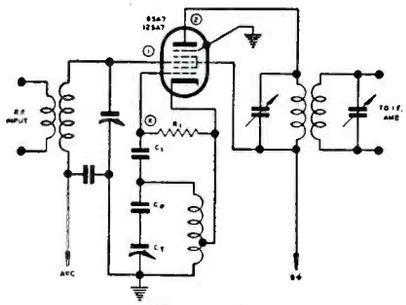


Figure 3

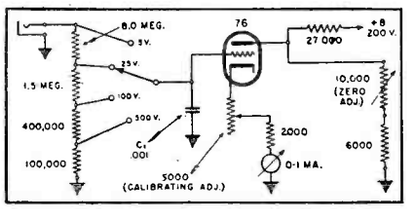


Figure 2

Many receivers become inoperative, or partially so, because of defects in the converter circuit. Often these troubles are difficult to located because there are times when a defective converter tube will not be detected by an ordinary tube checker. It is always best to check such tubes by substitution. Common circuit troubles are a defective oscillator coil, caused by excessive dampness, shorted trimmer or padder in the oscillator section of the gang condenser, and misalignment. Best method of checking for oscillation is to use an electronic voltmeter. The circuit of a simple type, such as is used in the Chanalyst and other similar signal tracing instruments, is shown in *Fig. 2.* By connecting the probe to the grid of the oscillator section of the converter, and the other terminal to the set ground, as shown in *Fig. 3*, a negative voltage should be indicated if the tube is oscillating. This voltage will decrease if the grid is touched

[*see page* 43]

ERIC JOHNSTON IS DISTRIBUTOR IN WEST

President of United States Chamber of Commerce heads firm of wholesale distributors of radios & appliances. Carries special lines for dealers in farming country.

Mr. Johnston & view of displays in his showroom for dealers.

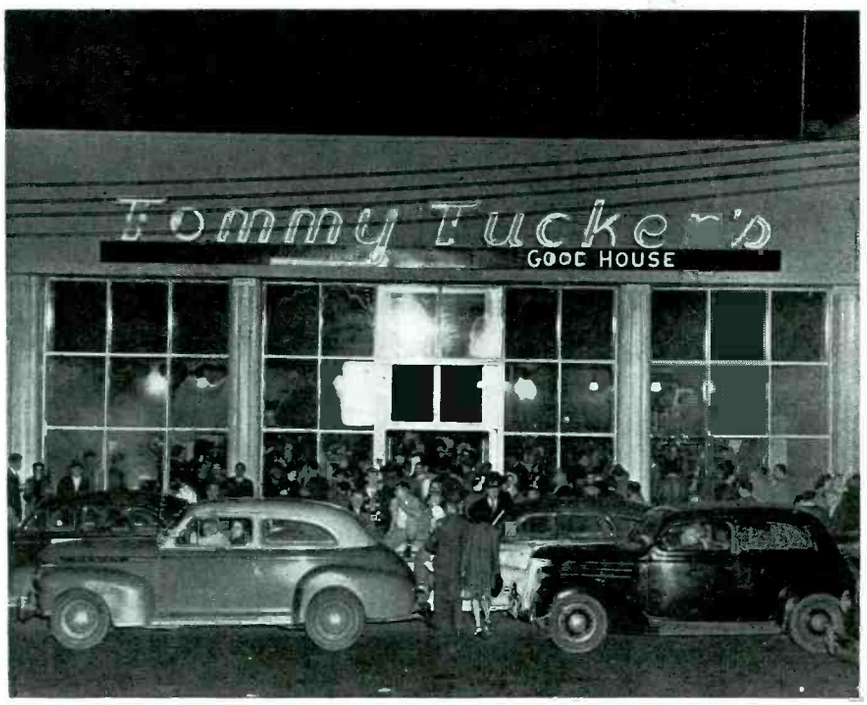
DEALERS from western Montana, northern Idaho, and eastern Washington attended the 1946 Zenith line presentation held at Spokane by the Columbia Electrical & Manufacturing Company, of that city. Eric Johnston, president of the United States Chamber of Commerce and the Motion Picture Producers and Distributors of America, Inc., is president of the Columbia Company, which has been a Zenith distributor for more than twelve years. Maage E. LeCounte, general manager of the company, assisted in presenting the 30th Anniversary Line.

The portable radios, as well as sleek plastic and wood table models, attracted enthusiastic attention. The presentation also included the company's rural line, containing the first battery-operated, completely automatic record changers ever offered the folks who live beyond the highlines.

Band L-e-a-d-e-r INTO D-E-A-L-E-R

Tommy Tucker bang-opens his radio & appliance store with own orchestra. Employs ex-band member veterans.

Dealer's market comes to his store: Teenagers attracted on opening day form bulk of record-buying customers now, will get the habit of shopping Tucker for other merchandise. "Premiere" got lots of publicity through show put on by entire orchestra and vocalists. Outside view shows "depth" of crowds.



A BANDLEADER turned business man can use to advantage in his commercial career the same techniques which made him a swing king, Tommy Tucker has proven in his Asbury Park electrical appliance store.

Long a resident of the town, Tucker's main interest for a long time was in settling down there when he retired from music. The necessity of providing for several veterans, former members of his band who did not wish to return to the road, and the absence of any other major appliance store in the community, however, gave him the idea for his present establishment.

While Tucker is on the road, the store is under the direction of Orville Winterstella and that of his brother Arthur Winterstella who is sales and promotion manager. Both of these men have considerable experience in running electrical appliance businesses.

The gala opening of the store was unusual in many respects. Most important, perhaps, was the presence of Tucker's whole orchestra and all his vocalists. Considerable publicity in both local and statewide papers was achieved by this premiere.

A popular summer resort, Asbury Park is also the year-round home of a great number of people. This means, Tucker explains, that in addition to the regular sales which may be expected from the regular residents, each summer there is an influx of potential buyers whose summer homes require electrical appliances of all types. The air-conditioning units which Tucker will carry are expected to be greatly in demand with the summer visitors.

In Asbury Park Tucker uses a great variety of promotional tieups to publicize his store. He has a regular program of record music on the radio each week. He is active in all community projects. In addition, Tommy Tucker trophies have been introduced at the high school in Asbury Park to promote interest in sports. This, Tucker feels, is an important part of the merchant's life in the community.

"I believe," this dealer declares, "that the far-sighted merchant will build customer goodwill before the customers are out of school. These boys will remember the name of the store and this, I believe, is important to public relations."

Veterans play a large part in Tom-

my Tucker's managerial scheme. Many men, formerly in his band, who served in the war, are being put into various, of his business enterprises if they do not wish to resume their musical careers.

How He Merchandises

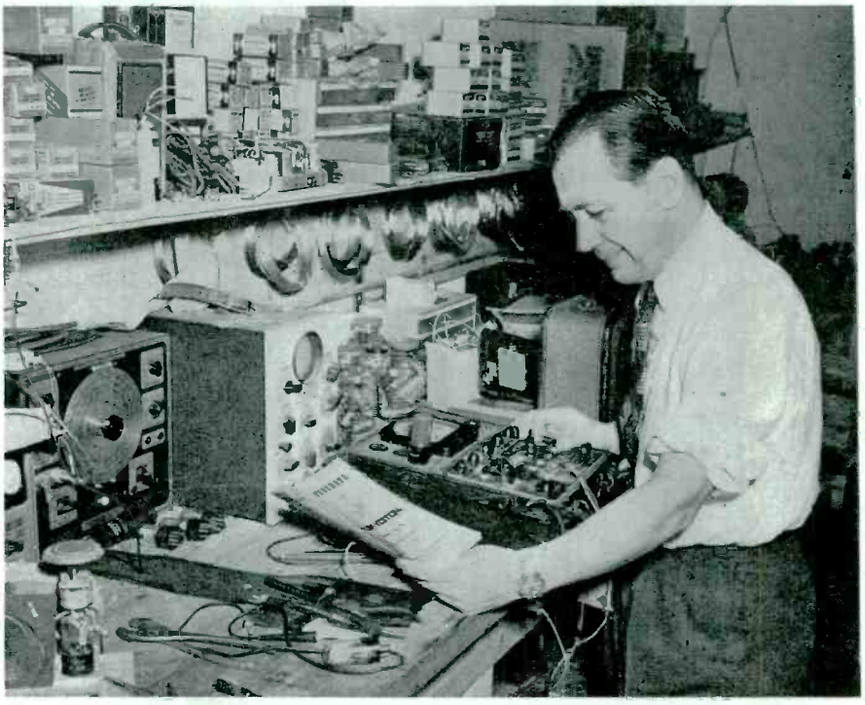
Completely modern in its furnishings, the Tucker store offers several unusual features. A lounge, complete with piano, has been installed for patrons interested in records. Every effort is made by the store personnel to encourage use of these facilities.

A complete "ham" department has been installed for amateur radio operators. Here all necessary equipment, testing devices, and trouble-shooting gadgets are made available to the enthusiasts. Himself an interested "ham", Tucker believes that this department will be one of the most important in the store eventually. Tucker prefers in his store to handle standard brands.

The record department in Tucker's store is of course of prime importance. Records from all manufacturers are carried in stock in special displays and promotions are organized each month by the store's sales force to push record sales.

Television will be one of the most important items for sale in the Tucker store as soon as the sets are available. One of the newest sets available has been set up in the store and is attracting considerable attention. Residents of the community are invited in regularly to see televized programs through the courtesy of the Tommy Tucker Home Service Shop.

Regular demonstrations of record players, automatic dishwashers, and washing machines are also a part of the store program. A complete repair service is also featured. At present, much of the work of this department consists in servicing old models which householders have not as yet been able to replace. This service department will also boost sales when appliances are readily available.



Tommy Tucker (in person) poses for the trade. *Top:* He checks on displays of albums in record department, which in his opinion is one of the most important dollar producers, besides encouraging customer traffic for future business. *Middle:* As a "ham" Tucker likes to tinker with equipment on the bench in his radio service department. Note complement of test instruments on busy-looking bench. *Right:* Merchandise is displayed on series of flattop counters. General lighting intensity appears somewhat low in photo. Displays feature lamps, radios, water heaters, ranges, odd lot of best selling discs.

Left, dealer Scoggins recently redecorated his appliance show room in white to conform with color schemes of various displays provided by distributors and manufacturers. Selling area 25 by 60 feet designed for appliances and radios. Layout includes parts section, service laboratory with storage for incoming and outgoing service items. Miscellaneous furniture handled to help build up unit sales with refrigerator, washing machine or range — all on same bill, in same monthly payment. *Middle, below:* Three service technicians are specialists on washer repairs, in addition to radios & other appliances. Keeping electrical properties of householders in good working order built solid good will, gives Scoggins edge on competition for new appliance selling. *Below, extreme right:* Staff is lined up behind array of Maytag washers: l. to r., T. A. Peterson, sales manager; J. H. Jackson, expert washing machine and refrigerator technician; Harold Scoggins, owner. Sixty percent of servicing and repair work is on washing machines.

SERVICES FUTURE BUYERS

by GRIER LOWRY

Service job files build prospect lists for selling new radios and appliances; give edge on competition.

Below: Present quarters outgrown, dealer Parise, owner of "Carey's" Appliance Shop, 5534 W. North Ave., Chicago, will move to location vacated by small department store. With more space, he will add displays of radios, washers, ranges, refrigerators, vacuum cleaners and traffic items. Window streamers feature repairs of radios & appliances.

IN Muskogee, Oklahoma, Harold Scoggins, who operates the Scoggins Appliance Company, is collecting the fruits of a trustworthy wartime repair service. $100,000 of backlogged orders for appliances are on file. A cash deposit, never below $20.00 on major appliances, and amounting to at least one-third of the retail sales price of small appliances, has been required by this dealer.

A solid advertising program on a consistent basis, plus the dependability of the war-geared service department, is credited with creating the demand for appliances merchandised by the firm. Harold Scoggins negotiated the transition from his former job as civil engineer with the Oklahoma state highway department to the ownership of an appliance business with one resolve uppermost in his mind — he would place the service department on a profitable basis, would never make a whipping boy of this essential branch of an appliance store.

"Breaking even on the service department is considered quite a feat by some dealers who place their main emphasis on sales," said Scoggins. "We built our service department with the same thoroughness and efficiency as we did our sales organization. We equipped it with good machinery and tools. We trained our service staff

[*see page* 38]

Sound Equipment "Over-the-Counter"

The various items in the new sound line can be used by dealers to build up a variety of Package Sound Assemblies.

A FULL line of newly developed, low-cost sound equipment for over-the-counter sales has been introduced by the RCA Engineering Products Department, according to F. E. Crain, manager of the Sound Equipment Section. Dealers can sell to small establishments, such as night clubs, concert salons as well as retail stores, and classrooms, it was disclosed

The components include new microphones, and newly-designed amplifiers, speakers and baffles, both automatic and manual record changers, portable sound systems, horns and a portable disc-recorder and playback unit.

Striking in design are two new, lightweight, velocity microphones. The diminutive program Velocity Microphone, no larger than a package of cigarettes can easily be concealed in the palm of an announcer's hand. The Junior Velocity bi-directional Microphone, sensitive to a frequency range of 50 to 9 thousand cycles, was designed for audition studies, stage and recording work.

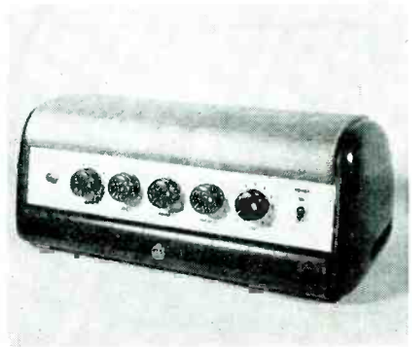
Because of its Styrol plastic diaphram, the RCA Aeropressure Microphone is especially adaptable for work out of doors. The reversible paracoustic baffle permits either sharp or broad directional use for mobile interviews and pick-ups. Its frequency response is 60 to 10,000 cycles.

Outstanding among newly produced amplifiers for use in the package line, is the 25 watt unit. Weighing only 35 pounds, this ten-tube amplifier has a frequency response of 30 to ten thousand cycles and is *ideal for use in night clubs, retail stores, gymnasiums, small hotels and for paging work at parking lots.* Two other units, of 6 and 15 Watt power output, are *adaptable for store demonstrations, auctioneers, dance halls, restaurants and small churches.*

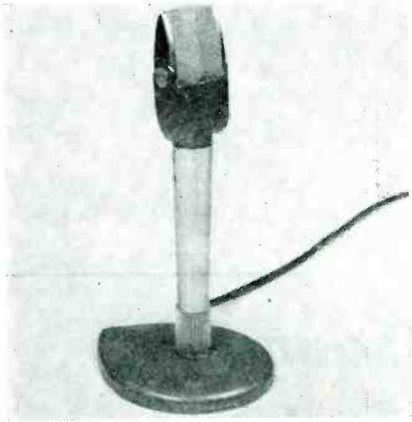
A portable mobile public address system for use with either 6 volt battery or 110 volt—60 cycle supply, consists of a 15 watt amplifier and high quality crystal pick-up and turntable assembly together with 85 feet of extension cable. This portable unit may be used with a variety of RCA speakers and high impedance microphones.

In the line of portable turntables and record players, are three models, one manual and two automatic. The manual turntable can play sixteen inch recordings either at 78 or 33 and 1/3 r.p.m. The automatic record changers will play either ten 12-inch recordings or twelve 10-inch discs. One model has a special mechanism which cuts off the power when the tone arm has returned to the rest position after the last recordings are completed.

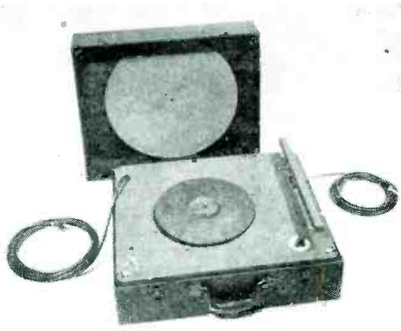
The Portable Disc Recorder is completely self contained; it holds within its case, in compact and convenient form, all of the components required for high quality recording. The turntables rotate at 78 r.p.m. and can accommodate discs of any diameter from six to twelve inches: the cutting is made from rim to the center and can be played back immediately after the recording is completed. The recorder features the RCA Aerodynamic microphone complete with table stand; high quality amplifier, and reproducing pick-up. A jack permits the use of high impedance headphones for monitoring while recording, and a visual indicator facilitates accurate adjustment and regulation of volume. Another control permits adjustment of tone when the instrument is used for recording and reproducing records.



Packaged line features 10-tube, 25 watt amplifier. Frequency response of 30-10,000 cycles. Two microphone controls, two phonograph controls, tone control, separate off-on switch.



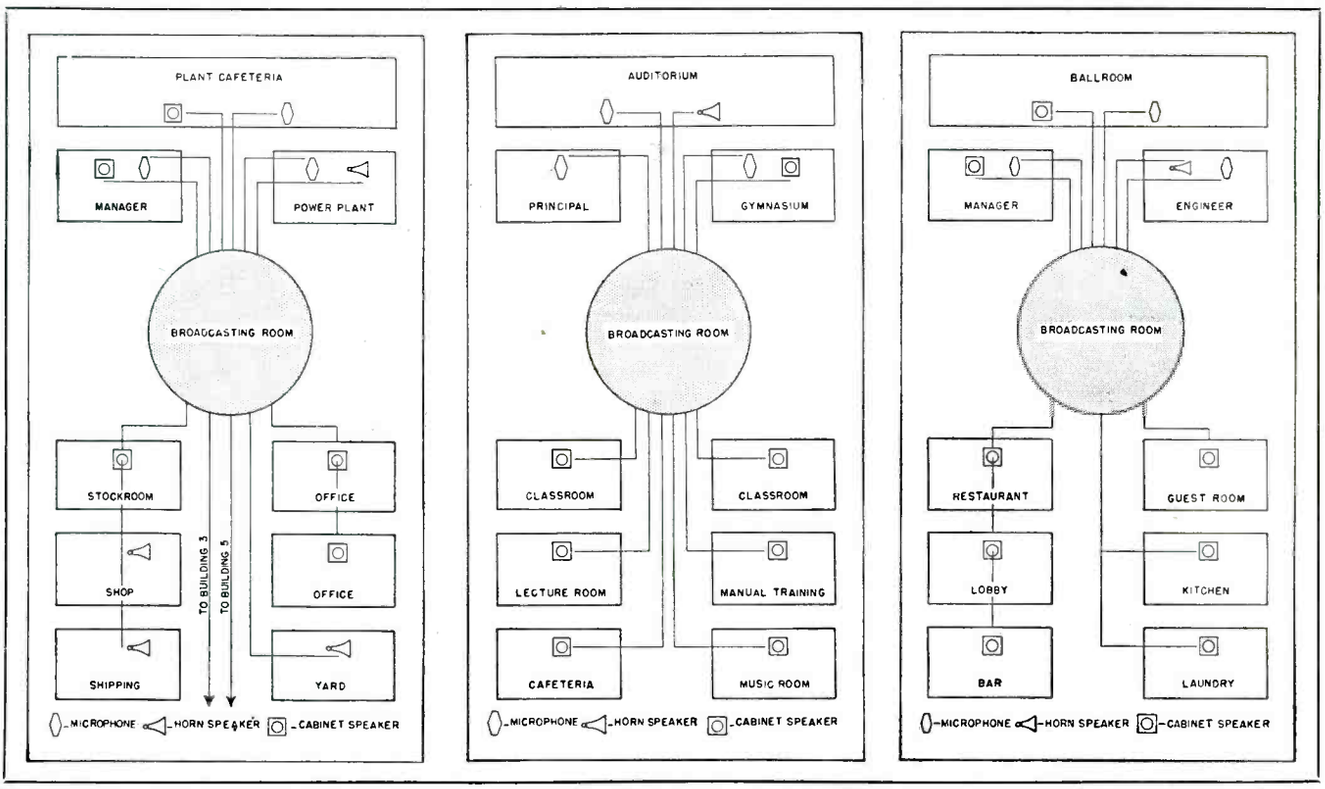
Lightweight velocity mike has tilthead; can be screwed to floor or desk stand. ***Below:*** **Portable record player with interchangeable turntables. Operates on any amplifier with high impedance input for crystal pickup. Operates either 78 or 33-1/3 r.p.m. for standard or transcription recordings.**



Radio Industry's OPAilment

As we go to press, Washington reports a 53 to 11 Senate vote for a "weak OPA". Identical in both the Senate and House is this provision: "Prevent OPA from ordering reduction of normal peacetime trade discounts and mark-ups of wholesalers and retailers of . . . radios and refrigerators . . ." This means an end to price-absorption.

As we go to press, the wind is in the straw. By the time you read this, the wind may have brought a law. As we go to press, we hope that a Senate-House committee will us with a free-enterprise industry bless . . .



Sound Systems Described

AN informative panorama of the increasingly varied uses of electronic sound systems in industry, institutions, and commercial organizations is presented by the RCA Victor Division of the Radio Corporation of America in a new illustrated brochure entitled "RCA Sound Systems." A distinctive feature of the brochure, and one that has brought enthusiastic reactions from the trade and potential users since distribution was begun, is the use of block diagrams to present graphically the special services rendered by sound in various types of establishments and the arrangements of control consoles, microphones, and loudspeakers in different kinds of installations. The needs of industrial plants and offices, schools, hospitals and penal institutions, and various types of commercial establishments are covered by the diagrams and accompanying text.

The diagram of a typical manufacturing plant system shows lines running from an RCA central control console with two record turntables to the manager's office, plant cafeteria, power plant, stockrooms, shops, yards, receiving and shipping departments, general offices, and other buildings associated with the plant. Horn-type speakers are shown in the shops, shipping department, and yard areas, with cabinet speakers in the other locations and microphones for two-way communication in the manager's office, cafeteria, and power plant. Such a system, it is pointed out, permits close administrative control of all individuals and departments, and facilitates coordination of sequential or simultaneous operations, such as the handling of travelling overhead cranes in steel mills and shipyards, or the steps necessary in a power plant to provide for a sudden change of load or an equipment failure. In addition, the brochure states, such a system is used to carry morale talks, on-the-spot instructions, and safety messages that are more effective than signs or memoranda, and to provide fatigue-relieving music to work areas and recreational music and entertainment during rest periods.

The console of a typical school sound system is shown connected with a microphone and horn speaker in the auditorium, a microphone in the principal's office, microphone and cabinet speaker in the auditorium, a microphone in the principal's office, microphone and cabinet speaker in the gymnasium, and cabinet speakers in classrooms, cafeteria, and lecture, music, and manual training rooms. Placing every part of the school at the administrator's fingertips, the system allows close coordination of activities, the making of announcements without calling special meetings, and the pick-up of messages and programs from various sources and their transmission to selected locations or to the entire school. Live musical programs and entertainment, talks, and selected radio programs and recordings can be supplied through such a system to enrich the curriculum.

In the use of similar systems for hospitals and penal institutions, emphasis is placed on the recreational value of music. In hospitals, headphones

Commercial installations are represented in the brochure by a typical hotel system. The diagram shows lines running from the console to the ballroom, the manager's office, and the engineer, each provided with microphones as well as speakers, and to cabinet speakers in guest rooms, restaurant, kitchen, lobby, bar, and laundry.

In a hotel, it is pointed out, the sound system allows close control and coordination of the whole organization, provides the guest with entertainment, and permits the hotel to sell its special services to every guest. Special uses may be made of the system to direct action by guests and personnel in an emergency such as fire, or to carry programs from an important meeting in the ballroom to overflow groups in other public rooms. Other commercial establishments in which similar systems may be used include business offices, department stores, railroad terminals, and airports.

OHMMETERS, Condenser Testers, Capacitance Meters

Article 1 of two articles

by GEORGE LEVY, B.S., E.E.,
Illinois Institute of Technology

RADIO test equipment is a part of the radio technician's tools. It enables him to locate trouble more quickly and effectively and helps increase volume and income. Naturally, every service technician should continually strive to increase and better his assortment of tools and equipment. While we do not ordinarily construct or build our own mechanical tools, there are cases where a serviceman might desire to build his own test equipment. The reasons for this might be that he cannot afford the cost of a commercial unit or, he might want to incorporate some special features in his own equipment which are not available in the corresponding commercial model.

The ohmmeter is one of the most important and most frequently used instrument. It is relatively simple to construct. The basic component is the milliammeter or microammeter. Purchase a good one, with a large scale, either 0-200, 0-500 microammeters or 0-1 milliammeter.

Ohmmeter

A simple series-type ohmmeter is shown in *Fig. 1.* A 4½-volt "C" battery is usually used for the voltage supply.

When the test terminals, TT, are short circuited the meter will read full scale or 1 ma. The total resistance required in the circuit to limit the curren to this value will be, according to Ohm's law:

$$E = I\,R \qquad R = \frac{E}{Y}$$

$$R = \frac{4.5}{0.001} = 4500 \text{ ohms}$$

Since the meter has a resistance of 27 ohms the *exact* value of R would be be 4500—27=4473 ohms. In a practical circuit the total resistor R is split into a fixed and variable resistor. The value of the fixed may be taken as 3000 ohms and the value of the variable as 2000 ohms. This will then permit the meter to be "zero adjusted" if the battery voltage varies from:

E = IR = 0.001 (5000) = 5 volts (high value)

E =0.001 (3000) = 3 volts (low value)

To calibrate the meter scale in ohms two methods may be used. If the service man has an assortment of known resistors, he may consecutively connect each resistor across the terminals TT after adjusting the meter to zero ohms at the extreme right, and make a mark on a blank meter scale. Blank meter scales may be purchased from the meter manufacturers. A typical scale is shown in *Fig. 2.* The main divisions may then be sub-divided into smaller divisions.

The other method of calibrating the ohmmeter is by calculation. This consists in assuming a value of resistor to be connected to the terminals and then calculating the value of current flowing thru the meter. Since the current calibration is known, the proper value of resistance is marked on the milliammeter scale. This maybe carried thru for any number of resistors desired. Method of calculating is shown in accompanying table.

Fig. 1 shows how the current read-

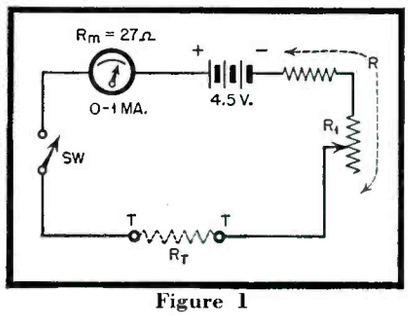
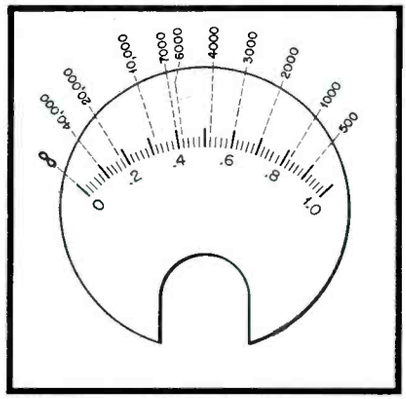


Figure 1

Figure 2



SAMPLE CALCULATIONS FOR CALIBRATING

Assume—

" R_T= 500 : R_{total}= 500+4500= 5000 : $I = \frac{E}{R} = \frac{4.5}{5000}$ = .9 MA

" R_T= 1000 : R_{total}= 1000+4500= 5500 : $I = \frac{4.5}{5500}$ = 0.818 MA

" R_T= 10,000 : R_{total}= 10,000+4500= 14,500 : $I = \frac{4.5}{14500}$ =0.31 MA

" R_T=100,000 : R_{total}=100,000+4500=104,500 : $I = \frac{4.5}{104,500}$ =0.043 MA

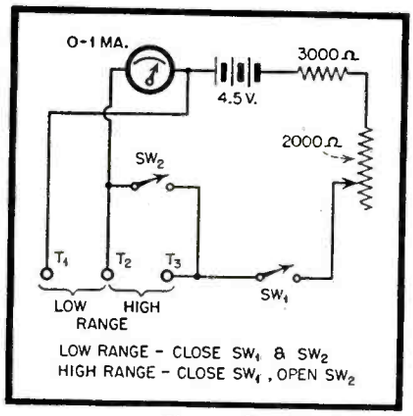


Figure 3

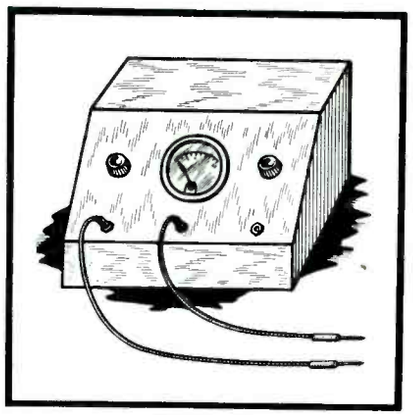


Figure 5

ings and the resistance readings match up on the meter scale. It is evident that this scale is very crowded. If the entire range is shown on one scale face. To overcome this crowding, the readings may spread out on two or more scales. Such a two-range instrument is shown in *Fig. 3*. For low resistance (approx. 1-500 ohms) measurements the shunt circuit is used, and for the high range (0-100000), the series circuit is used.

Calibration of this two-range Ohmeter may be made as described above. On the high range it should be noticed that the initial resistance is now

$$R = \frac{E}{I} = \frac{4.5}{0.001} = 4500 \text{ ohms as in the}$$

previous circuit.

The assumed values of resistance are then added to 4500 ohms and the current computed for each point. The resistance values are then marked on the milliammeter scale opposite the correct value of current.

Calculation of the calibration for the low range (approx. 1-500) are shown below. With the terminals T_1 T_2 open circuited the 2000 ohm variable resistor is adjusted for 1 MA or full scale deflection which gives a total resistance of $\frac{4.5}{0.001} = 4500$, including the meter resistance.

The circuit resistance exclusive of the meter resistance is $4500 - 27 = 4473$. Now if a resistor is connected to terminals T_1 T_2 with switch sw_2 closed the 1 ma of current which flows will divide between the meter and the additional resistor in a ratio inversely proportional to their resistances.

Since I_1 is the current through the meter the meter will therefore read 0.95 MA when 500 ohms is connected to terminals T_1 T_2. In a similar manner the other divisions on the meter scale may be computed. The readings of the meter are given below for other values of calibrating resistor R_T. The radio technician should check these values to verify his understanding of the method.

R_T	Meter reading	R_T	Meter reading
500	0.95 MA	25	0.48 MA
400	0.935	10	0.27
300	0.916	5	0.156
200	0.88	2.5	0.085
100	0.785	1	0.035
50	0.65		

It should be pointed out that the current I changes *very slightly* as the different resistors are connected into the meter, but for practical purposes it may be considered constant without affecting the accuracy of the ohmmeter.

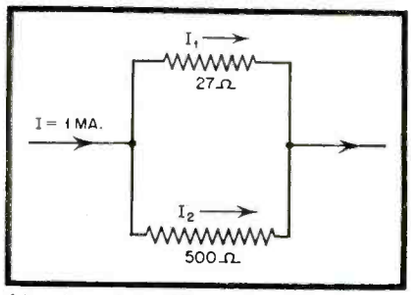
It is believed that if the radio technician understands the theory and construction of the two ohmmeter circuits discussed, he may exercise his ingenuity and so design and construct an instrument incorporating his own particular features. To finish off the construction, it is desirable to mount the components in a cabinet and provide a set of test leads. *Fig. 4* shows a suggested arrangement.

(To be continued)

NOTE: Condenser Testers and Capacitance Meters will be discussed in the second part of this article. Look for it in the July issue.

SAMPLE CALCULATIONS FOR CALIBRATING LOW RANGE

Assume $R_T = 500$ Then the simplified circuit of the ohmeter may be shown: $I = I_1 + I_2$



The parallel combination of the 27 and the 500 ohm resistors may be calculated by dividing the product of the resistance by their sum.

$$R_{total\ (parallel)} = \frac{27(500)}{500+27} = \frac{.3500}{527} = 25.6$$

The voltage across the circuit will be $25.6 \times 1 = 25.6$ M. V. The total current $I = I_1 + I_2$

and $I_1 = \frac{25.6}{27} = 0.947$ MA $= 0.95$ MA (for practical purposes)

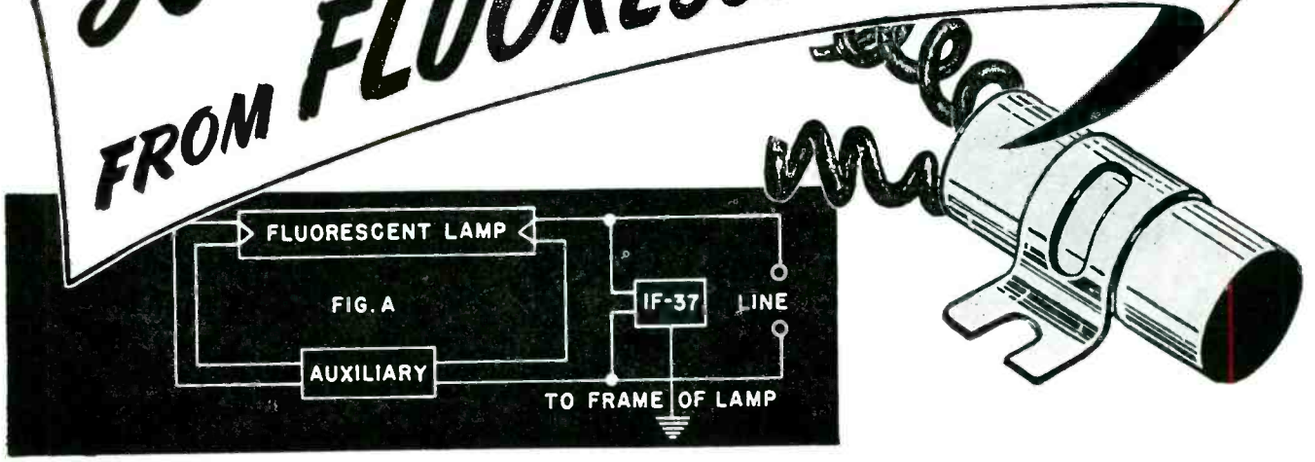
$I_2 = \frac{25.6}{100} = 0.256$ MA $= 0.26$ MA (for practical purposes)

SERVICE SHOPS MAY RAISE CEILINGS TO COVER PAY INCREASES

Service and repair shops for appliances, motor vehicles and farm equipment that employ not more than eight persons may automatically increase their ceiling prices when they grant wage increases to their employees. Owners will determine the amount of the price ceiling increase by use of the form previously provided and now reincorporated in the regulations covering these repair shops.

This action became effective May 25, 1946. Under the Government's new wage price policy, employers of eight or less persons are not required to obtain approval of a wage increase as one of the conditions for obtaining a price ceiling increase. Consequently, the former automatic provision is restored. (Amendment 4 to Supplementary Service Regulation 6 to Revised Maximum Price Regulation 165 and Amendment 4 to Supplementary Service Regulation 22 to Revised Maximum Price Regulation 165—both effective May 25, 1946.)

SUPPRESS RADIO NOISES FROM FLUORESCENT LAMPS!



EASILY INSTALLED — HIGHLY EFFECTIVE

The most serious radio interference from fluorescent lamps is that which is conducted down the power line to receivers at remote points. Such interference cannot be avoided merely by placing the lamp at a safe distance from the radio antenna circuit. Nor can it be avoided by using shielded lead-in wire, as in cases where interference is caused, either by direct radiation from the lamp bulb itself or by radiation to the radio antenna circuit from the electric supply lines.

Yet interference conducted down the power line to remote receivers should, and CAN, be reduced.

The really effective method is to connect Sprague IF-37 Filters directly to each fixture as indicated in the above diagram. These filters are specifically designed for fluorescent lamp interference suppression. They are recommended for single lamp fixtures, connected as shown in figure "A". One filter is required for each auxiliary.

Type IF-37 Filters are EASY to install. Inexpensive, too—only $1.11 each, net.

RADIO DEALERS! REMOVE INTERFERENCE IN YOUR OWN STORE

The use of Type IF-37 Filters in your own store will help you sell more radios through better demonstration. Your sets may be perfect, but if your own fluorescent lamps interfere with reception your customers may assume the radio is at fault.

Don't let noise spoil your sales!

WRITE

for your copy of the new Sprague Catalog No. C-306. It's the first Sprague Catalog in five years devoted to civilian radio service. In it you'll find new capacitor types and outstanding resistor improvements. Write for your new catalog today!

SPRAGUE PRODUCTS CO.

NORTH ADAMS, MASS.

Jobbing Distributing Organization for Products of the Sprague Electric Co.

CIRCUIT COURT

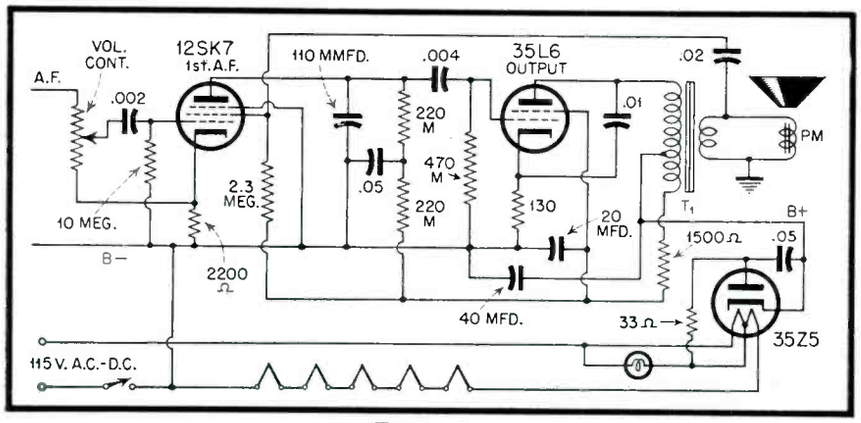


Figure 1

STEWART-WARNER

Several interesting points appear in the schematic of the new *Stewart-Warner* model 9014-E. *Figure 1* shows the audio portion of the set, and the power supply components.

A system of hum-bucking by the use of a tapped primary on the output transformer is employed. The small portion of the coil included in the filter circuit, in series with the 1500 ohm resistor, acts to filter hum and also to introduce an out-of-phase voltage into the output circuit.

The next point of interest is the lack of any by-pass across the cathode resistor of the 35L6 output tube. This decreases the gain of the stage, particularly at low audio frequencies, but the degenerative action introduced flattens out response over the higher frequencies and minimizes distortion.

The use of a pentode connected 12SK7 as a first audio stage is uncommon and incorporates unusual details. It will be seen that the grid resistor is large, 10 megs. This makes for high gain, but it will also be noted that the dropping resistor for the screen voltage is quite large, 2.3 megs. In addition, the screen is coupled to the high side of the secondary of the output transformer, through a .02 capacitor. This provides a measure of inverse feedback which further provides improvement in frequency response and freedom from distortion. The use of adequate filtering in the plate circuit of the first audio stage is to be observed. This item is all too frequently neglected in simple receivers.

CLARION

An interesting feature of the model 100 Clarion receiver is the incorporation of a voltage divider across the high voltage supply. The portion of the circuit showing the components to be discussed in reproduced *Figure 2*. It will be observed that the 50L6GT stage and 35L6GT rectifier are conventional except for the insertion of a 10,000 ohm resistor from the high voltage source to the cathode of the power output stage.

As in many circuits of this type, a protective resistor is included between the rectifier cathode and the first filter, and the plate supply for the output stage is taken off ahead of the filter resistor. The large, 30 mfd., first filter provides suitable filtering for this stage. The screen of the 50L6GT and all other B voltages are taken off after the 1000 ohm filter resistor.

A simplified explanation of the added 10,000 ohm resistor from plate supply to cathode of the 50L6GT is as follows: The normal plate current of a 50L6, at 110 plate volts, is 50 ma. This calls for a 150 ohm resistor from cathode to ground to provide the required 7.5 volts bias for class A operation. In *Figure 3A* is shown the voltage and current conditions.

This variation is shown in *Figure 3B* and we see that now the current through the cathode resistor consists of the usual 50 ma. due to the internal resistance of the tube and an additional 10 ma. flowing through the 10,000 ohm resistor which is effectively in parallel with the tube resistance. This flow is sufficient to produce the required bias voltage.

The real advantage of the inclusion of the resistor is that we now have a fairly low resistance voltage divider across the output of the filter and surges of voltage which might prove harmful to the filter and bypass condensers are less likely to occurr. During the period when the tubes are heating it is these surges which usually cause condenser failure.

HOWARD

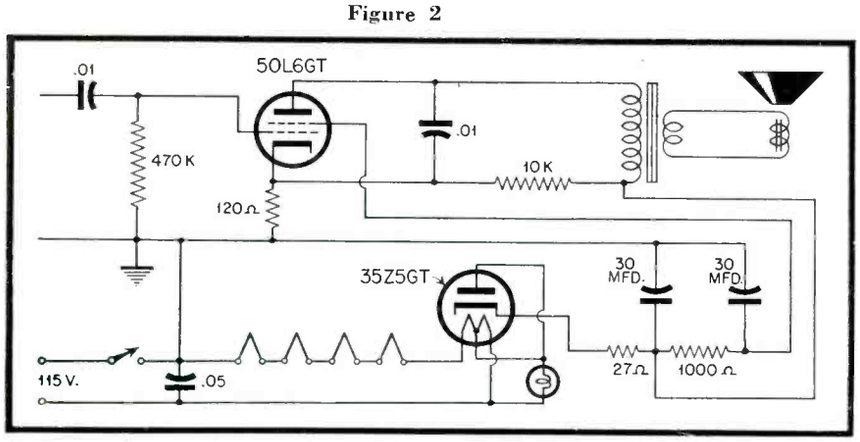
Those of us whose memories go back to the days of the type 226 RF amplifier will recognize an old friend in an occasional offering on today's market. One of these is found in the Howard model 901 *Figure 4*. What with the high gain possible with the present pentode tubes and iron core I F transformers, they have deemed it advisable, if not necessary, to insert in the grid circuit of the single stage a losser resistor. The use of such a component is a sure-fire method of eliminating regeneration, or even oscillation. The band-width will be increased and tone quality improved. A more common scheme to achieve this end is to shunt one coil of the transformer with a large resistor, but in this case a series connection has been used.

TRUETONE

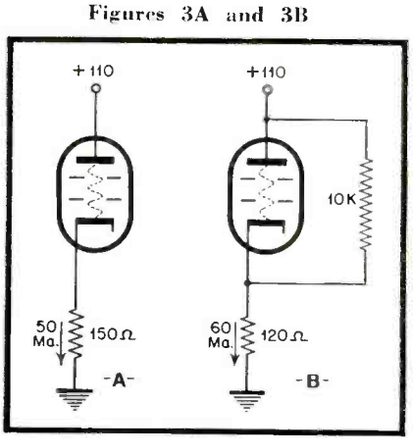
In AC/DC receivers it is common to connect the pilot light across part of the heater of the 35Z5 rectifier tube. The tube was designed for this use, but there are several good reasons for the employment of some other type of connection. For one thing, more current is available for use in the receiver plate supply. Another advantage is the freedom from pilot light failure due to the wide divergence of resistance in the heater string in cold and not conditions. If it is desired to use

[*see page* 34]

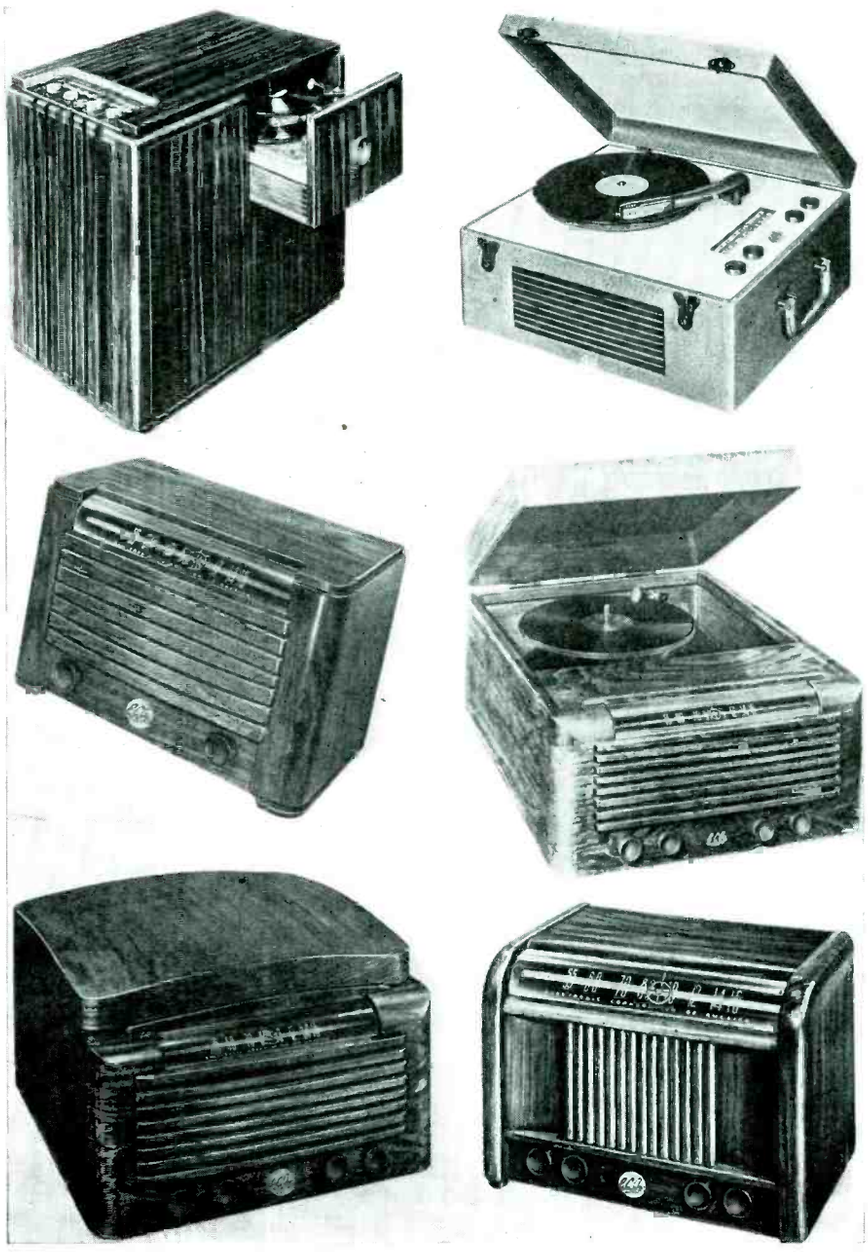
Figure 2



Figures 3A and 3B



MERCHANDISE PRE-VIEWS—14



Show Full Line

THE Electronic Corporation of America offers six new ECA home radios. Attached to every set is an informative labelling tag which will tell the consumer exactly what he is getting in the set, and will guarantee that the set will perform in accordance with the information given. Among the items of performance information provided on the tag are the undistorted maximum output, speaker size, frequency range, frequency response, sensitivity and power consumption.

According to Samuel J. Novick, president of Electronic Corporation of America, the ECA decision to label each set accurately arose from the company's desire to meet the demands of consumers and consumer organizations. "In addition," he declared, "at the same time that we distribute our sets we will issue an informative booklet entitled 'The Consumer's Guide to Radio Buying.' This booklet will contain scientific information in layman's terms explaining to every consumer exactly how the information he gets works out in actual radio performance."

The sets include five and seven tube table models and four radio-phonograph combinations. Two of the combinations are table models; one is a luggage type with handle for easy portability, and the fourth is a chairside model with phonograph compartment sliding out to left or right.

In discussing the sets, Jack Geartner, sales manager, said, "Our seven tube AC-DC set produces 2½ watts of undistorted output, which is more than twice the undistorted output of comparable pre-war models. This should not be confused with 'peak output' which has been widely advertised but has no meaning whatever in terms of actual radio performance. Two and one-half watts of undistorted output will give the ECA seven tube AC-DC radio, selling at under $40.00, performance comparable to many pre-war console models."

A special feature of the entire ECA line is an acoustic grill, trademarked "Di-fusa-tone." This exclusive feature will be built into all models from the lowest to the highest priced. The new grill is constructed so that the sound is sent to all parts of the room rather than in a straight line from the speaker.

Tubes in Models 107 and 121: 6SA7, 6SF7, 6SL7, 2-25L6, 2-25Z5. Tubes in Models 101, 104, 105, 106: 12SA7, 12SK7, 12SQ7, 50L6, 35Z5.

The sets were shown to the trade at an open house party held in June at the official opening of the firm's new factory in Brooklyn. A "first edition" of a 12-tube AM-FM combination was on view.

Pictured left (top to bottom):

Model #121 — 7-tube chairside model radio-phonograph combination with gentle action record changer. Phonograph slides to either right or left so that model can be positioned at either side of chair with no necessity to lift top. Handles twelve 10-inch records or ten 12-inch records. Album storage space provided. Light weight crystal pickup. Noiseless performance. Hand rubbed wood cabinet of functional design finished in mahogany, bleached mahogany, and walnut. Radio gives 2½ watts (5%) undistorted power output. Eight inch Alnico V speaker. Tone control. Uniform sensitivity over the entire tuning band from 540 to 1700 kilocycles. Full vision slide-rule grill for equalized sound diffusion. Radio operates without opening phonograph. Provision for convenient servicing through top of set, exposing entire chassis.

Model #101—5 tube AC-DC table model. Hand rubbed wood cabinet of functional design. One-watt undis-

[*see page* 42]

In Trade

[*from page* 10]

the projection as well as direct-view types. All these television sets will be made at the Bridgeport, Conn., plant. General Electric television transmitters and related studio equipment are now being manufactured in the G.E. factory at Syracuse, N. Y. Present plans call for delivery of this equipment to broadcast customers early in 1947.

PRICE INCREASE ON RADIO TUBES TO BE ABSORBED

Increases in manufacturers' ceiling prices for radio receiving tubes and allied special purpose tubes, which are similar to radio tubes but of different construction and use, are announced. Although an increase factor was given for tubes sold as replacement parts as well as those sold as original equipment, *consumer costs for replacement tubes will not be affected.*

Two increase factors were given manufacturers of these products by the present action, effective May 2, 1946:

For sales of tubes to resellers for replacement purposes — 20 per cent over March 31, 1942, levels at which maximum prices for these sales were previously frozen. For all other sales of tubes, including those used as original equipment on radios—27.5 per cent over March 31, 1942, levels at which price ceilings were frozen prior to September 1945. At that time, OPA granted manufacturers of tubes used for original equipment an increase of 10.4 per cent. As a result, this increase, which replaced the one granted in September, actually raises current maximum prices for these sales only 15.5 per cent.

These two increase factors are designed to return to the industry 25 per cent additional revenue over 1941 levels on all its sales. This increase is necessary for the industry to recover current factory costs including higher wage rates recently granted. This increase in manufacturers' maximum prices for replacement tubes will not affect retail prices because under the agency's absorption policy the increases will be absorbed by distributors and retailers. Full absorption will be required pending completion of a study now under way.

Available data indicates now that wholesalers can absorb 20 per cent of the manufacturer's dollar-and-cent price increase and dealers can absorb

[*see page* 39]

Wholesalers' Policy Points

BY unanimously endorsing the *Declaration of Electrical Interdependence* and *Tenets of the Electrical Wholesaler,* the National Electrical Wholesalers Association has launched a nation-wide public relations-promotional program designed to increase acceptance of electrical products and establish the creed of electrical wholesalers in terms of services rendered both to suppliers and customers. The program was presented as a special feature on the opening day of the Association's 37th Annual Convention which was held at The Stevens, Chicago, recently. President John L. Busey, General Electric Supply Corp., presided at the meeting

N. J. MacDonald, chairman, NEMA General Sales Promotion Committee, who addressed the meeting, declared that all branches of the electrical industry are interdependent, that the sale of one electrical product often affects the sale of many more products. He cited the adequate wiring program, other industry promotions and electric range sales as examples of electrical interdependence as between industry groups and the thousands of individual products often thought unrelated.

"The electrical wholesaler is in the key position in our industry." Mr. MacDonald said. He warned that the industry's future depended on increased consumption, on "greater acceptance of electrical products in all markets", and characterized the interdependence idea as "the one sure way we can all work together to build a highway of demand." The Tenets were read by Secretary Alfred Byers from the "viewing screen" of a large television set.

THE TENETS

We, as members of the National Electrical Wholesalers Association, realizing that the electrical wholesaler's *key position* in our national economy requires a specialized program of service to manufacturers and buyers alike, do hereby state the following to be our tenets:

1. We *serve the manufacturer* by performing the essential economic functions of

(a) carrying adequate stocks of his products in marketing centers,

(b) promoting and selling his products to customers in all types of markets,

(c) reporting requirements of local markets,

(d) performing credit and collection functions, maintaining continuous investment in receivables as part of the credit function,

(e) coordinating the needs of specifiers (architects, engineers, etc.) relative to product use,

(f) assisting in the development of new markets and the promotion of new products.

As appliance distributors, we promote an active public desire and demand for specialty electrical appliances through specialty selling methods.

2. We *serve our customers* and, indirectly, the general public by performing the essential economic functions of

(a) carrying local warehouse stocks available for quick delivery,

(b) assuming investment and obsolescence risks,

(c) supplying needed information and data promptly,

(d) providing engineering and other specialized assistance relating to products and their applications,

(e) providing specific maintenance products to promote more efficient and economical production..

As appliance distributor we

(f) help to create sales of specialty electrical appliances,

(g) train retail sales personnel,

(h) initiate a variety of specialty selling sales programs and cooperate

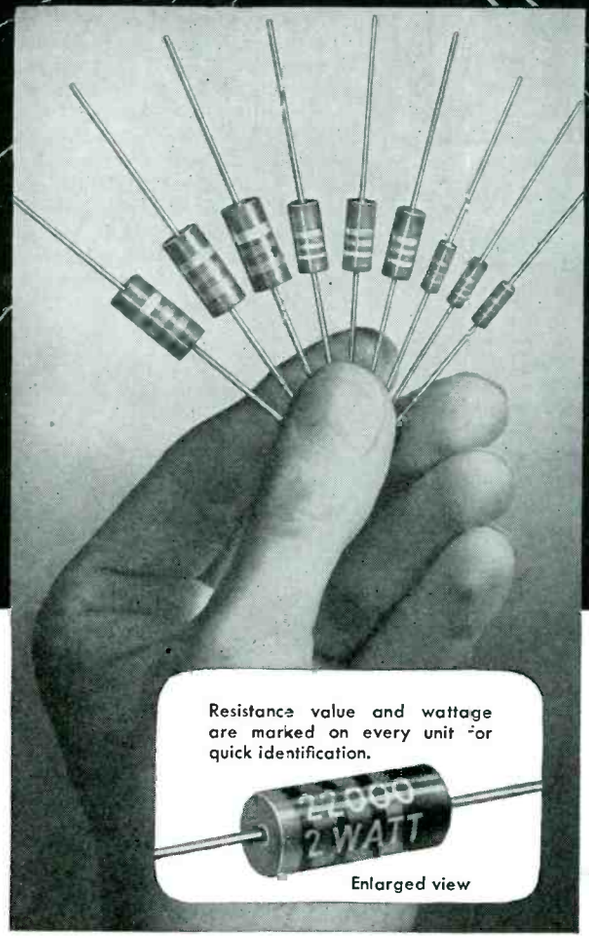
[*See page* 48]

NEW ...and Individually Marked

OHMITE Little Devil

INSULATED COMPOSITION RESISTORS

½ Watt • 1 Watt • 2 Watt • ±10% Tolerance



NOW . . . OHMITE makes available to you three *Little Devils* of exceptional ruggedness and stability!

Millions of these tiny molded fixed composition resistors have been used in critical war equipment and in the nation's foremost laboratories. They meet Joint Army-Navy Specification JAN-R-11, including salt water immersion cycling and high humidity tests. They can be used at their full wattage ratings at 70°C (158°F) ambient temperature. They dissipate heat rapidly—have low noise level and low voltage coefficient.

Ratings for maximum continuous RMS voltage drop are high: 500 volts for the ½ watt unit—1000 volts for the 1 watt unit—3500 volts for the 2 watt unit. Units have high insulation breakdown voltage.

Little Devils are completely sealed and insulated by their molded plastic construction. Leads are soft copper wire, hardened immediately adjacent to resistor body—strongly anchored—and hot solder coated.

Light, compact, easy to install. All units color coded. Resistance value and wattage are marked on every unit for quick identification. Available from stock in Standard RMA values from 10 ohms to 22 megohms.

Little Devils are ready for any job . . . anywhere. And they're low in cost. Order them now!

AVAILABLE ONLY THROUGH OHMITE DISTRIBUTORS

Meet Joint Army-Navy Specification JAN-R-11

AVAILABLE FROM STOCK IN STANDARD RMA 10% TOLERANCE VALUES

TYPE	SIZE		RESISTANCE RANGE	MAXIMUM VOLTS	LIST PRICE
	LENGTH	DIAM.			
½ Watt	3/8"	9/64"	10 Ohms to 22 Meg.	500	13c
1 Watt	9/16"	7/32"	10 Ohms to 22 Meg.	1000	17c
2 Watt	1 1/16"	5/16"	10 Ohms to 22 Meg.	3500	25c

OHMITE MANUFACTURING COMPANY
4846 FLOURNOY STREET, CHICAGO 44, U.S.A.

Send Now for BULLETIN No. 127

Gives complete data and list of RMA values. Includes dimensional drawings and handy color code. Write for it today!

Be Right with

OHMITE

RHEOSTATS • RESISTORS • TAP SWITCHES • CHOKES • ATTENUATORS

Circuit Court [*from page 28*]

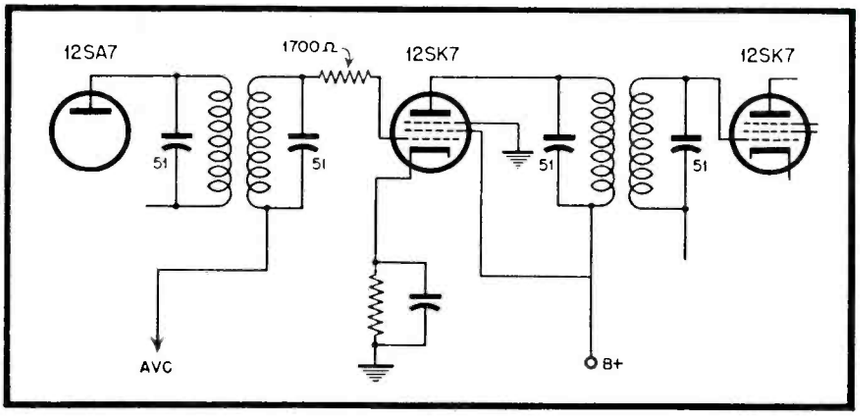
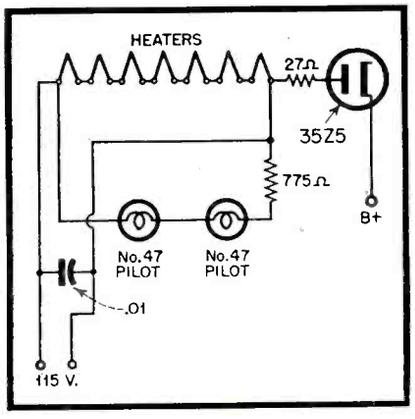


Figure 4

Figure 5



two pilot lights with the usual circuit it is necessary to use non-standard lamps or suffer from low illumination.

One method of overcoming these objections is found in the new Truetone model D2630 *Figure 5*. The portion of the schematic which illustrates the pilot lamp circuit is shown. It will be seen that the rectifier takes it's place in the series heater string and that the pilot circuit is independent of any other parts of the receiver. Two of the usual type 40 bulbs are used in a series circuit with a 775 ohm wire wound resistor, the whole connected directly across the power line. It is true that the failure of one lamp will cause both to go out but the promise of more uniform light and freedom from failure due to faults in the rest of the receiver should prove advantageous.

MORE SERVICE SHOPS

Looking over sales records for the past few weeks (which means during May and early June), a representative of a prominent jobbing house found that 60 per cent of orders received for tube testers, oscillators, analyzers (ohm or volt-milliammeters) comes from newly formed service dealer establishments.

From personal contact with these servicemen, our representative has learned that they are war-trained in electronics, consequently favor the civilian radio field. Hearing about the vast number of privately owned rariods which need servicing—they get themselves a tube checker and an analyzer and "go into business". There's plenty of room for good technicians, and to the "good" ones we say, "Welcome!"

Rivet Note

Several new uses for its Rivnut, which can be used as a blind rivet, nut plate, or both, are reported by The B. F. Goodrich Company, Okron, Ohio. They include applications on record changers, for attaching storage shelves and freezer units on several makes of refrigerators.

Shop Notes

ZENITH 52 HUMS

This hum is not remedied by replacing filters, and varies as the volume control is rotated. Install an 8 mfd. detector-cathode filter condenser.

ALIGNING *(Fig. 1)*

Occasionally, when aligning a superheterodyne, it will be found that difficulty is encountered aligning the oscillator trimmer at the high frequencies. There seems to be no reasonable relationship between the band of frequencies received and the resonant frequency of oscillator coil and trimmer. This is often caused by the padder condenser screw being so far out of adjustment that the padder condenser capacity is practically zero. This results in a virtual open circuit. As a result, the trimmer has little or no affect on the alignment. See *Fig. 1.*

If this condition exists, the best procedure to follow is to adjust the padder to maximum capacity first, after which the adjusting screws is turned back a half-turn. This operation precedes the adjustment of the oscillator trimmer. It might also be advantageous at this point to check the dial calibration with relation to the position of the variable condenser.

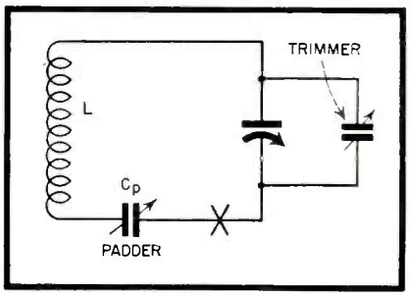


Figure 1

TRANSFORMER BURNOUTS

In receivers using 6X5 rectifier tubes, transformer burnouts, or overheating, is sometimes caused by an internal 6X5 cathode to heater short. This short does not ordinarily show up in a tube tester. However, in operation, the high voltage applied between these two points causes a break-down of the insulation between heater and cathode.

If transformer replacement is necessary, replace the rectifier tube also. Better still, obtain a transformer with an extra 5 volt winding, and use the conventional 5Y3 or 5Y4.

TAPPED OUTPUT TRANSFORMERS

Many modern receivers use tapped output transformers as shown in the circuit illustrated in *Fig. 2.* The purpose of this device is to reduce A.C. hum. This is accompanied by the ripple produced by the plate circuit ampere turns bucking out the ripple produced by the ampere turns of the other circuits as shown. If hum occurs due to incorrect ripple balance, the output circuit components should be checked in the following order:

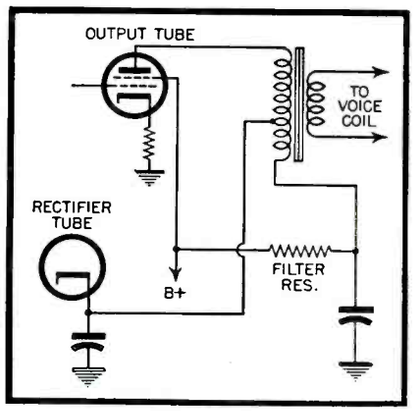


Figure 2

1. Replace output tube
2. Check rectifier filter condensers
3. Check cathode and filter condensers
4. Replace output transformer

OUTPUT TRANSFORMERS AND POWER TRANSFORMERS

Many high fidelity receivers may be improved remarkably by replacing the output transformer with a power transformer. This is especially true where the output transformer is small in size.

Undersized output transformers result in excessive distortion, particularly cross-modulation distortion. This type of distortion is primarily due to the generation of frequencies not harmonically related to the fundamental.

In determining what connection to use on a power transformer the following formula is used:

$N = \frac{Zp}{Zs}$ where N = the turns ratio

Zp = the output load resistance for maximum undistorted power output (not the plate resistance)

Zs = the voice coil resistance

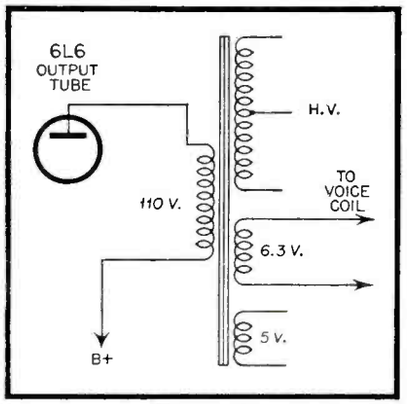


Figure 3

For example, the value for Zp using a single 6L6 operated at 250 volts plate and cathode biased (see your tube manual) is 2500 ohms. Using a speaker with an 8 ohm voice coil:

$N = \sqrt{\frac{2500}{8}} = \sqrt{313} = 18$ app

What windings on a typical power transformer will have a turns ratio of 18 to 1? Since the primary winding operates at 115 volts, the 6.3 volt filament winding will have a step down ratio nearest this 18 to 1 value:

$\frac{115}{6.3} = 18.3$

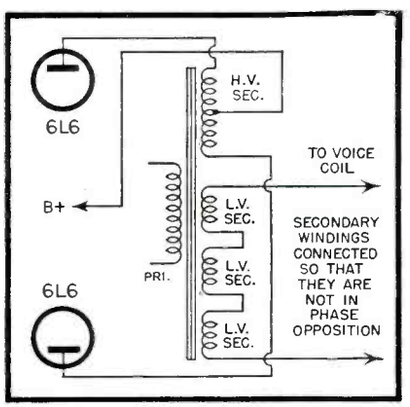


Figure 4

Therefore connecting the primary of the power transformer to plate and B+, and the 6.3 winding to the voice coil as in *Fig. 3* the problem is solved.

Suppose it is desired to connect 2-6L6 tubes in push pull to a power transformer which has been substituted for an output transformer. From the tube manual, Zp = 5000 ohms.

If the voice coil impedance Zs is 8 ohms: $N = \sqrt{\frac{5000}{8}} = \sqrt{625} = 25$

It is obvious that the high voltage secondary winding is the one to be used as the plate winding since it is center-tapped. The secondary voltage on the transformer resulting from a step-down turns ratio of 25 is:

Secondary voltage $= \frac{700}{25} = 28$ (assuming a 700 volt secondary)

A suitable power transformer may be obtained by using one containing a number of separate filament windings and connecting them in series. See *Fig. 4*. It is important that the phase relationships between the windings be observed so that they are not connected in opposition with each other.

G. E. PORTABLE

G. E. 530 3-way storage battery portable. Sometimes, when operated on A.C., a 60 cycle audio growl will be heard. Reversing the line plug will cure this condition.

Services Buyers

[*from page 22*]

with the same completeness as we did our salesmen."

Repair specialty at the shop is washing machines, and Scoggins looked carefully for good washing machine repair talent. Nucleus of his service staff is comprised of three A-1 technicians. Two part-time assistants completed the war staff, one a manual training instructor at the Muskogee high school.

Although a lively selling program is in the offing, Scoggins believes in the continued development of the service department. Two of the staff are attending a 32-week course on refrigeration theory and repair, expenses paid by the boss. The course is offered at the high school two nights a week. In the past, a service technician working independently in the shop attended to refrigerator repair, but the foresighted Scoggins has his eye on the trade-ins which will be received on new refrigerators. If the trade-in box is worth rebuilding and refinishing, the technicians will place it in tip-top shape and the unit will be sold at a profit.

"To sell trade-ins," insists Mr. Scoggins, "the dealer will have to make them almost as attractive and desirable as new machines, and sell them on a warranty that will stand up. If he doesn't, he will have a growing accumulation of useless trade-in appliances."

A card system is used in the flow of appliances to and from the service department. In two sections, the top part gives the customer's name, make of appliance, date repaired and cost. Lower portion reveals the same data, plus a list of the parts used and the amount of time taken to do the work. Incoming machines have the cards wired to them until they are repaired. After the machine is serviced, the lower section of the card is detached and filed. Cards are numbered. The upper part of the card is attached to the appliance in a place where customers will not look, to avoid removal. If a machine comes back after the warranty period, a clerk checks the number of the card on the machine, can tell from the number the location of the complete job card in the file.

"A complete filing system of repair work gives us records of the make, model, owner and address of each appliance we service. It is a valuable source for new appliances that can not be duplicated. The sales staff should have a field day with it when we start working those files!"

Harold Scoggins now has his advertising campaign going full blast in preparation for the steady flow of appliances. One fifty-word spot announcement is on the local radio station, and two newspaper advertisements, totaling around ten square inches of space, are used daily. Other ads are carried in the weekly county newspaper. This gives almost complete coverage of the trading area. Screen advertising, with colorful trailers featuring pictures of new appliances, is divided equally between the three town theatres, running one week alternately in each.

In Trade

[*from page 30*]

the remaining 80 per cent of the increase without hardship. This is required pending completion of the agency's absorption survey, through a new OPA wholesalers price list and by leaving retail ceilings unchanged. Therefore, wholesalers are permitted to increase their former prices by 80 per cent of the manufacturer's increases. The dealers' ceiling price list has been expanded, however, by adding to it recently developed types of radio receiver tubes.

The present action places sales of radio tubes at all levels under Order Number 619 of the general machinery regulation (Revised Maximum Price Regulation 136). At the same time, the agency is revoking Section 3.3. of Supplementary Regulation 14J, which formerly covered wholesale and retail sales of new standard radio receiving tubes. (Order No. 619 and Amendment 37 under Revised Maximum Price Regulation 136—effective May 2, 1946.)

Circulars Not Available

Spirling Product Company's ad (page 48, May issue) offered a 4-page illustrated folder to dealers. This was included by mistake. The folder may be offered at some future date. Watch coming ads.

NEW DEMOUNTABLE RACON

A new 2'6" demountable horn is announced by Racon Electric Co. Inc., 52 E. 19th St., New York, N. Y. The new loud speaker is of the re-entrant type. The bell is rigidly held by means of four spring clips. When these are unfastened the center section of the lung and tone arm can be taken apart and "nested", so a large number of the speakers can be packed compactly in small space.

MODERN TUBE TESTING

[*from page 17*]

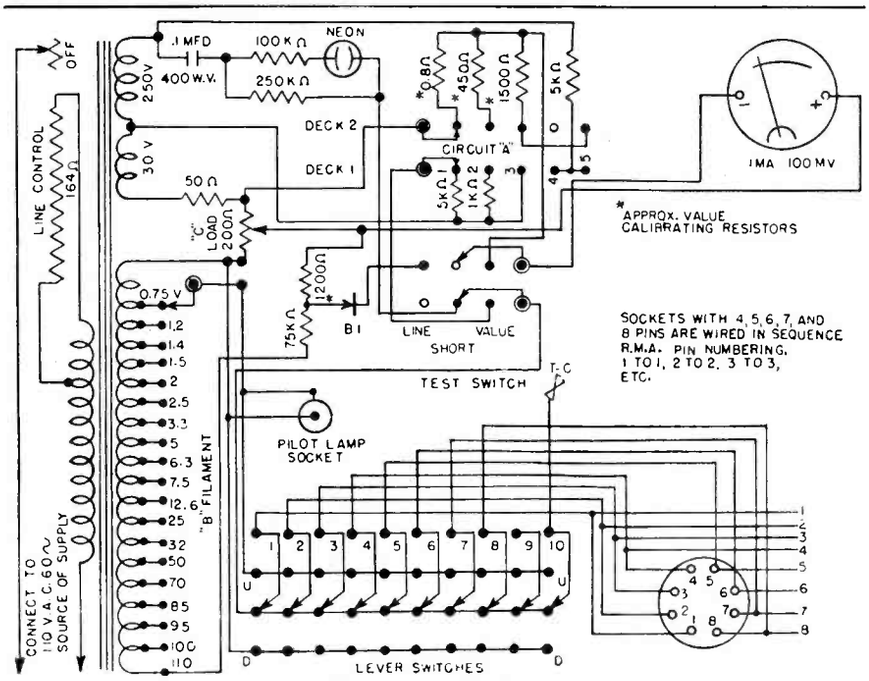


Figure 7. Triplett.

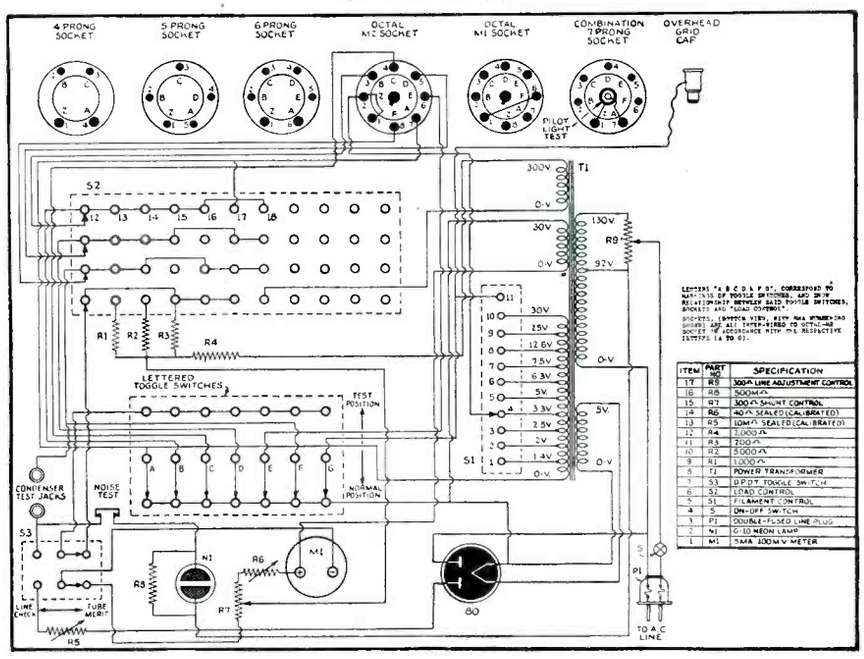
desired loads and meter shunts for the different tube testing conditions. The meter shunt and tube load resistor network are rather complex and can best be studied through the circuit breakdowns shown in *Figs. 4, 5 and 6. Fig. 4* shows the resulting network in position A. *Fig. 5* covers positions B, C, D and E while *Fig. 6* represents conditions when the switch is set to position F.

If the complete load and meter shunt networks are calculated for a single load resistance value it will be found that two of the three recommended RMA loads for emission tube testers are used plus some intermediate load conditions which the meter manufacturer probably found to be desirable. Here again the general circuit will be found similar to that in *Fig. 2* of the first article (see page 17).

Triplett Model

The Triplett Model 3212 and 2413 is shown in *Fig. 7* and once again should not be confused with another model of different type produced by

Figure 9. Precision.



the same manufacturer for bench use.

The Triplett device is basically quite similar to the Simpson Model 305 describe above, but a separate filament return switch is not used. Sockets for all receiving type tubes are included. The nine 3-position switches handle all element switching and single element testing is also possible. In the upper position of these switches one filament connection is made to the transformer. The lower position connects the elements to the test circuit along with the other filament lead.

30 Volts AC is used on all general tube types, 250 volts is used for special rectifier tubes only. All tube loads are per RMA recommendations.

The circuit of the Triplett Model 3212 is broken down in *Fig. 8* and will be found quite conventional.

The load for general tube types is formed by the 200 ohm variable rheostat, which also acts as a meter shunt, and the 50 ohm series resistor. Battery types of tubes are tested through the same load plus the 1000 ohm resistor or a total load of 1250 ohms. Diodes are loaded through the 5000 ohm resistor for a total of 5250 ohms; these values are approximately as recommended. The resistors on the other deck of the switch are used to alter the shunt on the meter as the different classes of tubes are tested.

The neon short test circuit is quite conventional with one lamp sensitivity available. The 75000 ohm and 1200 ohm resistors act as a voltage divider across the filament transformer feeding a half-wave copper oxide rectifier connecting to the meter when it is necessary to standardize the line voltage.

Precision Model 510

The Precision Model 510 is not to be confused with their Model 540 which is of a different type.

The model 510 schematic is found in *Fig. 9* and is very similar to the previously described units. All common tube sockets are present. Individual element control is provided. Most tubes are tested at 30 volts AC and load values of 1000 ohms, 5000 ohms and 200 ohms are used as represented by R1, R2 and R3 respectively. One sensitivity is available in the neon short test circuit.

From the above it can be seen that most emission testers now on the market are of the same general type. Therefore, selection of such a device will depend on the individual preference in design and the quality of the components used plus the degree of care used by the manufacturer in establishing his rejection limits.

SHOW FULL LINE

[*from page 29*]

torted power output (5%), twice the undistorted power output of comparable pre-war sets. Five inch Alnico V speaker. Uniform sensitivity over the entire tuning band from 540 to 1700 kilocycles. Full vision slide-rule illuminated dial with bomb-sight indicator and convex dial shield. Di-fusa-tone grill for equalized sound diffusion. Built-in loop antenna.

Model #104—5-tube table model radio-phonograph combination. Manual operation. Hand rubbed wood cabinet. One-watt undistorted power output (5%). Five inch Alnico V speaker. Uniform sensitivity over the entire tuning band from 540 to 1700 kilocycles. Full vision slide-rule illuminated dial with bomb-sight indicator and convex dial shield. Di-fusa-tone grill for equalized sound diffusion. Built-in loop antenna. Tone control. Light weight crystal pick-up. Radio operates without lifting phonograph lid.

Pictured right (top to bottom, p. 29):

Model #105—5-tube radio-phonograph combination. Durable two-tone leatherette cover with handle for portability. Manual operation. One-watt undistorted power output (5%). Five inch Alnico V speaker. Uniform sensitivity over the entire tuning band from 540 to 1700 kilocycles. Full vision slide-rule illuminated dial with bomb-sight indicator and convex dial shield. Di-fusa-tone grill for equalized sound diffusion. Built-in loop antenna. Tone control. Light weight crystal pick-up.

Model #106—5-tube table radio-phonograph combination with gentle action automatic record changer. Handles twelve 10-inch records or ten 12-inch records. Light weight crystal pick-up. Noiseless performance. Tone control. One-watt undistorted power output. Five inch Alnico V speaker. Uniform sensitivity over the entire tuning band from 540 to 1700 kilocycles. Full vision slide-rule illuminated dial with bomb-sight indicator and convex dial shield. Di-fusa-tone grill for equalized sound diffusion. Built-in loop antenna. Radio operates without lifting phonograph lid.

Model #107—7 tube AC-DC table model. Hand rubbed wood cabinet of functional design. 2½-watts (5%) undistorted power output, twice the undistorted power output of comparable pre-war sets. 6 inch Alnico V speaker. Tone control. Full vision slide-rule illuminated dial with bomb-sight indicator and convex dial shield. Uniform sensitivity over entire tuning band from 540 to 1700 kilocycles. Di-fusa-tone grill. Large size built-in loop antenna for improved sensitivity. Tone comparable to many pre-war console sets.

MEN IN THE NEWS

Robert H. Bishop, overall Director of Sales, Sylvania Electric Products, Inc.

Sidney L. Chertok, Advertising Manager, Solar Manufacturing Corp.

Bob Hope gets his recordings from Capitol Record Co.'s Glen Wallichs, vice pres. & gen. mgr.; Jim Conkling, recording director; H. W. Woodmansee, advertising director.

TROUBLE SHOOTING

[*from page* 19]

with the finger. If not oscillating, there will be no change in the voltage reading, which will remain zero. Dead spots on short-wave bands are detected by rotating the gang condenser while electronic voltmeter is connected, a dead spot being indicated when the negative voltage reading suddenly returns to zero. Cause may be a defective converter tube or oscillator coil,

[*see page* 44]

TROUBLE SHOOTING

[*from page* 43]

improper voltages in oscillator section, or displaced wiring in this circuit. The latter condition may be suspected if the set has previously been serviced by an inexperienced serviceman.

In a-c/d-c receivers of the four- and five-tube varieties with no r-f preselection, a defective oscillator section of the converter is often revealed by simply tuning over the broadcast band. Although the oscillator may be inoperative, frequently a single station at the low-frequency end of the dial will be heard over the entire band. If the signal is strong enough, the lack of sensitivity of the receiver will enable the station to be received because the converter functions as an r-f amplifier. When the i-f amplifier is adjusted to 456 or 465 kc, strong signals around 540 kc are frequently picked up and amplified directly sufficiently to operate the speaker. This test should always be made on such receivers which are inoperative before going through other routine tests. It saves time.

INTERMITTENTS

Intermittent operation is caused by a defective electrical or mechanical connection in the wiring or some component of the receiver. Because a receiver which cuts out will often operate normally as soon as a test prod is touched to some point in the set, these are often the most difficult of all sets to work on. Often the trouble is caused by a defective tubular condenser, and many servicemen waste no time trying to find the defective one; they replace all tubular by-passes. This method often works, but often after going to all this trouble the real fault lies in some other component. Best bet is to use either signal tracing or signal injection (which is another form of signal tracing) to locate the trouble.

In signal tracing, using a typical signal tracer, the test signal is fed to the input circuit of the receiver point 1 and ground, *Fig. 4*, using a modulated test oscillator signal adjusted to the low-frequency end of the broadcast band, to which the receiver is likewise tuned. The signal tracer RF channel is connected to the second detector input (point 4 and ground). With the set operating normally, the RF section of the signal tracer is tuned to the i-f signal frequency present at the detector input and the signal level is noted. Then, when the set cuts out, the channel indicator is examined to see if there is any change in the signal level at the detector. Obviously, if the signal disappears at this point, the

trouble is due to some fault which affects the operation of the receiver circuits ahead of the detector. Thus we know the trouble is not in the audio stages, and those stages are therefore eliminated.

But if the signal tracer indication remains unaffected when the set cuts out, we know the trouble is not in the i-f, converter or r-f stages. So the search is narrowed down to a relatively few components and stages. To test the audio stages, the AF channel of the signal tracer is hooked across the speaker voice coil, the power supply is checked by connecting the electronic voltmeter across the high voltage output and ground, the power consumption is measured with the wattage indicator, and the oscillator section of the converter is checked by connecting the oscillator channel of the signal tracer to the oscillator in the receiver, tuning the channel to the same frequency as the set oscillator.

With all channels hooked up simultaneously to the receiver under test, by examining the indicator provided on the signal tracer it is possible to determine just which section or sections of the set are affected when the receiver cuts out. Once the search is thus limited to a single section with its few components, individual tests of these components will reveal the fault.

SIGNAL INJECTION

Using signal injection, otherwise termed the oscillator-output meter method of testing, an output meter is connected across the receiver voice coil. An audio signal is fed to the audio amplifier while the set operates normally, noting the output meter reading. The audio oscillator is then shut off, leaving the leads connected to the receiver. The set is tuned to a broadcast signal and left playing. When it cuts out, the audio oscillator is turned on and the signal output is adjusted to the same level as that used originally when the set was operating normally. If the trouble is due to some component affecting the audio stages, the output meter reading will change. If there is no change, then the trouble must be due to a defect in some portion of the set other than the audio amplifier.

By using a test oscillator adjusted to produce an i-f signal at the same frequency used in the set under test, and feeding this modulated signal to the converter input, the test may be repeated and will indicate whether the cause is due to some trouble affecting the i-f stages. Lastly, using an r-f signal, the test is made of the r-f section in similar manner, if the previous tests do not isolate the offending

[*see page* 46]

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TROUBLE SHOOTING

[*from page 45*]

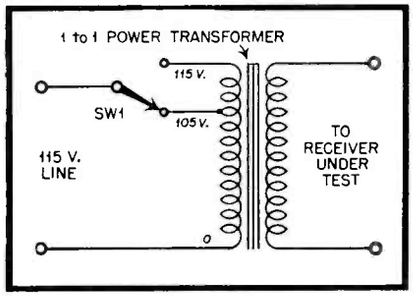

Figure 5

section. While these tests are being made, it is good practice to connect a voltmeter across the power supply output to see if the voltages change.

One of the major difficulties in servicing intermittents is to persuade the defective receiver to cut out—and stay that way until tests are completed. Often just touching the chassis with a metal prod is sufficient to restore operation. For this reason, the most successful test methods are those which employ instruments already connected to the receiver before it cuts out. Various methods are employed to coax to set to cut out. Often all that is necessary is to snap the power switch on and off a few times. If the defect is electrical in nature, a sudden surge in voltage may induce the trouble. One way of doing this is to use a one-to-one coupling transformer with a tapped primary, as shown in *Fig. 5*. Connecting the line voltage through a switch to a lower-voltage tap and operating the switch from high to low tap will often make the

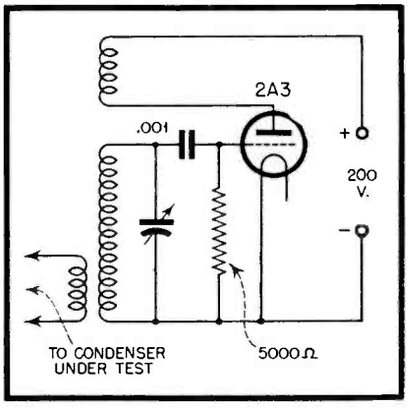

Figure 6

set cut out. Another way is to use a portable electric heater to warm components beneath the chassis, where heat causes intermittent operation. This occurs frequently with wire-wound resistors and, in some cases, tubular condensers. In other instances, putting the set in a refrigertor will do the trick.

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The r-f oscillator tester shown in *Fig. 6* is often useful. When tubular condensers become intermittent because of a defective joint between foil and lead, often a high resistance joint develops. This high resistance becomes hot when subjected to high r-f current, as is supplied by the power oscillator, when its output leads are connected across the suspected condenser. Heat causes the connection to open up, making the intermittent condition permanent. A good condenser is not affected by this test.

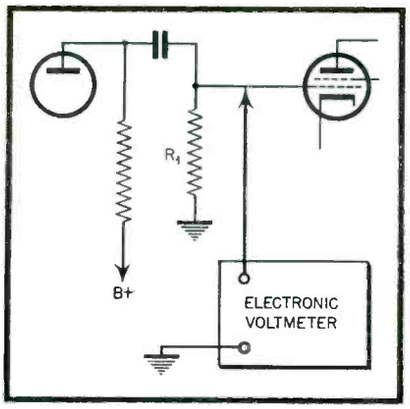


Figure 7

The most commonly used method in testing tubulars is to move the leads while the set is operating. This must be done carefully, otherwise good condensers may be spoiled by breaking the connection between foil and lead.

FADERS

Sets in which the signal fades are rather common variants of the intermittents, because often the fading occurs only at certain times and in certain locations. This is the case when the fading is dependent upon some line voltage condition, and a method of raising or lowering the line voltage over a fairly wide range is a useful adjunct which will induce the trouble to show up in these and other intermittents. The Variac will do the trick.

Slow fades are often due to a gassy output tube. In such cases gas current flows after the tube reaches a certain temperature; therefore, when the line voltage is low, such tubes often function normally. The electronic voltmeter is the most useful instrument for detecting such troubles. A hookup for this test is shown in *Fig. 7*. When the power tube is excessively gassy, the grid resistor becomes positive with respect to ground and the voltage drop acros the grid resistor R1 may be read on the electronic voltmeter. When the grid becomes positive, the signal fades and distortion develops.

A leaky coupling condenser will also cause the grid of the power tube to become positive with respect to ground. But, whereas a gassy tube develops a positive voltage slowly, as the tube heats up, a leaky coupling condenser applies the plate voltage of the preceding tube immediately upon the power tube grid, as indicated in *Fig. 7*. These two causes can therefore be distinguished from each other by the time which it takes for the effect to become apparent. In a-c receivers, the power tube may be removed, too, an indication that any voltage appearing across the grid resistor is definitely caused by condenser leakage.

Ad Index

Wholesale Policy

[from page 32]

with the local utility and others on special campaigns,

(i) train dealers in carrying out manufacturers' service policies to the consumer and arrange for continuity of service on appliances previously sold,

3. We believe that, in the conduct of our business as a wholesaler, we are helping business, both large and small, to market its products with a minimum investment in stocks and organization on its part.

4. We are justly proud to be a part of the great electrical industry whose destiny, since its inception, has been one of ever expanding service to our country in every phase of its life and its work.

5. We believe that our nation grows and prospers through the continuing process of providing more goods, and better goods, for more people at lower costs and that, as electrical wholesalers, we are privileged to perform, and do perform, an essential service toward that, our common goal.

Majority Favor Known Brands

The war years increased Mr. and Mrs. American Consumer's recognition of advantages found in the practice of manufacturer's identifying consumer goods with the makers' brand names, according to A. O. Buckingham, chairman of the Brand Names Research Foundation and vice president of Cluett, Peabody & Co. He disclosed that consumer surveys show that at present 78 per cent of all purchases made by the public are selected either on brand insistence or brand recognition. Other surveys show that the trend toward makers' brands, as opposed to private brands and unbranded goods, is reflected among dealers.

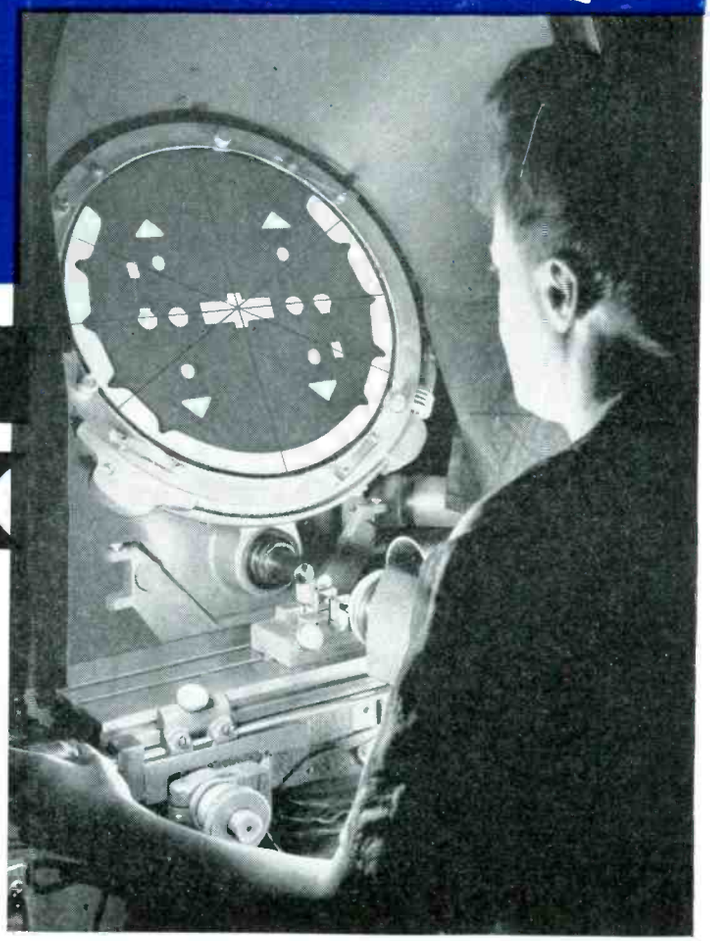
Servicemen home from the war are more brand conscious than they were before they entered the Services because of their experience with brand identified goods while in uniform, he said. Civilians, too, grew more brand conscious during the war years. When no supplies were available, or supplies were very short, as in the case of men's white shirts, the lack of merchandise emphasized the importance of brand name products.

Test Equipment Booklet

A booklet on testing equipment has just been published by the Metropolitan Electronic & Instrument Co., 6 Murray St., New York.

MAKING TUBES IS EASY

If YOU KNOW HOW!



HYTRON KNOW-HOW IS MODERN....

SUPPOSE you were given the job of making certain that micas for Hytron tubes were punched exactly to specifications. How would you go about it? You might use a gage or a precise rule. For a modern, faster, more accurate method, however, you would probably choose the illustrated J & L comparator.

The light beam of the comparator would project optically the magnified image of the mica. By adjusting precision controls, you could then compare visually to .0001 inch the dimensions and orientations of the mica's holes with allowable tolerances in the factory specification book.

That is the way this Hytron inspector is doing the job. Note the tiny mica just below the circular screen. Observe the image magnified 20 times. Many other Hytron tube parts are checked in this manner: plates, shields, leads, cathode sleeves, radiators, grids, ceramic insulators, filament springs.

The comparator is only one of numerous modern inspection tools employed by Hytron's Materials Inspection Department. For example, a Scott wire tester records graphically elongation, yield point, and breaking load of heater, filament, and grid wire. An amazing variety of precision balances, gages, and micrometers checks parts to .01 milligram or .0001 inch. Qualitative and quantitative chemical and metallurgical analyses assure adherence to specifications of coatings and alloys.

Every modern method is used to maintain exacting control over every part that goes into every Hytron tube you buy. If there is a newer way to do the job better — easier — Hytron is alert to expand the know-how which means the best in tubes for you.

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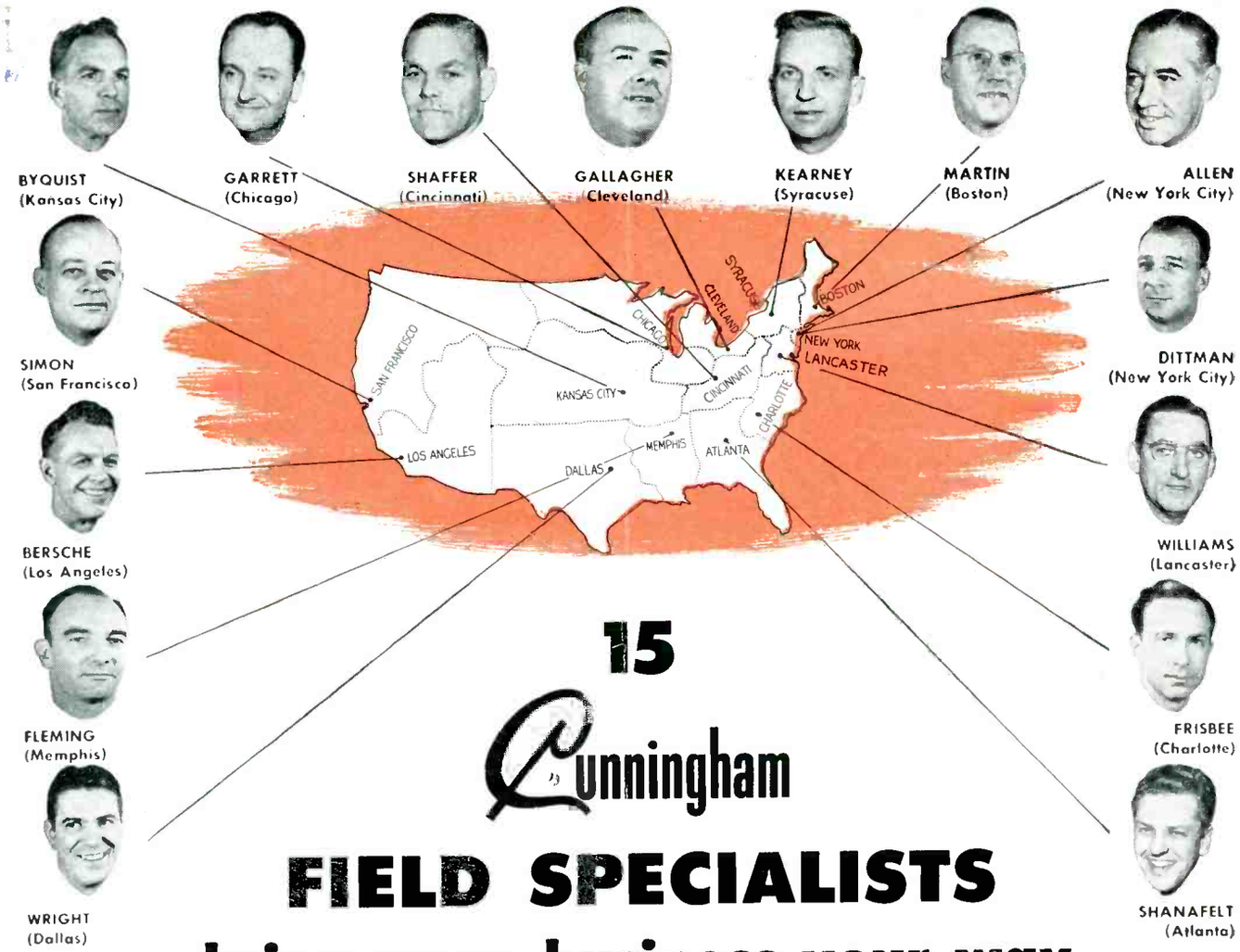

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