

Radio & Electrical Appliance **SERVICE-DEALER**



*Your
Post-War
Radio Set*

Page 4

**In
This
Issue:**

Industrial Sound Installations
★
Square-wave Generator for \$10

april, 1944
25c

How to Use MALLORY Victory Electrolytic Capacitors In High Surge Applications

MALLORY Tips on Radio Service Short Cuts

Mallory Victory Electrolytics have the same surge voltage ratings as other Mallory units of the same working voltage.

When replacing electrolytic capacitors where a high surge voltage condition is suspected, the following information will be helpful:

1. The surge condition exists from the time the switch is closed until the tubes heat up establishing normal load.
2. While the electrolytics draw current during the warming-up period, this load is temporary and may be of no safety value after a period of continuous operation.
3. High line conditions should be considered.



The best way to determine actual surge possibilities:

- a. Disconnect all electrolytics (except cathode by-pass).
- b. Connect a 2 to 4 mfd. paper condenser (600 V.) across voltmeter terminals and read voltage at output of rectifier during warm-up period.
- c. Note line voltage and mathematically compute (by ratio) surge voltage at 130 volt line for safety.

Use following table in making replacement. Bear in mind that where series connection is necessary the capacity is one-half of one of the units (two 8 mfd. in series equal 4 mfd.). No equalizing resistors are necessary with electrolytics in series.

Working Volts of Unit	Maximum Surge Volts Allowable
150	200
250	300
450	525
two 250 V units in series	600
two 450 V units in series	1050

NOTE: Where heater type rectifiers are used, there is little likelihood of unusual surge conditions, and replacement may be made without this procedure.

The *working* voltage rating of capacitor should be equal to or higher than measured *working* voltage at high line, regardless of surge requirements.



Buy More War Bonds

Mallory Helps for the Service Engineer



MVE TECHNICAL MANUAL
— 408 pages of complete data on capacitors, noise suppression, receiving tubes, loud speakers, vibrators, phono-radios, automatic tuning and other valuable information. Available from your Mallory distributor... Price, \$2.00.

4TH EDITION RADIO SERVICE ENCYCLOPEDIA . . . Complete information on repairing any make or model of receiver. Circuit references, original part numbers and recommended replacements. Available from your Mallory distributor . . . Price, 95 cents.

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

P. R. MALLORY & CO. Inc MALLORY Approved Precision Products



POINT OF SALE
DISPLAYS

SYLVANIA SERVICEMAN SERVICE

by
FRANK FAX



BANNER—boldly printed in black and green on special Duckline fabric — 46 x 28-inch size just right for truck sides or any spot you pick inside or outside your shop. Comes with six brass grommets for reinforced hanging. Price: 40¢ each or 3 for \$1.00.



FLANGE SIGN—green and white enamel baked on heavyweight sheet metal — is weatherproof. Size: 16¼ x 11¼ inches. Five flange holes give sturdy mounting. Price: 25¢.



DECALCOMANIA—easy transfer of green, black and white design on windows — 7 inches in diameter. FREE.

If your distributor does not have these items in stock, send your order to Frank Fax, Sylvania, Emporium, Pa.

SYLVANIA

ELECTRIC PRODUCTS INC.

RADIO DIVISION

April, 1944

Radio & Electrical Appliance SERVICE-DEALER

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

VOLUME 5, NUMBER 4

APRIL - 1944 CONTENTS

With the Editor	2
The latest from the Washington Front	
On Our Front Cover	4
What the dealer may expect in 194X radio sets	
DISCUSSION	7
The reviews of late records, etc.	
Letters to the Editor	8
The customer's always write	
In & Around the Trade	11
A brief digest of the news	
A Square-wave Generator For \$10.00	Oscar E. Carlson 13
A useful gadget for the serviceman	
How to Install an Industrial Sound System	A. B. Cavendish 16
Taking advantage of the release of Sound Equipment	
Servicing With a 'Scope	John H. Potts 19
Alligning F-M and A-M receivers. Part 2	
Technical Service Portfolio	Section XXXVII 22
Some interesting odds & ends	
Optional Service Plans	26
Two proven systems for charging are suggested	
Using Auto Radios In Homes	26
A hint! Put idle auto sets to work	

ELECTRICAL APPLIANCE RETAILING SECTION

Refrigerator Service Hints	18
Toaster Hints	18

SANFORD R. COWAN *Editor & Publisher* KARL A. KOPETZKY *Managing Editor*
 JOHN H. POTTS *Contributing Editor* HENRY F. KROEGER, JR. *Photography*
 ROCCO D. NAVIGATO *Art* SYLVIA BORNKOFF *Circulation*
 CHARLES H. FARRELL *Advertising Manager*

Copyright, 1944
COWAN PUBLISHING CORP.

Executive & Editorial Offices: 342 Madison Ave., New York 17, New York
Member of the Audit Bureau of Circulations.

Midwestern Editorial Offices: 7645 North Sheridan Road, Chicago 26, Illinois

RADIO & ELECTRICAL APPLIANCE SERVICE-DEALER is published monthly at 34 North Crystal Street, East Stroudsburg, Pennsylvania by the Cowan Publishing Corp., Executive & Editorial Offices: 342 Madison Avenue, New York City 17, New York. Subscription rates:—United States and Possessions \$2.00 for 1 year, \$3.00 for 2 years; elsewhere \$3.00 per year. Single copies: 25c. Printed in U. S. A. Entered as Second Class Matter October 3, 1941 at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. All subscribers should allow at least three weeks for change of address. Everything concerning subscriptions should be directed to Circulation Dept., 342 Madison Ave., New York 17, N. Y. Material submitted must contain a self-addressed stamped return envelope. While every effort will be made to handle articles with care, the publisher assumes no responsibility. Material accepted is subject to any revisions, including change to, or omission in "by-line" as well as author's name, which in the opinion of the publisher may be deemed necessary or expedient. Payment will include all photographs, sketches, diagrams as well as all of the author's right, title and interest in and to the material submitted. Material submitted will be considered to have been released by the person or persons shown or mentioned therein, and the authors agree to hold this publisher harmless from any manner of suit or damage resulting from the printing of said pictures or articles.

with the editor

No Radios—Appliances A-Coming

"THERE ARE NO EARLY prospects for the production of automobiles, washing machines, refrigerators, vacuum cleaners or radios as plant facilities, parts and raw materials required to make these items are needed for war production." That pessimistic but clear statement, issued late in March by War Production Board can serve as a beacon for all Service-Dealers.

Now that WPB has had the gumption to call a spade a spade, Service-Dealers know that for an indeterminate period their prime activities and income will derive from the servicing end of their

business. And that is that! But, all enterprising business men must formulate their post-war merchandising plans in the interim. To do this, keep in very close touch with distributors; watch manufacturers pronouncements carefully; consider the merits of radio set and appliance franchises *now being offered . . .* and most important, *sign those that seem suitable*. Meanwhile, save money so ready cash will be available when the time comes for deliveries to be made. Those firms having the soundest financial background will probably get preference.

Will War's End Doom Servicing?

THIS IS A CONTROVERSIAL QUESTION. Some old-timers feel that replacement parts manufacturers will swing 100% into production of parts for new sets when the war ends. We have been assured by all reputable parts makers that they will not so desert their old customers, the jobbers and servicemen. We are confident they won't change their minds because they know from long experience that the servicing business will continue to be good despite the end of the war and the resumption of production of new radios.

When the war ends, of course, all set makers will try to get back into civilian production again. In fact, a dozen or more new set makers will be in there scrambling for their share. But the fact remains that several months must pass before the first radios can reach dealers' stores. Admittedly, these first - to - be - released radios will be nothing more than dressed up versions of pre-war models. The sooner dealers and the general public realize this, the better for all concerned. So, it is likely that long before the first new sets arrive at dealers, replacement parts which are needed for all the

old sets will have already been delivered and put to use by service organizations. The average man will not buy any radio offered for sale. He will have decided in advance what he wants, and he will wait for it, many months, if need be. While waiting, he will not be adverse to having his old receiver repaired. No, instead of there being a servicing depression, as we see it, there will be a boom, at war's end.

Carrying this line of "thinking out loud" just a bit further, we feel that there are many potential radio set buyers who have already decided that under no circumstance will they purchase the first post-war models that are released. These conservative-thinking people (as they like to consider themselves) believe that the first post-war radios will be not too good, but, that in six months after the war, the then "new" radios will be super-deluxers with everything built-in but the kitchen sink. That is where these die-hards will make their first mistake, for no extraordinary or Gollywoxer radios are now being considered for production by any reputable set manufacturer . . .

(Continued on page 26)

You will have a much bigger
market for Electronic Tubes
after the War



**GENERAL ELECTRIC IS HELPING YOU
BUILD THAT MARKET *NOW***

Besides serving at the fighting fronts, the famous G-E electronic tube is being used in every major war plant—for resistance welding, motor control, inspection, timing and counting devices, measurement, electronic heating and scores of other vital uses.

When victory is won, and these plants are converted back to peacetime production, the G-E electronic tube will have greater use than ever before. This means a bigger post-war market is being built for you right now . . . and you, the radio service man of today, will

be the electronic maintenance man of tomorrow serving both industry and the expanded radio receiver market.

G-E tubes are scarce today because of the demands of war. But tomorrow you will have an abundant supply. *Electronics Department, General Electric, Schenectady, N. Y.*

• Tune in General Electric's "The World Today" and hear the news from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday evening listen to the G-E "All Girl Orchestra" at 10 E.W.T. over NBC.

THERE'S A G-E ELECTRONIC TUBE FOR EVERY PURPOSE

GENERAL  ELECTRIC



... and waiting for you

FOR THE ARMY AND NAVY, the David Bogen Company is intensifying production of vital intercommunication, detection and specialized sound distribution equipment.

For Bogen distributors, we're working steadily to catch up with the demand for Bogen catalog equipment. It's equipment that's doing a mighty important war job, too. Delivery dates are being kept more regularly. What's more, they are going to be better.

We illustrate the Bogen Model E75, unquestionably one of the finest High Power Amplifiers ever manufactured to commercial specifications. Under wraps, as a matter of military secrecy, are the many wartime Bogen developments in sound equipment. These developments will be released after Victory for incorporation in great new Bogen equipment which will spell profit and prestige to our distributors—and a better life for a world at peace.

BUY MORE WAR BONDS AND STAMPS

David Bogen Co., Inc.

• 663 BROADWAY NEW YORK 12, N. Y.



THE STANDARD OF PERFORMANCE

Bogen Sound Systems

• Communo-Phones

• Amplifiers

• Electronic Equipment

ON OUR FRONT COVER

IT is not often that a scoop appears on the front cover of a radio magazine, even though front cover subjects of every magazine are carefully guarded secrets. Yet, with this month's issue we proudly present the first cover showing of the 194X receivers which may finally be seen in the "flesh" directly after the war is over.

The units were designed by *John Meck Industries* of Plymouth, Indiana; no new-comer to the radio field, but a recent addition to the ranks of set manufacturers having just obtained a Hazeltine license, *John Meck* has refused to confirm that he will make any or all of the sets depicted. Yet he readily affirmed that these were what he had in mind, and what he had engineers working on in such time which is not devoted to war work. One might wonder what time there might be for that, but in any organization there is a post-war planning group which meets regularly (See "Portrait of a Post War Radio Set," page 7, December 1943, *RSD*): The design of these receivers has doubtlessly been the responsibility of such a group at *Meck's*.

It may be said that the "guts" have been roughed-out on the drafting board. The exteriors may not look exactly like those shown, but they will differ only in small details. The cases will probably all be either wood or "grained" plastic.

So to the servicemen we say, "Look them over. This is probably what you will be selling directly after the *War Is Over*. But don't depend on the radios being exactly what is shown. It is only natural that *Meck* would protect his exact models until he is ready to release."

Regardless of whether *Meck* does or does not finally release the models shown on the cover, it nevertheless shows how he, and therefore the radio set industry, is thinking. For that reason alone they are a valuable sign-post.

We expect to have some further information on the insides of these sets which will appear in a future issue.

The Editors.

**BUY A BOND TODAY
BE RICH TOMORROW**



DYNAMIC DEMONSTRATOR



BUY MORE WAR BONDS

UNIVERSALLY accepted for practical laboratory and vocational instruction in radio.

Consists of the working parts of a six-tube radio receiver, mounted in proper functional position on a large schematic diagram suitable for use in visual instruction. Jacks are provided for interruption and test of the various circuits. When used with modern radio test instruments, facilitates both qualitative and quantitative analysis of radio circuit conditions—an ideal setup for rapid radio instruction. RCA Dynamic Demonstrators, like the one shown above, are in very extensive use today in practical laboratory and vocational radio training schools. For audio demon-

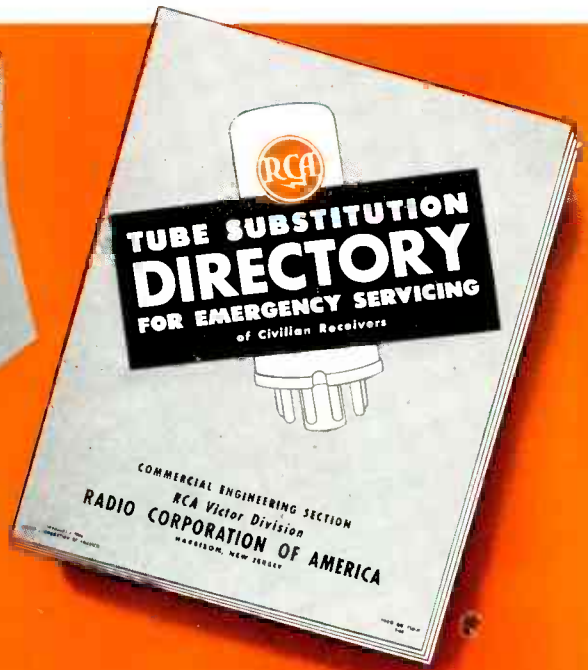
strations—for service adjustments—for signal tracing technique—for all manner of measuring, checking, testing, analyzing. (NOTE: Currently, deliveries can be made from stock, subject to prior sale, on a priority of A-1-a or higher.) Please address inquiries to Test and Measuring Equipment Section, RADIO CORPORATION OF AMERICA, Camden, New Jersey.

RCA Test and Measuring Equipment

RADIO CORPORATION OF AMERICA

NEW RCA TUBE GUIDE HELPS YOU SERVICE RADIOS FASTER

16-page Directory lists 304 RCA Receiving Tubes with over 2000 suggested substitutions



HOT off the press! The most complete Tube Substitution List ever issued by any tube manufacturer! Another great scoop for RCA Service Men and Dealers! Another timely RCA contribution — to help you use available tubes in place of hard-to-get types when you service civilian radio receivers.

With radio Service Men and Dealers, time means money. By showing you how to service radio sets in less time, RCA's new TUBE SUBSTITUTION DIRECTORY puts real, extra dollars in your pocket *today!*

Here's what's in your Directory:

A listing, in numerical-alphabetical order, of all 304 RCA Receiving Tube types — *and in most cases one or more substitution types which can be used as replacements.* Notations (with clear, detailed explanations) of the space limitations and the wiring, filament- or heater-circuit, and socket

changes involved in making the substitutions. Sample calculations of series and shunt resistors in heater strings. Suggested substitutions are cross-indexed and keyed to cathode voltages and functional groupings tabulated in the "Classified Chart of Receiving Tubes" which is also included.

Don't fail to get this valuable new RCA Directory at once. Ask your RCA Distributor for a copy today, or fill out coupon below and mail it, with your name and address and 10¢ to cover costs, to RCA, Commercial Engineering Section, 597 South 5th St., Harrison, N. J.

Where else but to RCA can you look for practical, dollars-in-the-pocket support like this?

**BUY MORE
WAR BONDS**



RADIO CORPORATION OF AMERICA

RCA, Commercial Engineering Section,
597 South 5th St., Harrison, N. J.

Enclosed is 10¢ for TUBE SUBSTITUTION DIRECTORY FOR EMERGENCY SERVICING OF CIVILIAN RADIO RECEIVERS. Please mail my coupon at once to:

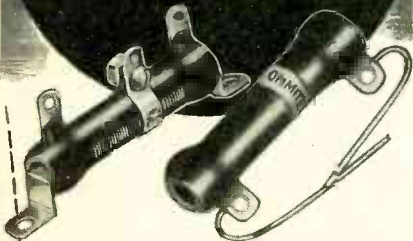
Name.....

Address.....

Radio & Electrical Appliance Service-Dealer

for Permanent
Resistance
Today and
Tomorrow...

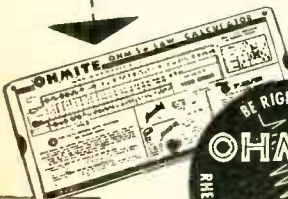
OHMITE Resistors



Consistent performance day-after-day under a wide range of operating conditions has proved the dependability of Ohmite Resistors. This rugged quality has enabled Ohmite Brown Devils and Dividohms to keep existing installations going longer. It has also made them especially well fit for today's wartime applications... and tomorrow's peacetime needs.

Handy Ohm's Law Calculator

Figures ohms, watts, volts, amperes—quickly, accurately. Solves any Ohm's Law problem with one setting of the slide. Send only 10c in coin for handling and mailing. (Also available in quantities.)



10c



OHMITE MANUFACTURING CO.
4845 Flournoy St. • Chicago 44, U. S. A.

April, 1944

DISCUSSION

Odds 'n Ends by KAK

From RCA-Victor: Charlie Spivak and his missus received a second little musician... Dinah Shore is claimed to be the most popular female vocalist on radio. Anyone disagree? ... Ask T. Dorsey which will be the two *Champion Teams* in the *Baseball Leagues* next summer. One will get you two he'll be right. He was in 1943! ... February 12th was the 20th anniversary of the *Birth of the Blues*... Toscanini has made an anti-Fascist film for *Uncle Sam*... Vaughn Monroe disbanded his orch. because of the usual "Greetings" notice. Got deferred because of medical reasons. Managed to hustle up 13 of his original 16 boys again... Since



Irene Daye, popular recording star of Columbia. (Down Beat Photograph)

the enlisted personnel get all the breaks with the stars, who takes care of the officers, our sec'y wants to know... Grace Moore may go to Naples to organize an operatic company... Spike Jones dishes out the corn to the boys overseas by means of the short-wave and "Command Performance". He has introduced a new song with an old army title, called "SNAFU." (liberally translated it means, "Situation Normal All Fouled Up".) When will he make one called "FUBAR"? (Translation: Fouled Up Beyond All Recognition!)... Have you heard the *Flit Gun Music*. Honestly, it's on a record called "Glow Worm"... Latest valediction: 4-F'er yours... According to DNB from *Hitler's Swillery*, that swine hated *Fats Waller*. Probably because the well-loved *Fats* wrote "Honey-
(Continued on page 26)



Customers—not in ones or twos, but in hundreds. If not in person, then they're represented by letter or telephone. And they're in early every day... before breakfast, so it seems... with requests for urgent radio and electronic components and equipment. Some are needed for the Armed Forces... others for industry and dealers... still others for laboratory projects, and schools. We're doing our best to fill orders and speed deliveries. We're doing our best to help you cut through red tape and solve vexing technical problems. And our best, as you must know, is just about the best there is.

For Non-Critical Consumer Applications

Lafayette Radio Corp. carries a supply of all standard radio replacement parts in addition to a wide variety of useful parts and equipment!

FREE! THE BOOK OF THE YEAR!
Catalog of Radio Components
and Equipment



Lafayette Radio Corp.'s latest contribution to wartime America. A catalog that should be in the hands of all war agencies. Send for your FREE copy. MAIL COUPON TODAY!

LAFAYETTE RADIO CORP. Dept. K-4
 901 W. JACKSON BLVD., CHICAGO 7, ILL.
 Please send me a FREE copy of the new Lafayette Radio Corporation Catalog No. 94.
 NAME
 ADDRESS
 CITY STATE

Lafayette Radio Corp.

901 W. Jackson Blvd. 265 Peachtree Street
CHICAGO 7, ILLINOIS ATLANTA 3, GEORGIA



Still your best bet for replacements

***Old Man Centralab**
 "Old Man" is right ... for he is a real "old timer". There is no substitute for experience, and the "Old Man" now, as in the past twenty-two years, is still your best bet.

Centralab
VOLUME CONTROLS



Centralab
 Division of GLOBE-UNION INC., Milwaukee

Letters to the Editor

WOMEN'S COLUMN?

Editor:
 ... I lost Mr. Freeland over a year ago. Like many women in these War Days I took over the radio shop. Last year in spite of war conditions I serviced over 700 radios. I'm sure other women did the same thing or better. Besides my shop work I am also teacher of Radio Service under our Missouri Adult Vocation & Industry Program. Why can't we have a Women's Column? I'm sure other women technicians have received as much help as I have from RSD and would love to have a column of our own.

Mrs. Mary A. Freeland, Missouri.

If the gals can get enough material together of general interest to them and also slightly to the men, we'll give them their column. Write us if interested, and send in the material which we will pay for at our usual rates.

GRIPES AGAINST THE "BIG COMPANY!"

Editor:
 Have just read *George Vouzouner's* letter in regard to tubes. First, I want to say that I am sure my supplier is playing square with me; but I still don't get any tubes to speak of; just about as many as *Mr. Vouzouner* says he's getting. Since I have so much to do, I don't get around shopping very much, but hear of only a small amount of above-ceiling-priced tubes being sold. But what gripes me is that *Big Company** is furnishing or selling tubes (not in quantity) that I haven't been able to buy for the last year and a half. It doesn't sound very good to me when a customer says, "Oh, well I'll get it from *Big Company*" when I haven't got the tube he needs. And what's more they do it, too. I know as I have bought some there myself! Let's have more on the tube situation!

E. H. Engel
 Missouri

* Real name of the company withheld for obvious reasons.

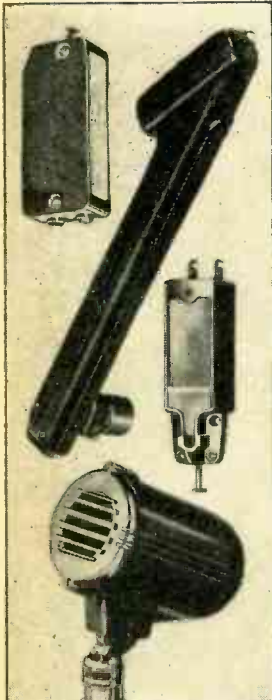
This is but one of many letters which we have been receiving about this particular company. We will ask them to state their side and if they will, we will report it here. Frankly, we believe that the reason why *Big Company* can get tubes, is that they have always had a tremendous sale in this item, and have bought direct from the manufacturer. Since the manufacturer is anxious to keep his former customers happy, so that he will have a good market for Post-war, *Big Company* is favored, and thus legitimately gets these otherwise hard-to-get tubes.

RIGHT AS TWO RABBITS!

Editor:
 ... I sincerely believe if the *Radio Technician* would take more pride with his shop, it would give him more prestige,
 (Continued on page 26)

There Are Two Sides

TO EVERY STORY



On the one side, Astatic continues to manufacture Microphones, Pickups, Cartridges and Recording Heads for various branches of the military service and accredited industrial or public address uses.

On the other side, Astatic is using its extensive facilities to manufacture Co-axial Cable Connectors for wartime radio communications and radar equipment.



ASTATIC

IN CANADA:
 CANADIAN ASTATIC, LTD.
 TORONTO, ONTARIO

THE ASTATIC CORPORATION
 YOUNGSTOWN, OHIO

SPRAGUE TRADING POST



A FREE Buy-Exchange-Sell Service for Radio Men

Important Notice!

We discourage offers to buy or sell anything beyond the O.P.A. ceiling prices, and will not knowingly accept such ads for the Sprague Trading Post.

WANTED — Hallicrafter Sky-Traveler. State cond. & lowest price. W. J. Hampton, Station WAKC, Monmouth County Police Radio, Court House, Freehold, N. J.

SWAP OR SELL—Tubes: 2-71A; 1-6A7; 2-6G6. Want 8"-10" dynamic speaker, a 25Z5, a 50L6, or what have you? Phillip Landis, P. O. Box 1296, Jacksonville 1, Fla.

FOR SALE—Cathode ray tube #902, used about 25 hrs., like new. \$8 cash. Christian Vinson, Jr., 1954 Weirfield St., Ridgewood 27, New York.

Wanted—0-1 ma. meter in new or used condition. J. M. Kinkel, YMCA, Box 511, Fort Wayne, Ind.

Wanted—Small Zenith portable (camera type) radio; also 117L7 and 1Q5GT tubes. Paul Ewanosky, 184 Zerby Ave., Edwarsville, Pa.

SWAP OR SELL—J-M-P tube tester chassis in new cond. but needs modernized for high-voltage tubes; double button carbon mike; home-built condenser mike with built-in 2-stage pre-amplifier. Want Silver VI or comm. receiver such as SX-17 or SX-25. Forrest Burnham, Richvale, Calif.

Wanted—33-1/3-78 r.p.m. turntable and motor—one that will handle 12" and 18" records for recording without "wowing". Cpl. F. J. Lewis, 545th Army Band, A.A.B., Alamogordo, N. Mex.

URGENTLY NEEDED — Hallicrafter S-2011 or similar receiver. Leonard Sugarman, Valley Forge Rd., Phoenixville, Pa.

FOR SALE OR TRADE—5AP4 5" CR television tube, unused, in orig. carton, also latest Philco sig. generator. Want all types of lab. instruments and high-grade test equipment in any condition. Charles C. Littel, Jr., 308 W. High St., Piqua, Ohio.

WANTED—Television receiver or oscilloscope and FM converter. A. W. Porterfield, Jr., 41 Winnebago Rd., Tuckahoe 7, N. Y.

WANTED—Morse sending key in good condition, for overseas use. J. L. Pasqua, MM 2/C, 140 N.C.B. Co. B., PN.4, Camp Parks, Calif.

FOR SALE—Miller FM tuner, 42-50 mc., 10 tubes, built-in V.R. power supply, \$72.50. Will trade slide auto. record changer for a drop auto. ditto. L. R. Ware, Jamison, Bucks County, Pa.

WANTED FOR CASH—Good sig. generator, tube tester, and condenser tester. Geo. Pidherny, 3415 - 31st Ave., Astoria, N. Y.

WANTED—Hallicrafter Sky-Traveler receiver or similar in range 542 kc. to 35 kc. Sgt. Arthur Wilner, A. Btry., 584th A.A.A. A.W. Bn., Fort Fisher, N. C.

WANTED FOR CASH—Late tube tester, sig. generator and/or multi-tester. Single or combination eqpt. desirable. Albert J. Stein, 73 Grand St., Reading, Mass.

URGENTLY NEEDED—V.O.M. and condenser tester, any good make. Cash. J. B. Davis, Jr., c/o D. K. & S. RR., Searcy, Ark.

WANTED—Late model sig. generator, a-c operated only. Paul B. Tomkins, 1801 N.E. 62nd Ave., Portland 13, Oregon.

117L7GT TUBES FOR SALE—New, in unbroken boxes. Doc. Cook, 233 So. Sandusky St., Columbus, Ohio.

WANTED—Record changer in good cond., also Amer. Beauty soldering iron 3/8" elec. hand drill 1/4". Cash. Capt. H. H. Honeywell, Hotel Antlers, Colorado Springs, Colo.

WANTED—S-W broadcast receiver (small) such as Hallicrafter S-29 or Echophone 1 for service man in South Pacific. Kline's, 310 S. Michigan Ave., Chicago 4, Ill.

FOR SALE—Dry & wet electrolytic condensers from 4 to 25 amps. also following tubes: 50C6G—3Z3—3Z4—3Z5—25Z5—25Z6—25L6—25B6G—14A7/12B7—14B6—14C7—12A5—12SQ7—12SF5—12F5—12Q7G—12A7—12A8—11Z76—7A8—6A8—6SQ7—6SK7—6SA7—26—45—etc. Not less than 6 tubes sold. J. S. Goral, Latrobe, Pa.

WANTED—#432A Readrite tube tester or Triplet #1213. G. L. Crosbie, Box 38, Bangor, N. Y.

WANTED—Late model tube tester. J. B. Vargo, 43 Norwood, Barberton, O.

RCA PARTS FOR SALE—Over 5000 hard-to-get numbers. What do you need? F. C. Hendrick, Cross-town Radio Ser., 1381 Irving St. N.W., Washington, D. C.

WANTED—Recording unit with playback, less amplifier, speaker, mike, etc. Also 0-1 milliammeters. C. H. McLain, 431 London St., Portsmouth, Va.

EQPT. REPAIRED—Sig. generators, test eqpt., meters, etc. modernized and repaired. Harry Wagner Radio, Watervliet, Mich.

WANTED—Silent moving-pix projector, 500 watts or more for larger-size pictures. Similar to Universal P500. H. Brown, 520 Pen Argyl St., Pen Argyl, Pa.

FOR SALE—40-watt P.A. system, 9 tubes, with 12" P-M speaker & velocity mike. No junk—high-grade manufacture, valued at \$100. Will sell or trade for test eqpt., comm. receivers, or what have you? A. H. Mekeel, Nine Marple Rd., Poughkeepsie, N. Y.

WILL TRADE—Good set of drawing instruments worth \$40 for multi-meter, tube tester, or combination. Julian Garcia, Box 107, Mosquero, N. M.

WANTED—Power amplifier, 8 or 10 watts, also a set analyzer. Hans Tjaden, Breda, Iowa.

WANTED—Radio-phonograph combination console cabinet and auto. record changer for same; also Supreme 1250, 1240, or 1280 or similar test instruments. Spot cash. Lakeview Radio & Elec., 5915 Catina St., New Orleans, La.

WANTED—Hallicrafter SX-25, SX-24, or S-20R. Urgently needed by navy men. K. L. Miller, Radioman 3C, U. S. Naval Aux. Air Station, Los Alamitos, Calif.

FOR CASH SALE—Howard 450A comm. receiver with matching P-M speaker 13 tubes, 550 kc. to 68 mc. Has crystal filter, B.F.O., Signal "R" meter, etc. A-1 condition. L. E. Carlini, 246 Wolcott Hill Rd., Wethersfield, Ct.

TELEVISION PARTS TO TRADE for RCA Voltohmyst, Jr., Sr., or any good V-T-V-M. Have 5" and 7" cathode ray tubes and most essential Meissner television parts. Forrest E. Rice, 700 DeGraw Ave., Newark 4, N. J.

FOR SALE—Several kits for making up crystal mikes & phono pickups. Sell for \$5 ea. or will trade for test eqpt. Lenox Antony, 3928 Dumaine St., New Orleans, La.

WANTED—Any late radio eqpt. and Rider's manuals. Marvin L. Nielsen, 119-7th St. S.E., Spencer, Iowa.

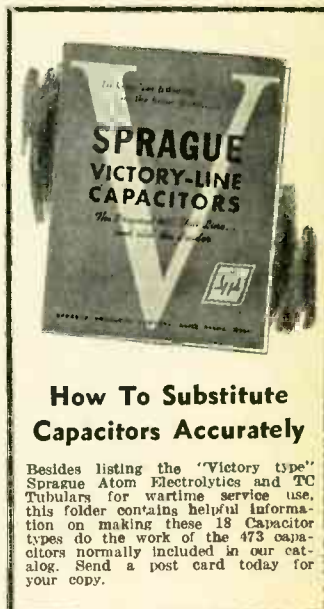
FOR SALE—Over 50 radio chassis, a-c, auto, bat., 32-volt, with gang condensers, coils, i-f trans. etc. still mounted, \$2.50 ea. Also forty 2-volt 8-prong tubes all types, 3 M74, one M54 micro-tubes; many hearing-aid parts, six 32-volt vibrators, and transformers. Write Ed. Larason, Box 46, Martinsburg, Ohio.

METERS FOR SALE—2—Readrite d-c voltmeters 0-500V; 3—d-c panel type Sterling voltmeters 0-7 1/2 and 0-150V; 3 panel Sterling voltmeters 0-6 d-c; one Sterling pocket ammeter 0-35 amps; one Sterling pocket voltmeter 0-50V, 0-35A; 2 Readrite voltmeter, ammeter, voltmeter 0-100-0-8; 1 Jewell voltmeter 0-7 1/2-0-150, also a few used meters. R. W. Seifert, Utica, Minn.

WANTED—RCA junior voltmeter, R. L. Elfinan, 3013 N. Broad St., Philadelphia, Pa.

WANTED—Set analyzer, also some 35Z5 tubes. Jas. Tedrick, 1849 Suman Ave., Dayton 3, Ohio.

FOR SALE—Crystal for 3550.5 kc. (80 meter) xmmitter. Brand new, mtd. in Biley holder. \$5.75 complete. Leon Medler, 2109 Daly Ave., Bronx, New York, N. Y.



How To Substitute Capacitors Accurately

Besides listing the "Victory type" Sprague Atom Electrolytics and TC Tubulars for wartime service use, this folder contains helpful information on making these 18 Capacitor types do the work of the 473 capacitors normally included in our catalog. Send a post card today for your copy.

WANTED—Phileo dynamic tester #0-20 or schematic for same. Kramolks Radio Clinic, 5641 Sears St., Dallas 6, Texas.

WANTED—#1280 or later Superior set tester and data sheets. All-in-One Repair Service, 1022 1/2 So. Bonnie Brae, Los Angeles 6, Calif.

WANTED—New or used A-1, 913 cathode ray tube, J. W. Shandle, Lake Shore Blvd., Mentor, O.

WANTED—All-wave sig. generator and output meter. Cash. Paul Herman, 118 Fabyan Pl., Newark, N. J.

FOR SALE OR TRADE—1943 sig. generator like new, 100 kil. to 30 meg. \$45, or will trade for tube checker or V-O-M. G.&G. Radio, 11643 Linwood Ave., Detroit 6, Mich.

WANTED—Used Hallicrafter Sky Traveler S-29. Pvt. Wm. O. Grieve, 39855621. Hq. Co. 66 Signal Bn., APO 402, c/o Postmaster, Nashville, Tenn.

WANTED—25A7G tube, also 35Z3, 35A5, 12A8G, 12Q7G, etc. B. E. Elec. & Radio Shop, Blue Earth, Minn.

YOUR OWN AD RUN FREE!

This is Sprague's special wartime advertising service to help radio men get needed parts and equipment, or dispose of radio materials they do not need. Send your ad today. Write PLAINLY—hold it to 40 words or less. Due to the large number received, ads may be delayed a month or two, but will be published as rapidly as possible. We'll do everything we can to help you—and the fact that thousands of pieces of Radio-Electronic equipment are in operation today as a result of sales or "swaps" made through The Trading

Post offer convincing proof of the far-reaching effectiveness of this service.

Different Trading Post ads appear monthly in Radio Retailing-Today, Radio Service-Dealer, Service, Radio News, and Radio Craft. Sprague reserves the right to reject ads which do not fit in with the spirit of this service.

When buying Capacitors — please ask for Spragues by name. We'll appreciate it!

HARRY KALKER
Sales Manager

SPRAGUE PRODUCTS CO., RSD-44 North Adams, Mass.

SPRAGUE CONDENSERS KOOLOHM RESISTORS



Obviously, Sprague cannot assume any responsibility, or guarantee goods, services, etc., which might be exchanged through the above advertisements

Industrial Sound Installations To Boom!

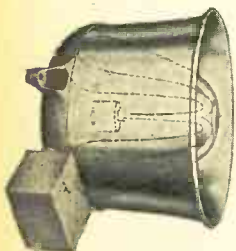


Public address sound equipment for industrial plants engaged in war work contribute to speeding up production. Music relieves fatigue and stimulates workers. Paging systems quickly locate personnel and reduce use of jammed telephone lines. So, WPB will now accept applications for industrial sound installations when submitted on WPB Form 617.

Most of the best industrial p.a. installations in use are RACON speaker equipped. They are the finest speakers

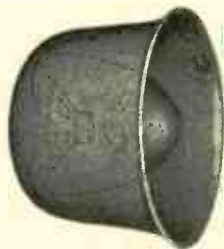
made and there is a type for every conceivable application. Our catalog is available without charge.

For Marine p.a. installations, too, RACON leads. Approved by the U. S. Coast Guard, RACON speakers are used aboard Army and Navy vessels. Only RACON can supply, when needed, patented Weatherproof, Stormproof Acoustic Material which is impervious to any weather condition and prevents resonant effects.



**MARINE
HORN SPEAKERS**

The MARINE HORN SPEAKER may be used as a loud-speaker or microphone, comes in several sizes; is approved by the Bur. of Marine Inspection, Dept. of Commerce. MARINE CONE SPEAKERS are the re-entrant type, suitable for indoor or outdoor use. Storm-proofed for all weather conditions. Sizes for 2, 3, 5, 8 and 12 inch speakers.



**MARINE
CONE SPEAKERS**



**RACON P. M.
HORN UNITS**

RE-ENTRANT TRUMPETS are compact, of the double re-entrant type which in a small space affords a long air column enabling them to deliver highly concentrated sound, of great clarity, over extremely long distances. Available in 6', 4½', 3½' and 3' air column sizes. RACON P-M HORN UNITS are available in operating capacities of 5 to 50 watts.



**RE-ENTRANT
TRUMPETS**

RACON ELECTRIC CO. 52 EAST 19th ST. NEW YORK, N. Y.

WPB Obtains Consent Order Against Chicago Novelty Co., Inc.

On March 18th, 1944, the Federal Register reported in part:

"The Chicago Novelty Company, Inc., is engaged in the mail-order business at 1314 Newport Avenue, Chicago, Illinois. Among other things it sells tubes. . . . During August and September of 1943, it sold considerable quantities of radio tubes, and in about half of these cases the sales were not to fill preferred orders, nor orders bearing a preference rating, neither did it receive suppliers' certificates or worn out tubes. The sales were therefore in violation of General Limitation Order L-265. The Chicago Novelty Company, Inc., admits these violations. . . . It does not elect to interpose any defense to the violations. It has consented to this order.

" WHEREFORE, upon agreement and consent of Chicago Novelty Company, Inc., the Regional Compliance Chief. . . . It is hereby ordered, That,

" (a) Chicago Novelty Company, Inc., its successors and assigns, shall not sell, assign, transfer, or deliver, during any calendar month, more than one-sixth the electronic tubes sold by it during the entire fourth calendar quarter of 1943. . . ."

Ellmore Named V.P. for Utah Radio

Today Fred R. Tuerk, President of *Utah Radio Products Company*, announced that W. A. Ellmore, Vice President in Charge of Engineering, assumes the additional duties of heading the Sales Department due to the resignation of Oden F. Jester.



W. A. Ellmore

Well known in the radio industry, Ellmore has been with the *Utah Radio Products Company* for fifteen years.

Mr. Tuerk also announced that Chester L. Walker, formerly Chief Engineer, has been promoted to Sales Manager in Charge of Manufacturing and Equipment Division, and that Marion S. Danisch will become Chief Engineer. Danisch is well known in radio engineering circles, and has been identified with the industry for sixteen years.

Gordon S. Carbonneau, who has been Production Engineer of the *Utah Radio Products Company* for many years, has been appointed to new duties as Engineer in Charge of the Quality Control Division.

O. F. Jester Goes to Meissner

Resigning his position with *Utah Radio Products Co.*, Oden F. Jester has assumed the title of Vice President of Meissner

In & Around the Trade

Being a condensed digest of some of the happenings in
and around the radio trade as compiled by the Editors

Manufacturing Company, Mt. Carmel, Illinois. Mr. Jester is a well-known radio



Oden F. Jester

manufacturing personality and brings to Meissner a wealth of experience in the field.

China Rebroadcasts

James L. Fly, chairman of the FCC, said today that China has begun the long-wave rebroadcast of short-wave American radio broadcasts to Chungking by the Overseas Branch of the Office of War Information in San Francisco.

Mr. Fly's statement follows:

"China's most powerful long-wave station, XGOA in Chungking, is now regularly rebroadcasting short-wave programs originating in San Francisco. Chungking reports that these rebroadcasts of American programs are as clear as local programs originating in Chungking.

"China has even made a start at bringing foreign radio programs to the lowest income groups—to the man in the street who could not dream of owning a 'receive-listen machine.' For example, San Francisco is now broadcasting a daily half-hour program especially for Kweilin, one of the great cities of southeast China. This program is rebroadcast by means of a public-address system whose amplifiers are placed at strategic locations throughout the city's streets and parks.

"These developments presage a growing two-way exchange of ideas between the people of America and the people of China—a direct popular intercourse that will lay the foundation for a deep-rooted understanding and friendship in years to come," said Mr. Fly.

Hilliard Named General Manager of Bendix

The appointment of W. P. Hilliard as

general manager of the Radio Division of Bendix Aviation Corporation, at Baltimore, Md. and Red Bank, N. J., was announced here today by Ernest R. Breech, president of the corporation.

Mr. Hilliard, who has been director of sales and engineering of the Radio Division since its inception in 1936, succeeds Hugh Benet who will assume for the corporation other responsibilities of a special assignment nature.

Sylvania Locates New Manufacturing Unit

Sylvania Electric Products, Inc., has established an additional manufacturing unit at Dover, N. H., occupying about 250,000 square feet of space in two mills formerly owned by the Pacific Mills and now owned by the City of Dover, it is announced by Edward Ellingwood, Industrial Agent of the New Hampshire State Planning and Development Commission.

The concern, which manufactures incandescent lamps, fluorescent lamps, fixtures and accessories, radio tubes, and electronic devices, also operates factories at Salem, Danvers and Ipswich, Massachusetts, St. Mary's Emporium, Williamsport, Mill Hall, Towanda, Altoona, and Warren, Pennsylvania.

Payroll Calculations Made Easier

Overtime, as well as straight time payroll calculations, can be figured in a jiffy with a new and improved model payroll calculator now being manufactured by the Berger-Brickner Company of Los Angeles, Cal.

Forty hours plus overtime are calculated in one operation on one side of the device for firms that require total pay check only. The reverse side is used for figuring straight time and overtime as separate items.

All hourly rates of pay from \$.40 to \$1.74 with a half cent spread between rates; and time periods up to 80 hours with divisions of tenths and quarters of an hour are covered.



Donna King, of the King Sisters, an RCA-Victor star. (Down Beat Photo.)

Famous Signatures

Michelangelo Rembrandt

Morganstouff

Whistler

Leonardo da Vinci

Rubens

Vincent Van Gogh

A. VANDYCK

Raphael

P. Cezanne



Jensen

Manufacturers and Designers of Fine Acoustic Equipment

A Square-Wave Generator For \$10.00

by oscar e. carlson

For the testing of audio and video amplifiers, nothing surpasses a good square-wave generator. The author describes how to build an excellent unit for about \$10.00

MUCH material has been published in recent months concerning the testing of audio and video amplifiers with square wave generators. With the growing interest in such methods and equipment for such testing, it can be expected that many servicemen and technicians will be interested in information on the construction and use of a small, inexpensive square wave generator. The unit is complete in itself and requires no outside sine wave source of signal excitation; it may be built for approximately \$10 and will prove satisfactory for testing audio amplifier response as well as the low frequency response of video amplifiers.

The schematic for the unit found in Figure 1 contains all the necessary component part values. A 6SN7GT tube is used in a conventional multi-vibrator circuit and the output of the multi-vibrator is fed into one grid of the 6SN7GT amplifier-clipper. This tube is used as a "buffer" amplifier and operated so as to prevent loading of the multi-vibrator and also to act as a clipper and further shape the square wave. The diode arrangement prevents the amplifier grid from going positive.

The power supply is of the regulated type to insure frequency stability but this feature may be omitted at the will of the individual constructor.

The schematic and drawings are self explanatory for construction and the mechanical detail may be modified to suit the chassis space of the constructor. 6F8G tubes may be used in place of the 6SN7GT's if this is more convenient.

The multi-vibrator is simply a two stage resistance capacitance coupled amplifier with the output coupled back to the input in phase. This is

then a relaxation oscillator which may be used to develop square waves at the plates of the tubes. The fundamental frequency of the multi-vibrator is a function of the tube gain, plate load resistance, plate supply voltage, and the time constants selected for the grid circuits.

With any given tube, supply voltage, and plate load resistance, the frequency of a symmetrical multi-vibrator is:

$$\text{Frequency} = \frac{1}{\log \epsilon \mu_{co} K (2RC)} \quad (1)$$

where Frequency is 1/T, or the recurrence rate

μ_{co} is equal to $E_b/E_{g_{co}}$
 K is equal to $1 - E_{p_{min}}/E_{p_{max}}$
 RC is the grid resistance times the grid coupling capacity. μ_{co} is usually equal to from 50% to 75% of the dynamic μ of the tube.

This has been simplified for a 6SN7G7 using 20,000-ohm plate load resistors and a 150-volt plate supply voltage to:

$$F \text{ in c.p.s.} = \frac{250,000}{RC} \quad (2)$$

A 6F8G may be used in place of a 6SN7GT and the same formula will hold.

Some of the other tubes that may

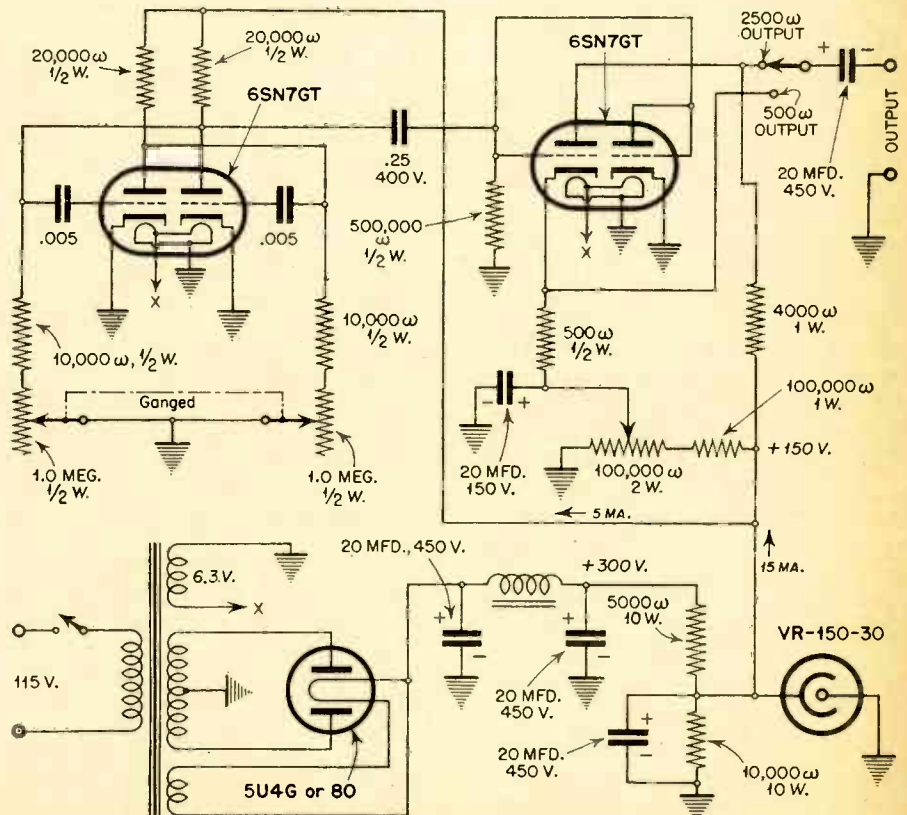
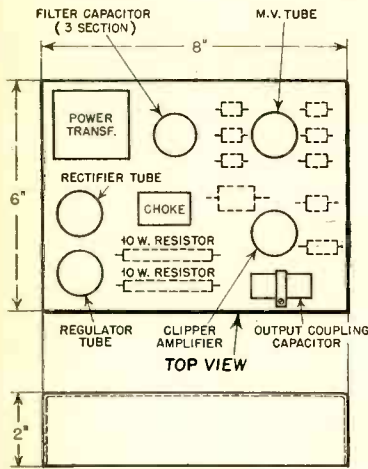


Figure 1. The circuit diagram of a simplified square-wave generator



CHASSIS LAYOUT
DOTTED LINES INDICATE UNDER-CHASSIS MOUNTINGS

Figure 2. The construction of the square-wave generator is shown in outline. Where an 8" x 9" chassis cannot be obtained, one an inch smaller in either dimension will do very well. Note that the components for each tube are clustered around that unit with short leads

be used instead of the 6SN7GT or 6F8G are the 6SC7 and the 7F7, or a pair of 6J5 tubes may be used in place of the dual triodes. The 6SC7 and 7F7 should be used with 50,000-ohm plate load resistors and the frequency will be:

$$F \text{ in c.p.s.} = \frac{166,000}{RC} \quad (3)$$

For the 6SN7GT, 6J5's, or 6F8G tubes the values in Figure 1 will provide a square wave output having a recurrence rate variable from 50 c.p.s. to 2000 c.p.s. by varying the ganged potentiometers in the grid circuits of the multi-vibrator.

For those technicians who are willing to sacrifice versatility for convenience, two test frequencies of 100 c.p.s. and 1000 c.p.s. may be obtained very simply as shown in Figure 3. Recommended is the use of fixed grid resistors of 500,000 ohms. They should be carbon resistors of the one half watt type. The coupling capacitors for 1000 cycles should be .0005 mfd and for 100 c.p.s. .005

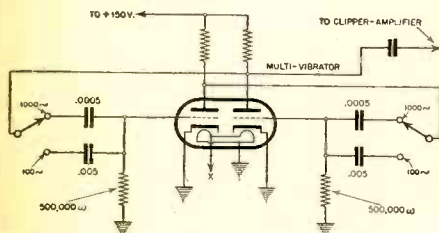
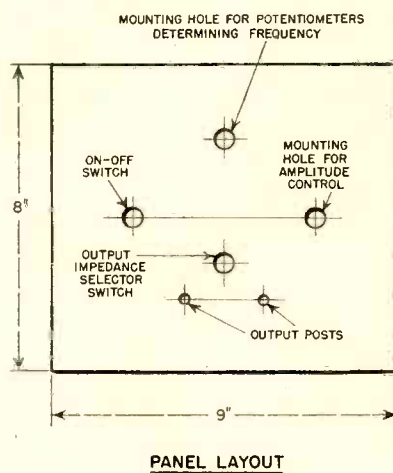


Figure 3. A simplified arrangement of not too complicated two-frequency multi-vibrator type square-wave generator employing a dual triode tube



PANEL LAYOUT



Figure 4. Various square-wave forms. "A" is perfect square-wave. "B" and "C" show low-frequency phase shift; "B" is poor low-frequency response, and "C" is high response at low-frequency. "D" shows extreme low-frequency attenuation, while "E" pictures a high frequency attenuation

mfd. This may be arranged for by the use of a simple switching arrangement to select either of the two desired frequencies. Other spot recurrence rates may be arranged for by capacitor and/or resistor switching, all of which is readily computed from the above frequency determining data. The frequencies achieved will, of course, depend on part tolerances and tube variations. An accuracy of 10% is usually encountered, however.

The output impedance may be chosen as either 500 ohms or a nominal 2500 ohms. At the 500-ohm output impedance the output voltage may be varied from 0 to 6 volts peak and at 2500 ohms the output may be varied from 0 to 30 volts peak. The output voltage for both impedance outputs is adjustable by the potentiometer which controls the bias for the amplifier-clipper tube, 6SN7GT. A switch is used to switch from 500-ohm to 2500-ohm output impedance.

One of the major disadvantages of many commercial square wave generators has been the lack of square wave output amplitude control. It has been overcome in this unit by the use of a double bias arrangement for the 6SN7GT amplifier-clipper. At maximum output, the cathode resistor supplies the sole bias for this tube. At other output levels the bias is varied by applying a portion of the 150-volt plate supply voltage unto the cathode of the amplifier. The 20 mfd 150-volt capacitor establishes signal ground at the end of the 500-ohm cathode resistor so that varia-

tions of output voltage do not affect the output impedance. The 2500-ohm output impedance will vary slightly with output. It will never exceed 4000 ohms nor will it be much below the 2500-ohm nominal value.

In amplifier testing with the square wave generator there are some fundamental facts to remember. The output of the generator will appear as in "A" of Figure 4. Low frequency attenuation and phase shift will appear as in "B" and "C." "B" representing poor response and a leading phase shift. "C" will represent better low frequency amplitude response than high frequency response and a lagging low frequency phase shift. If the low frequency attenuation as shown at "B" becomes very bad the pattern seen on the scope will eventually appear as in "D." High frequency attenuation will produce slowly rising waves approaching sine wave shape as shown in 4E.

Low frequency attenuation in an amplifier is due usually to series capacity reactance, and/or shunt inductive reactance. The loss of high frequency components is due to series inductive reactance, and/or shunt capacity reactance.

Oscilloscopic observation of the amplifier output with square wave input will then indicate the amplifier response from the square wave fundamental frequency to approximately the 21st harmonic of that frequency. Thus the use of 100-c.p.s. and 1000-c.p.s. square wave will check an amplifier adequately from 100 c.p.s. to approximately 20 kilocycles. However, a fair semblance of a 1000-c.p.s. square wave may be obtained from an amplifier having a response flat to about 6 kilocycles.

The testing of the high frequency portion of the amplifier response is easier of proper interpretation than the low frequency end. The high frequency response of the amplifier is indicative of the time of rise from zero value to maximum value for each half cycle of the square wave.

RISE TIME IN % HALF-CYCLE	HIGHEST HAR- MONIC ORDER REPRODUCED
50%	1 st
30%	3 rd
22%	5 th
18%	7 th
14%	9 th
10%	11 th
6%	13 th
5%	15 th
3.5%	17 th
3.2%	19 th
3.0%	21 st

Figure 5. Chart of the rise of time in percentage of half-cycle time to a highest harmonic order reproduced

Figure 5 gives an approximation of this rise and decay time for various highest orders of harmonics of the fundamental square wave frequency reproduced by the amplifier.

Low frequency checking by the square wave method offers one striking difference from high frequency checking. In testing the high frequency response, the amplitude frequency response is flat for the fundamental square wave frequency and for a good range of lower frequencies. In checking the low frequency response the square wave fundamental may oftentimes be on the rising portion of the amplitude vs. frequency response curve. This results in phase shift for that fundamental frequency. Figure 4 and data therein covers much of the detail con-

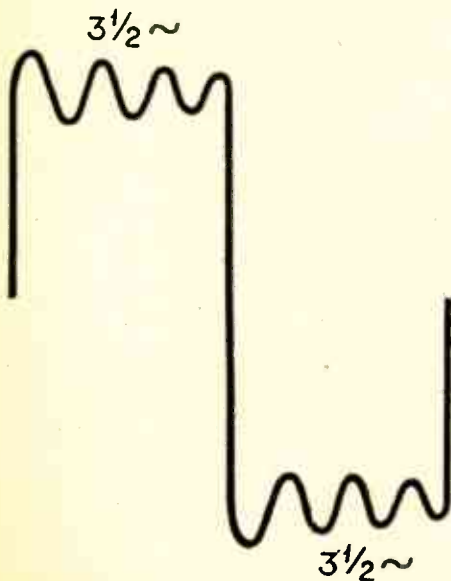


Figure 6. Oscilloscope tracing of an oscillation superimposed on a square wave. If this were a 500 cps square wave, the resonant frequency of the transformer would be 500 x 7 or 3,500 cps. Note the 3 1/2 cycles showing

cerning oscillograms for low frequency response. It may be easily remembered that when the amplitude response is low, the flat portion of the square wave will slope toward the square wave axis. If the low frequency response is better than the higher frequency response, the flat portion of the square wave will slope away from the axis of the wave.

Besides indicating the frequency response of audio amplifiers, the square wave generator will also readily show any resonance condition in audio transformers. This condition of resonance will result in an oscillation superimposed on the square wave as shown in Figure 6. The number of cycles of that oscillation superimposed on the square wave multiplied by the fundamental frequency of the square wave gives the resonant frequency of the transformer winding in question.

It is to be emphasized at this point that for best results with square wave testing of amplifiers, the scope should whenever possible be operated with the "Amplifier" off. That is, the input to the scope should be direct to the vertical deflection plates through a suitable blocking capacitor or that which is built into most oscilloscopes. This gives the best frequency response characteristic from the oscilloscope. The output of the square wave generator should also be studied on the oscilloscope and the distortion to the square wave pattern, usually very slight, offered by the scope must be taken into consideration when testing other amplifiers. The deflection sensitivity oscilloscopes is approximately 20 volts r.m.s. per inch of vertical deflection. Therefore a 60-volt peak value square wave will give a one-inch deflection. In most amplifier stages no trouble will be experienced in obtaining a deflection large enough to be readily interpreted without the use of the oscilloscope vertical amplifier.

A brief bibliography is attached herewith for those readers who desire to pursue the subject further:

Network Testing With Square Waves—General Radio Experiment—December, 1939.

Transient Response of a Broadcast System—General Radio Experiment—April, 1940.

Square Wave Measurements—Electronic Industries—Jan., 1944.

Amplifier Testing By Means of Square Waves—Communications—Vol. 19, No. 2, p. 15.

Radio Club of America Elects Officers

The Radio Club of America, Inc., founded in 1909, announces its newly-elected officers for 1944, as follows:

President, F. L. Klingenschmitt, Amy, Aceves & King, Inc.; Vice President, O. James Morelock, Weston Electrical Instrument Corp.; Treasurer, J. J. Stantley, Continental Sales Company; Corresponding Secretary, M. B. Sleeper, FM Radio-Electronics Magazine; and Recording Secretary, J. H. Bose, Engineer connected with Major E. H. Armstrong at Columbia University.

New Kaar Capacitors

Prompt delivery on an extensive line of standard and special types of variable air condensers is now being offered by Kaar Engineering Company of Palo Alto, California.

Kaar condensers are suitable for many applications in radio transmitters and receivers, and are particularly useful as tank and antenna tuning capacitors in low and medium power transmitters.

They are made with small cross-sections in order that a number of them may be assembled in multi-channel radio equipment in a minimum amount of space.

Shafts can be furnished slotted for screwdriver adjustment. Tapered lock nuts and split bushings assure positive locking without disturbing the adjustment.

Standard types range from 12 to 140 mmfd. Special types are available with very wide air gaps, double rotors and stators, high maximum capacities, or special mounting brackets.

Philco Builds Telly Relay

According to advices from the FCC in Washington, Philco Radio & Television Corp. of Philadelphia has applied for a construction permit for a television relay station for the New York City area to operate in the frequency band of from 204 to 216 megacycles with a power of 15 watts.

In these war times, this can be seen as the fore-runner of a definite scramble for television relay station allocations. Those who will control these units, like the company which controls the land lines, will be able to have the better hold on the telly programs which will ultimately reach the consumer, John Q. Public.

WPB Eases Copper

The War Production Board's Conservation Division has just issued its eleventh "Material Substitutions and Supply List," which shows an easing of copper and steel. The report emphasizes, however, that "easing" applies rather to the raw materials than to facilities or manpower for fabricating them.

Tin continues to be short in supply, an exception to the general improvement in the supply of nonferrous materials. It is recommended that tin be used as little as possible in bronzes and plating.

As groups, chemicals and plastics are somewhat tighter than on the previous listings, while textiles and fibres remain about the same.

How to Install AN INDUSTRIAL SOUND SYSTEM

by a. b. cavendis

With the green light from Uncle Sam, Jobbers can now get a large share of the industrial sound market. By a new interpretation of "war plant" many sales are now possible

will come under the present classification of "war-plant." Thus, it might be said that the field is, to put it mildly, wide open.

Make a Survey

The first thing for the Jobber to do after contacting the prospect, is to obtain permission to make a survey of the plant. This permission is extremely important, and in many cases will involve the "clearing" of the Jobber by the *Military Intelligence*. Some areas have a clearance department available where the Jobber can go to get himself cleared, while others depend on the local resident inspectors at the plant or area to do the necessary investigating. There is nothing difficult about being "cleared." The background of the man in carefully investigated to make sure that he is not an enemy of our Country, and as quick as that he is "cleared." Rarely, if ever is he given anything to show for this clearance, but the records on file may be referred to at any time the jobber is questioned and a phone call or telegram will cause a verification to be issued to the plant permitting ready access to the premises.

What is of greater importance, is that in getting entry to the plant as little disturbance as possible to the

O.K. On P-A Sales Says WPB

Public address system sound equipment will be made available to a limited number of industrial plants engaged in essential war work, the WPB announced February 28th.

Industrial sound systems have a wider use than merely providing music as a stimulus to workers during fatigue periods, the Radio and Radar Division of WPB said. They are also used to page personnel in a plant, to distribute "bulletin board" information to workers, and to give emergency warnings.

An applicant seeking industrial sound equipment must file Form WPB-617. WPB will control the number of installations under Limitation Order L-41, governing construction. Production of industrial sound equipment units will be authorized only by such firms as have facilities and manpower to produce them without interfering with other war production.

IN order for the jobber or distributor to entertain the sound installation business, he must be able to put aside most of his "pet" ideas and hew to a hard and fast line of salesmanship plus a modicum of engineering ability which, fortunately most of this type of businessman possesses. He will have to talk in figures of coverage and intelligibility and understandability. His prospects will have to be directed to the line of good quality, without necessarily devoting too much time to the technicalities involved, nor reference to distortion and response curves or number of tubes. The jobber's entire line will have to be changed to meet the situation of interesting a busy executive who is not one whit cognizant with any of the usual radio or amplifier terms. For those terms, the jobber will substitute sales talk on absenteeism, increased production curves, ease of operation, simplicity of paging and a large number of facts with which the jobber

has heretofore had only a slight bowing acquaintance. But if he master the subject, he will have it pay him many times more in dollar value per sale than the trading of tubes and components across his counter. In addition to this, he will know that he is truly doing some valuable war work, because the Government has indicated that it is interested in having sound—good sound—put into as many war plants as possible, as can be seen from WPB release No. WPB-LD-386 dated Feb. 28, 1944. To do this it has made the obtaining of the equipment comparatively easy, and to make it simple to get delivery, has assigned an AA-3 priority to the projects.

What Is a War Plant?

Naturally, the first question popped at the jobber is, "Is mine a war plant?" The answer seems to have been broadened by our Government to the stage where almost any plant engaging either directly or indirectly in war work, is termed a "war plant." This opens a vast heretofore untouched field for the sales of Industrial Sound. Many candy factories, for instance, where the output is sold outright to civilian candy jobbers who in turn sell better than 80% to the canteens of the Armed Services, apparently come, now, under the classification of "war plants." So, probably will a vast number of non-military plants where they make materials which are used in conjunction with war work. An example, of this, would be a vitamin manufacturing concern. Some of the output, it is true, goes to the Army or Navy, but the greatest part goes into the mouths of war workers who in turn make the war materials. This type of a plant, too, it is believed,

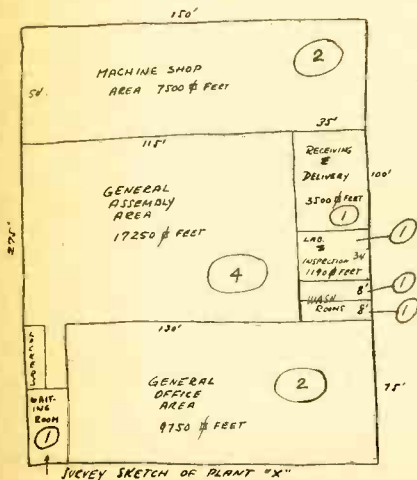


Figure 1. War plant layout sketch

régime and the work of the factory should be brought about. The man who upsets the workers and their schedule in trying to sell a sound system will usually not only fail to make the sale, but will find himself thoroughly unwelcome. Therefore, keep away from disturbing either executives or workers when making a survey or getting "cleared."

Having gained entry to the plant, the first thing is to walk all around the place looking it over. Do this without making any drawings or notes. Listen to the noise level. Look for noisy, occasional pieces of machinery. Note the level of conversation it is necessary to use to make oneself heard. Note the type of work the employees are doing, and the construction of the building. There is a difference in the resounding qualities of wood and brick construction over that of concrete. Ask someone if there are echoes present, and if so, where they are. Ask if the installations of the workers benches and the placement of machinery is permanent, or if there is some change contemplated in the near future. These are pertinent questions which affect the type of sound installation.

Having walked around and obtained a general picture of the premises, it is time now to make a rough sketch. *Figure 1* shows just such a drawing made on the spot, in pencil, by a Jobber. The plant obviously is a medium sized one. Note the complete lack of non-pertinent information. Do not clutter up the sketch with drawing in windows, doors or places where there is to be no sound used. Include, however, the washrooms (many a man has missed an important long-distance call in such a place because there was no way easily to inform him). Also do not forget the waiting-room. Many a "quickie" conference is held there with outside salesmen and engineers; and though the plant is completely wired with sound, more often than not, nothing can be heard in the waiting room. The man standing there talking, does not hear himself paged, and time is lost.

Having made the drawing of the premises, put in the approximate overall dimensions of the building. Next, divide the total area up into natural group-spaces. For instance, such units might be (1) a machine shop, (2) a maintenance room, (3) an assembly line space (4) an inspection and laboratory department, (5) the office, (6) a shipping department, etc. These are natural break-



ACME PHOTO

The forerunner of industrial sound! A loud-speaker set on sled runners is pushed towards the German lines by a Russian soldier. Speakers were used to broadcast speeches urging the enemy to give up war

downs of a plant, and almost all have them in one form or another. It is quite possible that there are many more divergent divisions, but essentially all should be divided according to the type of work done within the space.

Figuring coverage

Having the survey in hand, obtain the measurements of each sub-division. There is a direct relationship between the size of the space and the amount of power needed to cover it.

Mark up each space with its respective dimensions, and by multiplying them obtain the square footage devoted to that particular area. Mark the space with the square footage and also describe the type of space it is.

Using the following table, it is possible to approximate out the power needed to cover each area adequately, though there may be many special and different changes.

- Type A:* Quiet office.
- Type B:* Low noise level assembly line, or shipping room.
- Type C:* Moderately noisy assembly line, light manufacturing such as running lathes, drill-presses, moving equipment.
- Type D:* Noisy level—punch-presses, hammering, shearing noises and the like.

The approximate power needed to

cover the respective type areas is found in below:

- Type A:* 5000 square feet per 5-watts output power, diffused.
 - Type B:* 4000 square feet per 5-watt output power.
 - Type C:* 3000 square feet per 5-watt output power.
 - Type D:* 1500 square feet per
- (Continued on page 26)

Manpower, Music and Morale

A plan for helping achieve more effective personal relations in war production activities is outlined in a booklet just published by the RCA Industrial and Sound Department.

A well planned blending of manpower, music and morale is discussed in a pictorial round-the-clock exposition. It shows how an internal broadcasting system is a direct communication line to each employee, and how plant broadcasting helps build and maintain good morale, saves valuable time, simplifies plant administration, improves productive efficiency and creates good will.

The booklet, titled "Manpower, Music and Morale," described, among other things, a new type of pre-installation service—a scientific sound survey by expert RCA engineers. Among features which are carefully explained are RCA's industrial music library service, a proposed training program available for plant broadcasting system directors, and details of planned psychological surveys to study employee reaction to music in industry.

Impartial surveys are quoted as disclosing that carefully planned plant broadcasting of music, during working hours and during lunch and rest periods, lifts the spirits and re-energizes men and women—especially those engaged in repetitious operations.

ELECTRICAL APPLIANCE

Retailing

Registered U. S.
Patent Office

REFRIGERATOR SERVICE HINTS

Reprinted Courtesy Philco Radio & Telev. Corp.

Standard Unit

Allow the unit to operate until the evaporator is frosted. While waiting for the evaporator to frost, check the mounting of the unit and the condition of the condenser. When the evaporator has frosted, freeze in a thermometer on the bottom of the evaporator so that it can be easily read. Then with the test box in position allow the unit to operate from twenty to thirty minutes, after which a reading should be taken.

With the unit operating in this manner, certain points should be checked. If the service man familiarizes himself with the operation of units by occasionally checking the performance of a good unit, he will become familiar with the temperatures of the various parts of the unit when it is operating properly, and will be able, in a sense, to develop the ability to tell much about the performance of the unit by merely feeling various parts of the unit and noting the comparative temperatures maintained. This information coupled with a check up of the normal evaporator frosting and substantiated by the frozen-in thermometer reading allows the



"Hello, Mamie! Since my husband has become an appliance man, the baby is bright, I glow — watts with you?"

service man to make a comprehensive study of each unit in a very short period of time.

It is, of course, advisable to make two or more checks of a unit before reaching any definite conclusion. Occasionally, too, if the unit has been standing idle for an extended period it may be necessary to run it for some time before making a final check. In the course of checking inoperative units or studying the operation of new units certain points should be noted. These points include—

Frost On Lines

If the evaporator is level and the unit has been running long enough so that it is not operating under extreme load, frost on either the capillary tubing or the suction line should not extend beyond what would be considered the cabinet walls if the evaporator were mounted in the cabinet.

Frost On Evaporators

The evaporator should be evenly frosted with a solid coat of white frost. This frost coat should not have a smooth icy appearance unless the unit is being run with the evaporator uncovered so that the unusual heat load of the room itself is causing the outer surface of frost to melt. One reason for using the test box over the evaporator while testing the unit is to eliminate this condition which could lead to improper diagnosis.

Pressure Equalizing Time

Shut the unit off by removing the service cord from the current supply and allow it to remain off for two minutes. At the end of this period the unit should start, indicating that the pressures in the system are equalizing through the capillary tube at the proper speed. In cases of partial restriction the time required for the pressure to equalize will run into several minutes.

Temperature Conditions at the Unit

1. *Discharge Line Compressor To Condenser*—This line should be decidedly warm at any time that the unit is operating.

2. *Condenser* — The condenser

(Continued on page 34)

TOASTER REPAIRS

Proctor Toasters

Nos. 1435, 1436

Instructions for Adjusting Toasters

To reset the adjustment of the toaster, proceed as follows:

1st. Remove crumb tray.

2nd. Adjustment may be made with screwdriver through hole in base. To make toast darker, turn screw to the left. To make toast lighter, turn screw to the right.

If this does not give sufficient adjustment, proceed as follows:

1st. Remove base (2 screws)

2nd. Loosen hex head clamping screw that clamps switch point assembly to crank shaft.

3rd. To make toast darker move the switch points slightly further away from thermostatic strip. To make toast lighter, move the switch point slightly toward the thermostatic strip.

4th. Tighten hex head clamping screw and replace base.

It will be found necessary to test all toasters with bread, preferably bread that is a day old, evenly cut, and of uniform texture.

A toaster returned for lack of uniformity in toasting may be caused by the condition of the bread to be toasted. The bread should be reasonably uniform in thickness, shape and texture.

The bread pressure bar should be free to swing to keep the bread in contact with the thermostatic strip.

A defectively installed compensator will also cause lack of uniformity. This is the short blade of thermostatic metal directly welded to the crankshaft of the switch points. This is to automatically keep the toaster at a uniform setting. The compensator blade should float freely in the bracket slot. The wires to the switch points should not touch the base for approximately two inches on either side of the switch points.

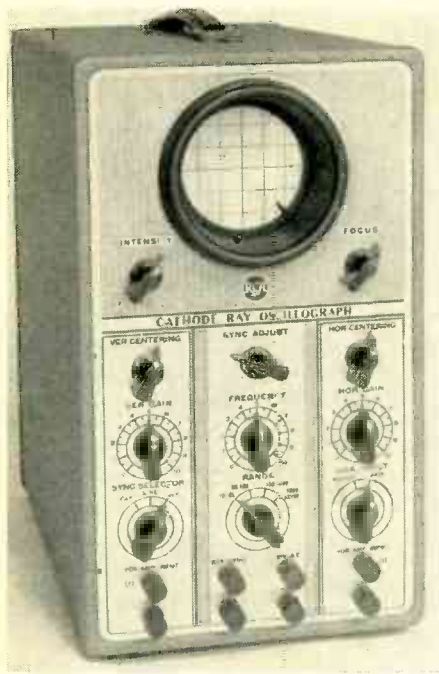
If Toaster Works But Bell Does Not Ring

Take toaster in both hands and shake toaster in all directions. This is to dislodge any dirt or crumbs that may be jamming the steel ball and preventing it from rolling freely up against the bell.

If Toaster Does Not Heat

Try snapping switch points apart, using a splinter, match or toothpick. This is done by pressing back on the insulating bushing carried on one of the switch points, and releasing it quickly so it will snap forward, and the two switch contacts will snap together.

« « « «



Serviceing with a Scope

by
john h. potts

This section describes the use of the cathode-ray 'scope in lining up IF stages of F-M and A-M receivers with heavy emphasis on the discriminators

Part 2

IN the first article of this series the essentials of cathode-ray tube operation and the application of the cathode-ray oscillograph to conventional receiver alignment were discussed. The problems involved in visual alignment of F-M receivers and of more complex A-M receivers incorporating automatic frequency control circuits are somewhat more difficult. While F-M receivers consist of *r-f*, *i-f* and oscillator stages similar in design to those in amplitude modulator types, they operate at much higher frequencies than the standard amplitude modulation receivers, and this introduces difficulties in the alignment procedures. Furthermore, F-M sets usually employ one or more limiters not found in conventional A-M sets, as well as a discriminator stage. The general routine in aligning the *r-f* and *i-f* sections of both types of receivers is, however, substantially the same. In F-M receivers the discriminator circuit is aligned

after the *i-f* adjustments have been completed.

A simplified circuit of the converter and *i-f* sections of an F-M receiver is shown in *Figure 1*. Often the *i-f* sections consist of two or more stages but the procedure involved in their alignment is the same. Fundamentally, the differences between the F-M circuit shown and that of a conventional A-M receiver is that the former terminates in a limiter rather than a diode detector. For the purposes of alignment the limiter acts just like a rectifier. In most limiter circuits a resistor, shown as *R2* in the diagram (*Figure 1*), shunted by a small by-pass condenser, forms the equivalent of the diode load in a conventional receiver. Therefore, the input to the vertical amplifier may be connected across *R2* from point (*d*) to ground.

In aligning, the same procedure is followed as for A-M receivers. The last *i-f* stage is aligned first. The

test oscillator is connected to point (*b*). The signal frequency is adjusted to the specified alignment frequency and the trimmer *C4* is adjusted until the trace appearing on the cathode-ray tube screen reaches a maximum height. This procedure is repeated for *C3*. A symmetrical resonance curve should result, similar to that obtained in conventional *i-f* stage alignment, but somewhat broader.

After the alignment of the last stage has been completed, the test oscillator signal is fed to the next preceding stage. In *Figure 1*, this happens to be the converter grid. The trimmers, *C2* and *C1*, across the secondary and primary of the *i-f* transformer in this stage are similarly peaked. The signal level should be reduced, so that the resulting image height is the same as that secured when aligning the last *i-f* stage. If the receiver has more than one *i-f* stage, the same process is

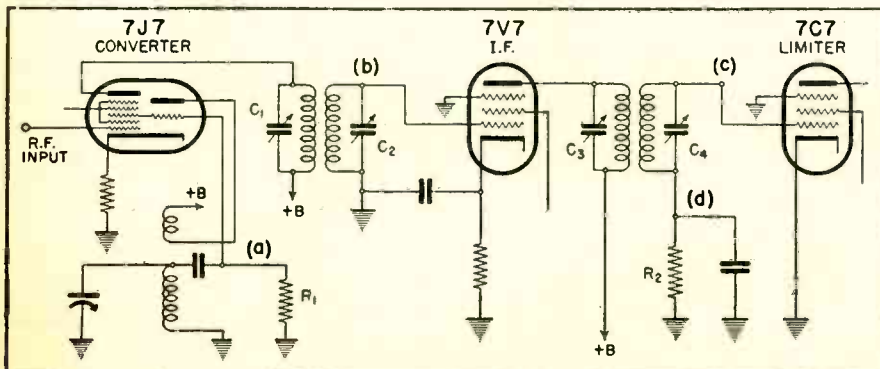


Figure 1

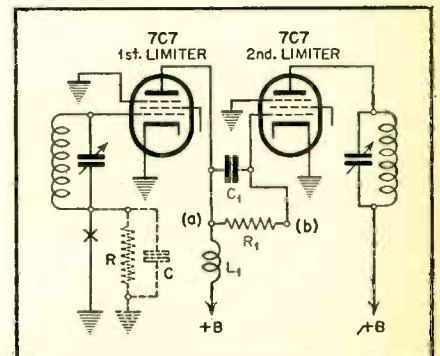


Figure 2

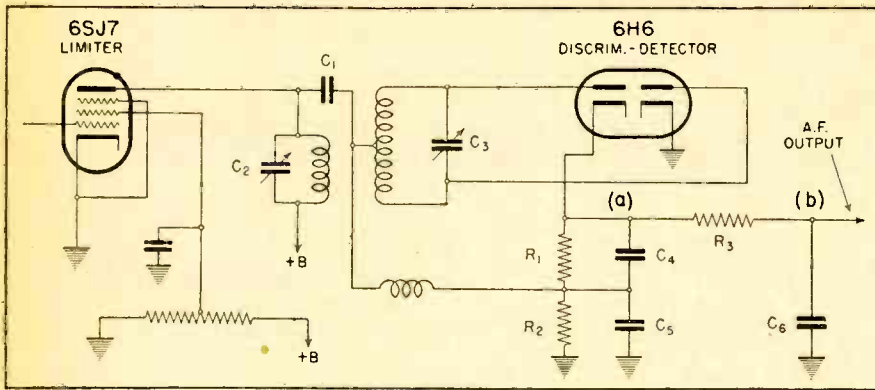


Figure 3

followed stage by stage until the alignment of the *first* i-f stage has been completed (the start having been made at the *last* i-f stage, as mentioned above).

While it is seen that this procedure follows conventional lines, difficulties are introduced because of the higher frequencies employed and the broader frequency band passed by the i-f amplifier. The test oscillator must be able to produce a frequency deviation of at least 100 kc above and below the specified intermediate frequency. Most test oscillators designed for conventional receiver visual alignment are not so equipped.

One method of securing such a broad band of frequencies is to use the harmonic of a lower fundamental frequency. Because the band width of the third harmonic is three times that of the fundamental frequency, it is possible in this manner to obtain a satisfactory band width. Thus, if the test oscillator is set to produce a 75 kc frequency deviation at 1000 kc, the deviation at 3000 kc will be 225 kc, which is adequate for most F-M circuits. Another difficulty arises because of the high intermediate frequencies employed, in that there is a greater tendency toward feedback. Instead of using a relatively large blocking condenser between the "hot" lead of the test oscillator and the point to which it is to be connected, a small mica condenser of, say, .005 mfd. should be used. Further, it is a good idea to use a very small clip to terminate this lead. The test oscillator lead

should, of course, be shielded, and with these added precautions the amount of exposed surface is reduced to a minimum.

In F-M receivers employing two limiters there is no resistor in the grid return circuit of the first limiter. In most cases the manufacturer indicates in the service notes just where the connection for aligning should be made. Where no such instructions are available the grid return circuit may be opened at the point marked (x) in Figure 2 of the resistor of approximately 0.25 megohms, by-passed by a .0001 mfd. condenser, and the oscillograph vertical amplifier leads are connected across this substitute load.

After the i-f amplifier has been aligned the test oscillator may be left connected to the input of the converter tube, and the discriminator circuit may then be aligned.

A typical discriminator circuit is shown in Figure 3. The purpose of the discriminator is to translate the frequency variations in the incoming signal into variations in amplitude. In order to do this without distortion the final curve should resemble that shown in Figure 4. It is particularly important that the line between the points marked (a) and (b) be essentially straight. Ideally, a perfectly straight line should result, but in commercial receivers this is rarely attained. A strong signal is necessary in aligning the discriminator and that is why the test oscillator is connected to the input of the i-f amplifier rather than to some intermediate point where less gain would result.

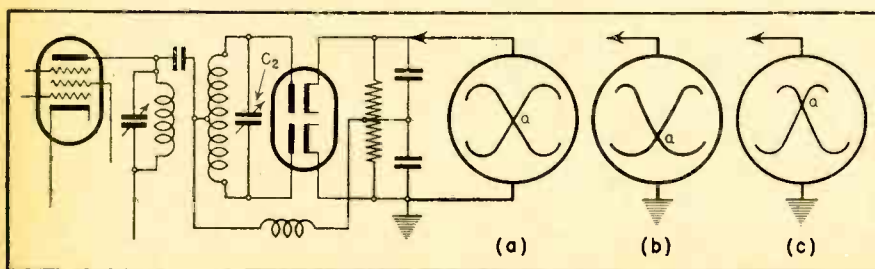


Figure 5

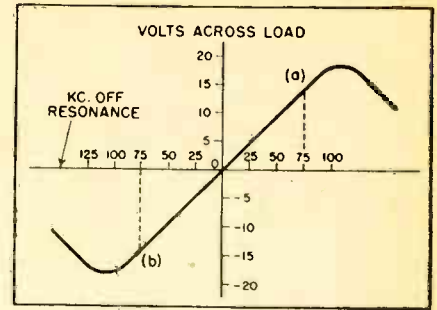


Figure 4

The first step in aligning the discriminator is to adjust the secondary trimmer condenser which is marked C2 in Figure 5. This adjustment is very critical and the ordinary type of aligning screwdriver is difficult to use. It is advisable to make up a special screwdriver by filing down a bakelite rod or similar insulating material until a blunt point is formed. If a sharp point is used it will break too easily. Any metal present in the connecting point is likely to cause detuning of the circuit. The proper form of trace which will appear when the secondary trimmer is correctly adjusted is shown in (a) in Figure 5. During the process of adjustment traces similar to (b) and (c) may result. When correctly adjusted both curves are symmetrical and the cross-over point occurs precisely in the middle. In all probability the slope of the lines will not be straight. This is corrected by adjustment of the primary trimmer. The tuning of the primary is much broader than that of the secondary and no sharply defined point will be found.

Some F-M discriminator circuits employ three windings. In such cases there are two secondary trimmers to adjust. A diagram of such a circuit is shown in Figure 6. The secondary trimmers, C2 and C3, should be adjusted in turn until the resulting image on the cathode-ray tube screen is similar to that obtained with the simpler type of discriminator. The adjustment of the primary circuit follows along the same lines.

Figure 7 shows a series of images illustrating various stages of i-f and discriminator alignment. In Figure 7 (a), the result of proper alignment

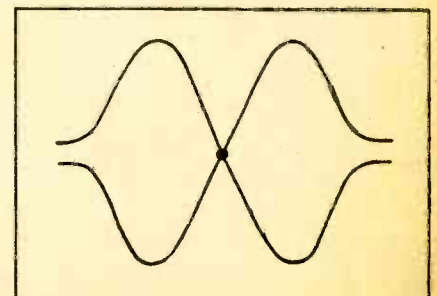


Figure 8

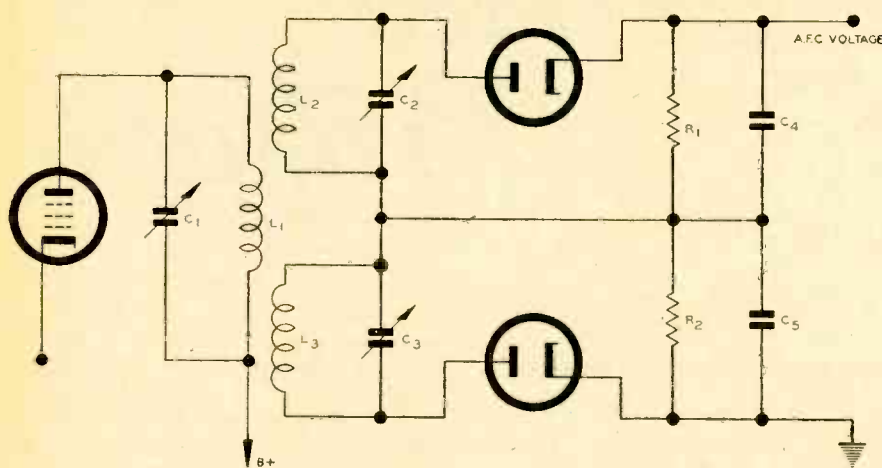


Figure 6

of the discriminator is indicated. In Figure 8 (b), the cross-over point occurs at the proper place but the band width of the frequency-modulated signal is not sufficiently great to show the full curve. In Figure 7 (c), the secondary trimmer is properly adjusted but the slope of the lines is curved, indicating improper adjustment of the primary trimmer. In Figure 7 (d), both the primary and secondary trimmers are improperly adjusted. Figures 7 (e) to 7 (h), inclusive, show images secured in various stages of the *i-f* aligning process. Proper alignment is represented by the resonance curve as shown in Figure 7 (e). In Figure 7 (f), one trimmer is out of adjustment. In Figure 7 (g), the curve is too sharp for an F-M *i-f* resonance amplifier. In *i-f* transformers employing a resistor to broaden the curve, a trace similar to this would result if the resistor were open or missing. In Figure 7 (h) the sweep frequency is not broad enough to show the true resonance curve. Hence, it is not possible to be certain that proper alignment has been achieved.

The alignment of automatic-frequency-control discriminator circuits follows along the same lines as those

of F-M circuits, the test signal being fed to the converter grid. However, the adjustment is not nearly so critical because the operation of discriminator circuits of this type does not appreciably affect the frequency response of the receiver. It is not essential that the resulting curve be perfectly symmetrical because control action takes place no matter what the shape of the curve.

There is another point of difference between *a-f-c* and F-M discriminators in that frequency band covered is considerably narrower. Whereas in F-M receivers the total range is in the order of plus or minus 75 kc, it is not unusual in *a-f-c* discriminators to limit the band over which the curve is linear to 3 or 5 kc at each side of the crossover point. For this reason the sweep frequency required in the test oscillator may be considerably narrower than that needed when aligning F-M receivers. An ordinary test oscillator suitable for visual alignment of *i-f* circuits of the conventional type of A-M receiver is perfectly satisfactory for *a-f-c* discriminator circuit alignment. An important point to be observed in aligning the discriminator is to make certain that the cross-over point occurs at precisely the rated in-

intermediate frequency specified for the receiver. If this is not done, control action will be greater when the frequency deviation is in one direction than it is in the other. Because the accuracy of the test oscillator frequency when using the sweep circuit is not as good as that when the sweep is not in use it is common practice to employ two signal generators for this purpose. When this is done one signal generator is adjusted to produce an unmodulated signal of precisely the desired intermediate frequency, while the other provides a frequency modulated signal of the band width specified in the manufacturer's service notes.

The resulting trace on the cathode ray tube screen will show a "pip" which rides over the frequency modulated trace. When this "pip" occurs at the cross-over point as indicated in Figure 9, the discriminator circuit is properly adjusted.

« « « «

Engineers Discover Many Uses For Induction and Dielectric Heating

One conspicuous peacetime benefit of wartime electronics can be named. It lies in the field of high-frequency heating and uses certain electronic tubes originally developed for war applications. These tubes, according to Westinghouse engineers, have made it possible to establish an economical and complete family of practical radio-frequency generators. Covering almost the full range of high-frequency heating work, these standard oscillators are being built in 2, 5, 10, 20, 50, 100, and 200-kw sizes.

Some laboratory experimentation yet remains to be done in both induction and dielectric heating. Almost every product presents its own problems in frequency power, coil and plate design. Much experimental work has been done in the Westinghouse laboratory recently in order to explore various war and post-war uses of this new branch of the industry.

Induction heating is ideally suited for soldering applications. For example, a terminal connector for a fighter plane has thirty wires soldered to it. This job, done by hand, one wire at a time, requires about fifteen minutes. In fifteen seconds induction heating solders all connections at one time leaving all joints clean and uniform.

The induction process for flowing tin on tin plate to obtain a bright surface is now well known. Using the same principle, experiments were carried out applying induction heating to a new kind of plastic made in large sheets. Two surfaces are required to be absolutely smooth—previously this had been accomplished by heating the surface between two steam-heated platens. With high-frequency heating, it appears that by using thinner platens and about 200 kilocycles, the job can be done much more quickly. Delays required for heating and tooling the thick steam platens will, of course, be eliminated.

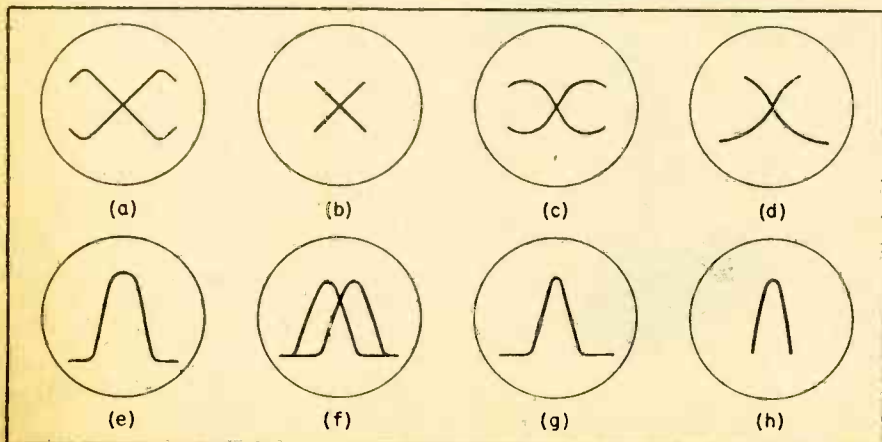


Figure 7

Technical Service Portfolio

SECTION XXXVIII

Odds and ends which every serviceman meets

Repairing Noisy Potentiometers

MANY times the serviceman will run up against a set with a noisy potentiometer which checks out rather well on the ohmmeter. There seems no need to replace it with a new unit, specially when the new ones are so very hard to get. Some of these noisy units can be made to run smoothly, because it will be found that when opened, they are full of *verdigris* or "whiskers" as they are sometimes called.

The Armed forces were continually running up against this sort of thing prior to the changing of the specifications of the pots to meet the conditions. "Whiskers" in pots are more likely to be found in warm climates

than in cool, and are most certainly to be found on the sea-coast.

To cure the defect, carefully unsolder the pot from the set. Place it on the bench and take the cover off making sure that the resistance element is not further damaged. With an air hose, if one is available (try your local garage's), or with a small brush remove all the *verdigris* or "whiskers."

Do not replace the cover! Replace the pot in the set, leaving the cover off.

Of course, where the pot is part of the on-off switch assembly, the cover will have to be replaced. In that case, insert a smooth, clean piece of *bond* writing paper between the cover and the element. Make sure that the paper is of the bond type,

and as little water absorbent as possible.

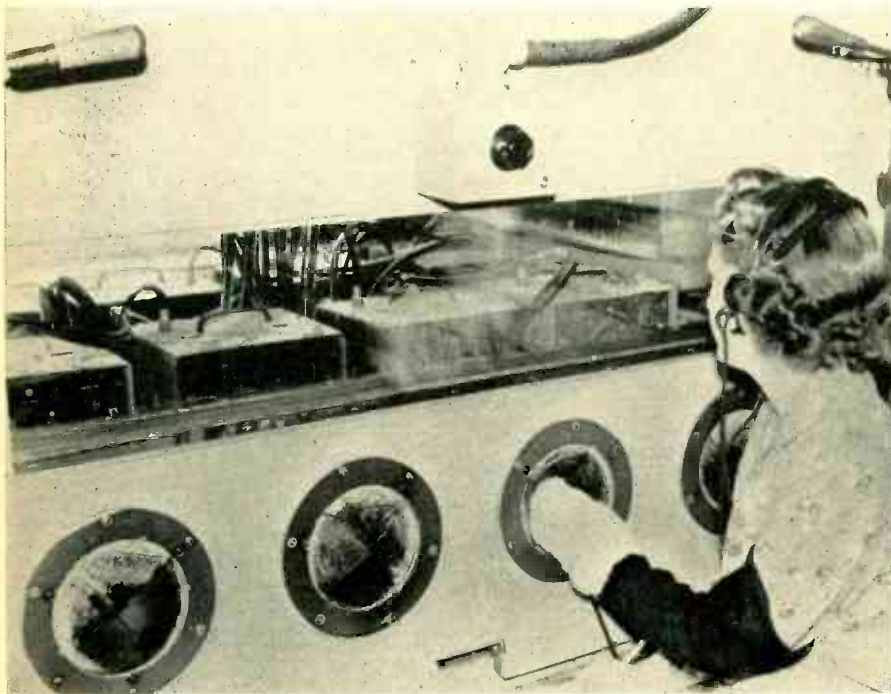
Break in the pot by turning several times by hand. Turn on the set, and it will be found usually, that the potentiometer's movement is smooth and noiseless. It will stay that way for a long time.

Broken Resistors

In repairing receivers or amplifiers, the serviceman is prone to break-off one or both of the connector wires flush with the resistor end. Then he finds that he has not an exact replacement; and, of course, there is not enough room for him to insert two or more other resistors in series to make up for the broken one. Many times the resistor will be of some odd value which works perfectly, but cannot be purchased from the average distributor; and to wait for a replacement from the factory will take long enough to lose the customer for good.

The resistor can be made usable. Take a sharp, small knife-blade and cut a groove around the remaining stub of the wire in the resistor. Do not dig in heavily because the wire stub will come out. Make just enough of a "cup" to hold a tiny drop of solder. Clean the wire stub thoroughly. Dip the resistor in soldering flux and flow a droplet of solder into the cup. Wash the resistor in alcohol and test the droplet to see that it is really soldered to the wire stub. Next, take a piece of wire at least twice as long as is believed is necessary to make connection with the rest of the components in the set. Tin the end of the wire carefully trying to leave a small droplet of solder right out on the very tip of the wire. Then quickly solder the wire into the "cup." Wash the resistor in alcohol and test with ohmmeter. If everything has been capably done the resistor should be OK to use.

In returning the resistor into the set, first set it into position where it is to be connected. Next tie the resistor down with cord so that it



Some of the new manufacturing techniques which will insure a finer radio set for the civilian after the war. Testing radio units under extremely low temperatures to make sure that nothing freezes when used in our mighty, high-flying air force. Picture from *Acme Photo*

NEW LETTER CONTEST for SERVICEMEN!

**ELEVEN 1st PRIZE WINNERS IN 5 MONTHS
IN CONTEST No. 1!**

Yes, sir, guys, the hundreds of letters received were so swell that *double* first prize winners had to be awarded each of the first four months and there were *triple* first prize winners the fifth and last month . . .

SO—HERE WE GO AGAIN!

Get in on this NEW letter contest—write and tell us your *first hand* experiences with *all* types of Radio Communications equipment built by Hallicrafters including the famous SCR-299!

RULES FOR THE CONTEST

Hallicrafters will give \$100.00 for the best letter received during each of the five months of April, May, June, July and August. (Deadline: Your letter must be received by midnight, the last day of each month.)

For every serious letter received Hallicrafters will send \$1.00 so even if you do not win a big prize your time will not be in vain.

Your letter will become the property of Hallicrafters and they will have the right to reproduce it in a Hallicrafters advertisement. Write as many letters as you wish. V-mail letters will do.

Military regulations prohibit the publication of winners' names and photos at present . . . monthly winners will be notified immediately upon judging.

BUY MORE BONDS!



hallicrafters RADIO

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

cannot move and does not depend on its wire connectors for support. Then wire in the connectors. This tying down technique cannot be used with non-insulated resistors. In that case, the resistor can be wrapped in paper if in its use in the cir-

cuit it does not get heated. If it does get heated, make a small buffer out of a piece of asbestos (there is lots around the shop from frayed iron-cords) and tie the resistor down with a piece of wire, placing a small

collar of asbestos around the resistor where the wire touches it. While ticklish work, and reeking of the watchmaker's art, the effort will be rewarded with a set that works without waiting for replacements.

« « « « » » » »

OPTIONAL SERVICE PLANS

★ In Buffalo, N. Y., several radio service-dealers are offering their customers a choice of two "service-fee-plans," when they bring their sets in for check-up and repair. The idea seems to be working out to the satisfaction of both customers and servicers, so it is worth reporting.

Plan 1—"Standard"

Under Plan 1, which could be called a Standard Check-up, the service-dealer contracts to check the receiver (for a nominal sum), and make all repairs necessary that will quickly and simply put the receiver back into fairly good operating condition. Customers are guaranteed that their sets will be repaired within 3 to 5 days. Nothing further in the way of customer satisfaction is guaranteed, and it pointed out to customers that the services to be rendered will be of a superficial nature, "just to make the set perk."

Plan 2—"Deluxe"

Under Plan 2, the DeLuxe Service, the service-dealer contracts to re-

place any and all receiver components that are worn, or *should* be replaced at that particular time. He agrees to clean the receiver, tighten connections, give it a thorough check for sensitivity and tone, make adjustments, and afford rather comprehensive overhauling, even to the extent of alignment.

Customers accepting Plan 2 agree to allow a 7-day repair period. They pay a basic service fee \$1 higher than that charged under Plan 1. It is understood that the customer will pay list price for all components replaced. Of course, this is all aside from the stipulation that customers pay the price-fixed standard hourly labor charges, where such labor is involved or required.

The advantage to the service-dealer working under Plan 2, lies in the fact that he is paid sufficiently to justify making a comprehensive check-up of parts that are subject to sudden breakdown. By making the required repairs right at the outset, he avoids the chances of having a set dumped back in his lap quickly after having, to all intent and purposes,

finished the job. You could call Plan 2's bonus fee "Job Insurance." By the same token, customers benefit under Plan 2 for it allows for contingencies under the "potential parts breakdown threat." True, the customer loses the use of his receiver for a longer initial service and check-up period, while his set is being worked on, but case records show that under Plan 2, the reward for his patience is ample in that he gets a most satisfactory job from the outset.

« « « « » » » »

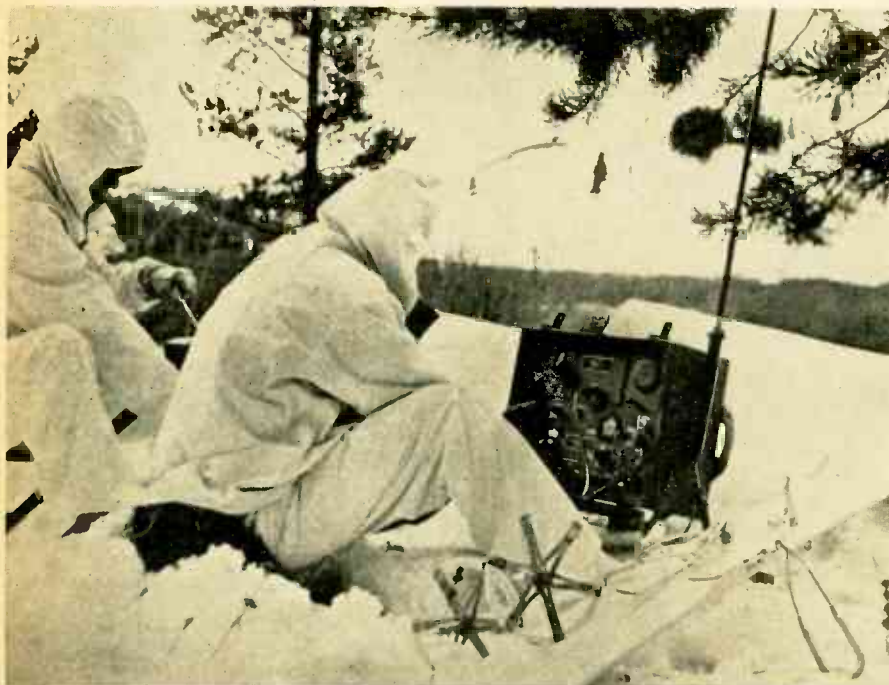
USING AUTO RADIOS IN HOMES

Some owners of auto-radio receivers, with their cars laid up and the regular home-radio receiver not up to par, want to use the set in the home. This can be done if an A-eliminator supplying 6 volts at about 8 amperes is available. Such power supplies generally consist of a step-down transformer and heavy copper-oxide rectifier; or, they may have a tungar bulb and transformer.

Usually the hum level is quite high, but by putting the eliminator in a closet and running a cable from the closet to the set the hum can be kept down. Many men, in an effort to overcome this disadvantage, start out with the idea of rewiring the set. Getting the filament wires snaked in and out of the radio receiver is a job, and it is impossible in practically all cases to install a power supply in the set itself, although half-wave rectifier arrangements sometimes can be jammed in.

Another factor is that the antenna used with the sets must not be too long. Sometimes hum is picked up, or the set becomes overloaded and chokes up when tuned to a station, if the wire connected to the antenna is longer than about 6 feet. A lot depends on local conditions, of course. A suitable A-eliminator generally cannot be built, even if you are prepared to wind the special step-down transformer yourself, for the reason that the tungar bulbs and copper-oxide rectifiers are not available. You can't even get the materials to build the rectifier copper-oxide units. All in all, it is generally

(Continued on page 26)



ACME PHOTO

All but invisible in their whites, are these soldiers of the only combined Canadian and United States Forces, seen in maneuvers near the border. They operate a U. S. radio set which is hand-generator driven. These are snow-shoe and ski troops which are Alps trained

ENVY OF AN INDUSTRY...

MEISSNER'S FAMED
"PRECISION-EL"



Men of Long Experience: You don't have to be much of a character to know that here's a man who knows his job from A to Z, takes pride in his work. He's typical of the "precision-el" who turn out Meissner's famous line of "Precision-Built" electronics products.



The Meissner "Know How" has long been envied by many in all phases of the electronics industry. There are said to be more electronics technicians per thousand population in Mt. Carmel than in any other American city.



Mighty Unit of America's Might: As far as the camera's eye can reach, it seems, are row upon row of skilled workers engaged in producing vital electronics material for Uncle Sam. This is one unit of the main Meissner plant at Mt. Carmel, Illinois.



Four of a Kind: From miles around Mt. Carmel, entire families have turned to electronics for a place in Meissner's great postwar plans. This family group of four employes, combining many years of varied experience, is about to report at one of the big gates.



ULTRA COMPACT!

Right — it's Meissner's "mighty midget" — a Cartwheel I. F. Transformer only $1\frac{1}{4}$ " by $1-1/32$ " by $1\frac{1}{4}$ " high! The perfect replacement unit for the many sets using odd shapes and locations for their I. F. transformers. Excellent, too, for countless AC-DC or Midget type receivers. It's complete with dual trimmers, with one-piece molded plastic trimmer base. Unshielded. For 456-kc only. Our supplies, of course, are limited.



MEISSNER

MANUFACTURING COMPANY • MT. CARMEL, ILL.

ADVANCED ELECTRONIC RESEARCH AND MANUFACTURE



Products of "THE HOUSE OF RESISTORS"

★ Clarostat is almost 100% on war work. That's why there are relatively few Clarostat green cartons on your jobber's shelves—only those items essential to wartime servicing.

However, this war won't last forever. And when it ends, those tougher Clarostat resistors, controls and resistance devices will be available to you. Once again those green cartons will be back in full strength on your jobber's shelves to meet your every need. And all of us will be well repaid for having concentrated on the biggest job of all—winning the war.

SEE OUR JOBBER . . .

He's carrying replacement controls and other essential service items. Consult him regarding your wartime servicing problem.



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

WITH THE EDITOR

(Continued from page 2)

not for the first year, or five years, after the war. Yes, F M and television sets are slated for quick production after the war, but they are not be confused with Gollywoxers, or Rube Goldbergs.

S. R. Cowan

LETTERS

(Continued from page 8)

and tend to give the public the impression that they are dealing with a professional man, rather than a man just handy with a screw-driver!

E. Darrow Dickinson
California

DISCUSSION

(Continued from page 7)

suckle Rose" which Hitler doesn't smell like

From Columbia: Les Brown has waxed two nice ones, "A Good Man Is Hard To Find" and "Bizet Has His Day" (36688)

From Capitol: Ozzie (Rutgers Pride) Nelson, Eddie Miller, Freddy Martin and Woody Herman are all going Army Bob Crosby has gone over to Universal in "Pardon My Rhythm" The Horn (H. James) goes Army muy pronto Bob Zurke, famous 88'er, died recently in L. A. of pneumonia "Look" magazine is featuring a day in the life of Johnny Mercer, prexy of Capitol to appear soon Dave Dexter has gotten off a terrific waxing of Jazz Americana which will not be ready for a coupla months. He assembled the biggies of jazzmania himself. Sides are supposed to be out of this world Jerry Colonna now with Capitol Joe (3-deuces-Chicago) Rushion, who earned the nick name of "motorcycle mike" is now with Horace Heidt Art Tatum is in NY. . . . Artie Shaw reported ailing last month, is outta the Navy with a med. discharge and convalescing at home

Not much happening. Sorry See you next month

AUTO RADIOS IN HOMES

(Continued from page 24)

impracticable to convert such radio sets for home use.

Another cute trick that an occasional customer may have is to bring a set into the shop and blithely announce that through some strange and inexplicable act of Fate the loop antenna is no more and what would you like to do about it. Mentally you decide, but orally you mention merely a price and proceed to install an antenna coil, having first pointed out that maybe the r.f. won't track exactly with the new inductance but that, at least, the set will "play" fairly well.

An antenna also will have to be used. If wire is unavailable the old

dodge of connecting to a ground can be used. In a.c.-d.c. chassis a blocking condenser is connected in series with the antenna lead. Sometimes you may find it necessary to use a small capacity of the order of 100 mmf. (0.0001-mf.) which cuts the signal somewhat but also reduces the intensity of a tunable hum that otherwise may be most annoying.

There are a thousand-and-one things that can happen in a serviceman's career to test his ingenuity. It is safe to say, I believe, that out of this war will come a good many improvements that might otherwise have taken years to develop. The serviceman, I am confident, will contribute his share, for even more than many a high-powered engineer, he knows first-hand, from real experience, what makes the radio sets "tick". It's his bread and butter but also it is his patriotic duty these days to KEEP THEM PLAYING.

SOUND INSTALLATION

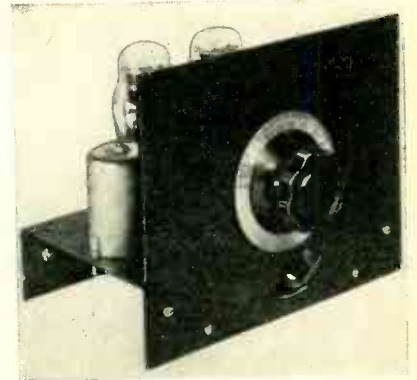
(Continued from page 17)

Since the better sound system manufacturers figure a conservative 5 watts per speaker, it is simple to

(Continued on page 28)

LAFAYETTE KITS AVAILABLE

Lafayette Radio Corp. of Chicago and Atlanta, is now able to offer radio training kits in quantity, to military and private training programs. The one and two tube regenerative kits illustrated are designed to provide complete basic receiver training at the lowest cost.



The one tube kit, when assembled, demonstrates grid leak detector operation and the effects of regeneration on a detector circuit. With the addition of a minimum of parts an r-f stage can be added without redrilling the chassis or moving any component parts of the detector circuit. Alignment procedure can then be demonstrated in its simplest form. These kits may be operated either from power supplies or from batteries when proper tubes are used.

A Third CITATION FOR THE INSTRUMENT LEADER



... FOR MERITORIOUS WAR PRODUCTION

This third citation for meritorious war production . . . climaxing a long record of war service . . . is a source of justifiable pride to the men and women of WESTON.

The record began back in the earliest days of our defense period, when a large segment of WESTONS' capacity was assigned to the production of instruments vital to military needs. Thus, when we finally were forced into this world struggle, WESTON was ready for *full-scale war production*.

This new star which adorns our "E" pennant marks the *third* time WESTON has been *first* in this highly specialized field to receive each successive war citation. Weston Electrical Instrument Corporation, Newark 5, New Jersey.



Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transformers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters . . . Aircraft Instruments . . . Electric Tachometers . . . Dial Thermometers.

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

substitute one speaker for each 5-watts output power. By using the two tables not only can the power of the System be determined, but the number of speakers as well.

Considering *Figure 1*, it is seen that the *Machine Shop* across the rear of the plant has an area of 7500 square feet. That is a medium sized shop, and it will be probably quite noisy. Going into table of areas one finds that is a *Type C*. *Type C* runs 3000 square feet per 5-watt output power, or 1 speaker for every 3000 square feet of area. Thus in the *Machine Shop* approximately 2 speakers will be needed, or an out-

put power of 10 watts; the speakers reinforce each other so the lesser number should be used.

In the *Assembly Line Area*, which measures 17,250 square feet, and falling under *Type B*, it is obvious that 4 speakers will be necessary, or 20 watts of power; again using the lesser number of speakers.

Similarly the rest of the area can be figured and the number of speakers required for each marked down in a circle on the drawing.

Summing up all the speakers needed for the premises determines at once the total of power required and a real lead as to the size of the

equipment which should be installed. In the plant in question, 13 speakers will be required to cover adequately the whole plant. Thirteen times 5 watts totals 65 watts, the power equipment this plant owner should purchase.

Since a central amplifier system with that kind of power plus 10% reserve might be both ungainly and expensive, it is well to consider the installation of a plurality of 50-watt units. Four 6L6G's push-pull parallel in Class AB1, for instance, furnish 50-watts nicely. This means that a central sound system should be installed plus a number, in this case, additional "booster" amplifier operating off the same music bus and same speech line. Each "booster" would handle 10 speakers loaded to 5 watts, and the entire system would more than cover the factory adequately, and also allow for expansion.

Speaker Installation

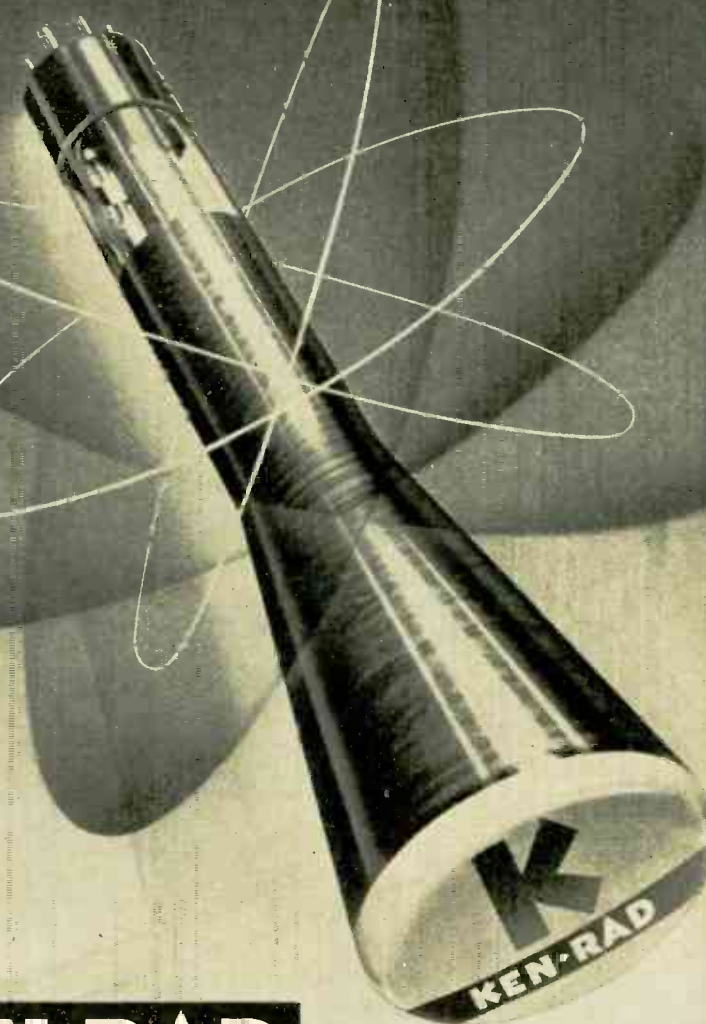
Speaker lines should be run in parallel and not in series. By means of ingenious methods at the transformers of each speaker, it will be then possible to maintain the lines at the 500-ohm impedance. Assume this sort of set-up: An output transformer on the amplifier which is of 500-ohms secondary with, say, 5 speakers in parallel, each speaker transformer would have to have an impedance of 2500 ohms in the primary to match the load line (2500 divided by 5 equals 500 ohms), and the secondaries would have to match the voice-coils (6-8 ohms). Thus by multiplying the number of speakers required for any given installation, by 500, one arrives handily at the tap on the transformer which to use. All speakers transformers have taps starting at 500 ohms and reaching by 500-ohm steps to about 7000 ohms. The purpose for the extra taps, since only 10 speakers would be used with a 50-watt amplifier, will be explained a bit further on.

It is only necessary to have the sound where it will be heard. That simple rule is the best and only one to follow. The area where this takes place has been determined to be that between the levels of 3 feet and 6 feet above the floor. Above that none need hear it; and below that level, there is no necessity for it. The speakers should be of the horn type, swivel mounted, so that each will cover the required area in space. Some experimentation is usually indicated so as to avoid speakers from bucking each other by their placement; and certainly they should all be in phase.

Some speakers come ready-phased

KEN-RAD

ELECTRON TUBES



KEN-RAD
EXECUTIVE OFFICES
OWENSBORO · KENTUCKY
EXPORTS 11 MOORE STREET NEW YORK

TRANSMITTING TUBES	RECEIVING TUBES
CATHODE RAY TUBES	INCANDESCENT LAMPS
SPECIAL PURPOSE TUBES	FLUORESCENT LAMPS



History of Communications Number Three of a Series

PRIMITIVE COMMUNICATIONS



An early communications instrument was the Tom-Tom—to prove its efficiency, it is still used by the natives of Africa. Tom-Tom signals are “Beat out” along jungle lined rivers, but even then distance is a handicap, and “repeater” stations are many.

Like all means of communications, other than voice communication, translation of coded signals must take place in which additional skill is required, and another chance of error is presented. As in the case of the Tom-Tom beater: knowledge of the Tom-Tom code was restricted to a special family within the tribe, and was handed down from generation to generation.

Today, Universal Microphones in the hands of the fighting men of the Allied Armed Forces are performing a simple but vital need in electronic voice communications where their quality and efficiency are bringing us one step closer to victory.

< Model T-30-S, illustrated at left, is but one of several military type microphones now available to priority users through local radio jobbers.

UNIVERSAL MICROPHONE CO., LTD
INGLEWOOD, CALIFORNIA



FOREIGN DIVISION: 301 CLAY STREET, SAN FRANCISCO 11, CALIFORNIA -- CANADIAN DIVISION: 560 KING STREET WEST, TORONTO 1, ONTARIO, CANADA

"THE HELP SITUATION" by Lariat



The members of the radio servicing industry can well be proud of the valuable contribution they have made in preparing technicians for specialized work in the armed forces—even if it hasn't been easy to see your help "come in one door and go out the other."

However, there is one important group of workers that you can share with the services—Rider Books. Used in every branch of our armed force, for the training of radio personnel, these books are also making it possible for civilian servicemen to meet their obligation to "keep 'em playing"—even under today's difficult conditions.

Rider Manuals make it easy to trace the circuit in a faulty receiver. Other data in the thirteen volumes simplify your servicing work. Be sure you have a complete set on each of your benches.

Also check the other Rider Books in the list at the right. They're chock full of proven principles that will further speed your work and enable you to make the most of your opportunities to serve your customers and your country.

HERE'S HELP YOU CAN Share with the Services

RIDER MANUALS (13 VOLUMES)

Volumes XIII to VII.....\$11.00 each volume
 Volumes VI to III..... 8.25 each volume
 Abridged Manuals I to V [1 volume]....\$12.50
 Automatic Record Changers and Recorders 6.00

OTHER RIDER BOOKS YOU NEED

The Cathode Ray Tube at Work
 Accepted authority on subject..... \$3.00
 Frequency Modulation
 Gives principles of FM radio..... 1.50
 Servicing by Signal Tracing
 Basic Method of radio servicing..... 3.00
 The Meter at Work
 An elementary text on meters..... 1.50
 The Oscillator at Work
 How to use, test and repair..... 2.00
 Vacuum Tube Voltmeters
 Both theory and practice..... 2.00
 Automatic Frequency Control Systems
 — also automatic tuning systems..... 1.25
 A-C Calculation Charts
 Two to five times as fast as slide rule..... 7.50
 Hour-A-Day-with-Rider Series —
 On "Alternating Currents in Radio Receivers" —
 On "Resonance & Alignment" —
 On "Automatic Volume Control" —
 On "D-C Voltage Distribution"..... 90c each

JOHN F. RIDER PUBLISHER, INC.

404 Fourth Avenue, New York 16, N.Y.
 Export Division: Rocke-International Electric Corp.
 13 E. 40th Street, New York City Cable: ARLAB

from the manufacturer. This is done by using tracer wire in the installation, and by grounding the same transformer terminal of the speaker lines. Automatically all are then in phase. Should it be necessary, because of the inability to obtain tracer-wire for the Jobber to put the speakers in phase, two methods may be used. The first is to "key" the speaker lines by connecting the same wire to identical speaker terminals. With an "ohmsifter" determine which wire used, of the two of the line, is the same, and connect it to the same terminal. The second though more tedious method is to use a 6-volt battery, hooking one terminal of the speaker terminal to the plus post, touch the other terminal to the negative several times. The cone will move either in or out depending on its magnet's polarity. Make sure that all the speakers' cones move in the same direction when the same polarity is applied to their respectively identical terminals, and be sure to hook up the speaker lines so that this relationship is not disturbed.

Microphone Installation

A microphone should be installed wherever a person will have need to use the sound system as a paging unit. This will vary greatly with each factory and the manner in which the operator has set up his plant. Usually there will have to be one mike at the switchboard operator's position, and normally there will also be one in the plant manager's office. At Jack & Heintz, Bill Jack, president, has one in his office which he uses for morale-lifting speeches. It is a good idea to sell Management that this should be done. In many plants, the shipping and receiving clerks and also, occasionally, the Chief Engineer will want to have a general plant paging system at their beck and call. It will all depend on the purchaser.

In installing a microphone paging system, cutoffs should be employed in the amplifier which will limit the response to 400-5000 cps. Anything over that is too high for use with the average human voice, and most frequencies below the 400 cps mark are generally lost in the rumble of machinery. It is necessary to sell the client on the fact that the paging system is not intended to sound like the person talking into the microphone. Rather intelligibility is stressed, and the customer is shown that as long as his speech is definitely understood, there is no need that it be "pretty." The voice level of a good sound system should be

RIDER MANUALS GIVE YOU THE HELP YOU NEED!



SERVICE TO SERVICEMEN... THAT'S STANCOR'S RECORD

Standardize ON

STANCOR

Call your nearest Stancor Jobber... or write us for his address

Transformers

STANDARD TRANSFORMER CORPORATION
 1500 N. HALSTED STREET · CHICAGO



CORPORATION



Out in front and widening the lead!

Radio & Electrical Appliance **SERVICE-DEALER**

FIRST... in paid circulation to owners of leading service-dealer establishments
FIRST... in total coverage amongst leading radio & appliance service-dealers
FIRST... in volume of replacement parts advertising for service-dealers
FIRST... in number of pages of text published on repairing radios & appliances
FIRST... in publishing exclusive articles geared to the needs of service-dealers
FIRST... has the highest subscription renewal percentage in the industry
... these and many other **FIRSTS** are the records that **RADIO & ELECTRICAL APPLIANCE SERVICE-DEALER** now proudly holds, wants **YOU TO SHARE IN**

A Limited Number of New Subscription Orders Can Still Be Accepted. Use the Order Form Below. Tear It Out ... Mail It Today! Extend Your Old Sub. With It.

**TEAR
OUT**



RADIO & ELECTRICAL APPLIANCE SERVICE-DEALER

(Remit by Check or Money Order. We cannot assume responsibility for cash sent thru mails)

COWAN PUBLISHING CORP.
342 Madison Ave., New York 17, N. Y.

Sirs: Here is my check (or money order) for \$..... Enter my subscription order for the next..... issues. The information given below is accurate. If my subscription is rejected I expect an immediate refund in full. Subscription Price: 12 issues \$2.—24 issues \$3. Canadian and Foreign subscription are \$3 annually.

Name (print carefully)

Address City State

Firm Name Year Est. 19.....

I am OWNER If some other classification or occupation, state it on the line below:
 DEP'T MGR.
 EMPLOYEE

Please check whether firm is

- | | | |
|---|--|--|
| <input type="checkbox"/> Radio Dealer | <input type="checkbox"/> Radio Wholesaler | <input type="checkbox"/> Hardware Store |
| <input type="checkbox"/> Radio Service Organization | <input type="checkbox"/> Music Store | <input type="checkbox"/> Electrical Appliance Dealer |
| <input type="checkbox"/> Automotive Store | <input type="checkbox"/> Any other classification (State it) | |

OPPORTUNITIES WITH SPRAGUE

Wanted for production and product development:

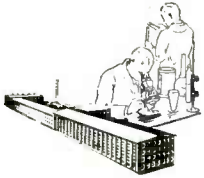
JUNIOR ENGINEERS FOR QUALITY CONTROL

For this work, we need four or five practical men who are qualified, not only to check up on capacitor and resistor production, but who can also pick up a soldering iron or other tool on occasion and show how things should be done. Technically-informed men with better-than-average radio service or similar practical experience should find this a worthwhile opportunity.

RESISTOR ENGINEER

The man to fill this position will need a good, practical working knowledge of resistance problems and a particular leaning toward the broad electrical field rather than radio alone. The work is interesting and has to deal with further development and expansion of the most unusual and most rapidly-growing resistor line.

WRITE AT ONCE if you feel that you can qualify for either of these positions. To the right men, Sprague offers interesting work, good living conditions and salaries in keeping with experience, plus worthwhile future opportunities made possible by planned post war developments of far-reaching importance.



Dept. RSD, Personnel Section

SPRAGUE SPECIALTIES COMPANY

North Adams, Mass.

Applicants will, of course, be engaged only in strict compliance with regulations of the War Manpower Commission.

deliberately pitched high and clear to override the plant noises.

A system should be used which will enable each microphone user to pick that part of the plant where he intends his speech to go. This is known as selective paging, and is comparatively simple with multi-"booster" installations. A small signal light to indicate when another is using the circuit should be included to avoid cross-talk.

Naturally, push-to-talk buttons should be a part of every sound system installation; or the equivalent in a desk box incorporating this type of switch should be employed.

The music channel response should be of excellent quality. This is a selling point. There is small use in installing a system, which when hooked to a record player, gives forth with such distortion that the tune is unrecognizable. Response should run substantially flat from 50 through 10,000 cps. By using inverse feed back this is easy to obtain.

Additional Equipment

The ideal sound system should have a fine record changer with a capacity of at least 12 ten-inch records, a good record library (which should be kept reasonably up to date), and a radio tuner for news and National announcements. The newer sound systems are all including this in their basic units.

In order to run the system, the jobber should recommend that only one or two persons should be assigned to the work. The Jobber should instruct these employees in the simple operation of the record-changer, the radio set, how to set the audio levels and where to get in touch with the Jobber in case of trouble. This last, coupled with a policy of quick service for the customer, will do more to further good will than anything else the jobber can do.

Costs

In the matter of costs, many of the sound systems vary greatly with the type of equipment. But by following the kind described generally herein, a quick estimate can be made by multiplying the area (in square feet) to be covered by 1½ cents. Thus the plant in *Figure 1* would have to have a system costing about \$618.75. This figure should normally be reasonable and acceptable to the Government for Tax and WPB purposes. It should include the cost of the System plus the labor of installation.

Miscellaneous

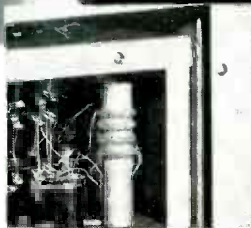
One of the bugaboos of the Industrial Sound installation, is where



MODEL
No. 1632

Signal
Generator

Continuous coverage—100 KC to 120 MC—all frequencies fundamentals. New high frequencies for frequency modulated and television receivers. All coils permeability tuned. Litz wire wound against humidity with "high"-Q cement. This and other models will be available to you after the war.



Triple shielding throughout. Steel outer case, steel inner case plus copper plating.



Triplet

ELECTRICAL INSTRUMENT CO.
Bluffton Ohio ★ ★ ★

\$ 10,000

WORTH OF HELP FOR YOU!

THE kind of practical, down-to-earth help busy servicemen need these days doesn't grow on trees. It takes plenty of time and money to produce! Actually, well over \$10,000 in cash plus months of work by A. A. Ghirardi, Radio's foremost servicing expert, went into this new 3rd Edition of A. A. Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK—before a single book was printed! Just think of it! Over \$10,000 of the finest time-saving servicing helps money can buy—and you get them all for only \$5 complete (\$5.50 foreign). What's more, you can see the book first! Our 5-Day Money-Back Guarantee is your absolute protection!

Ghirardi Helps You SPEED UP! . . . DO MORE WORK in Less Time. . . MAKE MORE MONEY!

You don't have to spend hours of study before Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK starts working for you. It isn't a "study" book. It's a big 744-page manual size, "on-the-job" data Handbook that you turn to FIRST whenever you start to fix some particular radio set, or handle a particular type of trouble, or parts or tube replacement.

TELLS YOU JUST WHAT TO DO— EXACTLY HOW TO DO IT

Mr. Ghirardi spent years in collecting the material it contains—plus months more in revising this new 3rd edition and bringing it strictly up-to-date to help busy wartime servicemen do better work in less time. He visited hundreds of service shops, contacted leading receiver and parts manufacturers, checked carefully on every available bit of useful servicing information—and prepared it in the most convenient possible form for quick, easy

reference . . . all thoroughly indexed! Nine times out of ten, the Trouble Case Histories in Ghirardi's Handbook will tell you exactly what is wrong with an ailing receiver and exactly how to repair it promptly and directly—usually without any testing whatsoever. Over 400 pages are devoted to these Trouble Case History compilations alone! 4,820 models are covered! Going far beyond this, however, you'll find hundreds of additional pages of charts, diagrams, compilations, tables, tube or part substitution data or bits of information you require in your daily work. Most servicing problems that you face are covered in this ONE convenient Handbook.

MONEY-BACK GUARANTEE

In brief, the Handbook is so extensive, so complete, we much prefer to have you see it and judge for yourself for 5 days. Send the coupon today! Then if you are not more than satisfied, we'll gladly return your money and no questions asked. What could be fairer than that?

HERE'S PROOF!

"Ghirardi's RADIO TROUBLESHOOTER'S HANDBOOK paid for itself the very first day. Best book I ever bought!" C. G. ROBERT, NEW ORLEANS.

"Saved more than the price of the Handbook on two different jobs. Wouldn't be without it!" B. J. ABELL, DETROIT.

"It's a treasure storehouse for any serviceman! I quickly found information I had been looking for for two days and

solved a tough job. Ghirardi is a star!" R. E. LOCKE, CALAIS, ME.

"Cuts servicing time in half!" C. VAN HOLLAN, SUPERIOR, WIS.

"The first day I got the Handbook, it helped me to repair four radios within 3 hours—radios which I couldn't ordinarily fix in 3 days." M. J. PENCZAK, LAWRENCE, MASS.

"This book is a 'MUST' for every serviceman—just what I have been searching for. It would take me years to accumulate the information that is now at my fingertips!" JOHN E. MORGAN, DORCHESTER, MASS.

5-DAY FREE TRIAL OFFER

RADIO & TECHNICAL DIVISION of
Murray Hill Books, Inc.,
Dept. RSD 44, 232 Madison Ave., New York 16, N. Y.

- Enclosed find \$5 (\$5.50 foreign) for Ghirardi's 3rd Edition RADIO TROUBLESHOOTER'S HANDBOOK postpaid; or send C.O.D. (in U.S.A. only) for this amount plus postage. If dissatisfied in any way, I may return the book at the end of 5 days and receive my money back.
- MONEY-SAVING COMBINATION—Check here if you wish to buy both the TROUBLESHOOTER'S HANDBOOK and MODERN RADIO SERVICING.
- \$9.50 enclosed (\$10.50 foreign) or send both books C.O.D. (in U.S.A. only).

Name _____
Address _____ State _____
City (and Dist. No.) _____



SPECIAL MONEY-SAVING COMBINATION!

How would you like to have Radio's most widely acclaimed servicing expert at your side to teach you everything you need to know to help make you an accomplished radio service man? Actually, ownership of Ghirardi's MODERN RADIO SERVICING means just about that!

The Only Complete Book of Its Kind

This famous 1300-page book is the only single, inexpensive volume giving a thorough course in modern Radio service work—explanation of the workings of all Test Instruments; Receiver Troubleshooting Procedure; Circuit Analysis; Testing and Repair of Component Parts; Installation; Adjusting; Maintenance, etc. Contains 706 illustrations, 720 self-testing review questions, 766 different topics. Sold singly for only \$5 (\$5.50 foreign)—or sold on our special Money-Saving Combination Offer with the above RADIO TROUBLESHOOTER'S HANDBOOK—a big \$10 value for only \$9.50 (\$10.50 foreign). Use coupon today before the paper shortage limits available supply!

FEATURED BY LEADING RADIO JOBBERS

REPAIR ANY KIND OF RADIO EQUIPMENT—Easier—Better—Faster!

It Spells "VICTORY"



D.C.V.	CAPACITY
25	25 mfd.
50	10 mfd.
150	20 mfd.
150	20-20 mfd.
150	50 mfd.
250	20 mfd.
450	10 mfd.
450	10-10 mfd.
450	40 mfd.

• The bulk of today's electrolytic capacitor replacements in standard sets can be handled with these "Victory" types of Aerovox Dandees. Used singly or in combinations. For the duration at least, you can bank on "Victory" Dandees for satisfactory, profitable, good-will-building servicing.

• Ask your jobber for Aerovox "Victory" Dandees. Ask for latest Aerovox Catalog—or write us direct.



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

A GOOD PLACE TO BUY YOUR

RADIO AND ELECTRONIC DEVICES



BURSTEIN-APPLEBEE CO.
1012-14 McGee St. Kansas City, Mo.

it is necessary to run one speaker, of a number, lower in volume than another. In *Figure 1*, the speakers in the washrooms, the waiting-room, and the laboratory all should normally be run at less than 2 watts and will together equal only 5-watts of power for everyone except noisy locations. The problem is how to do this economically. Several means are possible. The first is to build a "T"-pad into each speaker installation. This, however, will be found to be expensive and somewhat difficult to do.

Another method is to use the wide-range impedance transformers at each speaker mentioned earlier in this article. Thus if to match the load across a 500-ohm line, the norm of the installation, 10 speakers were connected in parallel as has been suggested, the tap on each transformer would be the 5000-ohm one. Ten 5000-ohm primaries in parallel equals 500 ohms, the line impedance of the system. However, it will be possible, under the conditions mentioned earlier to have taps on the transformers which go up to about 7000 ohms in 500-ohm steps. So, to lower the audio level of one speaker, it is only necessary to shift the transformer tap to some impedance higher than 5000 ohms, say 7000 ohms and, at the same time, shift some other speaker's tap to, say, 3000 ohms. The speaker with the 7000-ohm tap would be lower in audio output level while the speaker with the 3000-ohm tap may be a bit higher. Meanwhile the load across the line would be maintained at approximately 500 ohms thus keeping out distortion and holding the amount of work to lower the single speaker's level or to match the impedances of the speakers, to a minimum.

As long as the speakers' lines are maintained at 500 ohms, open, unshielded lines may be run. They should be kept reasonably away from power lines, but little pickup will be noticed.

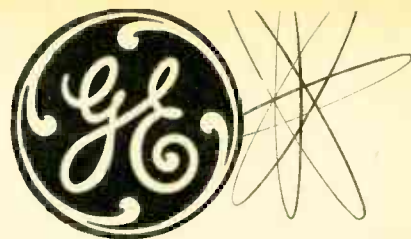
By balancing the microphone lines to ground with center-tapped transformers, these, too, may be left open. But the same caution applies to these as to the speaker lines.

If push-to-talk buttons are paralleled, and a relay used should operate with low voltage DC, then the relay lines can be included in multi-conductor cables which need not be shielded.

REFRIGERATOR REPAIR

(Continued from page 18)

should be uniformly warm throughout its entire length. Only when the unit is operating under ex-



PORTABLE TUBE CHECKER



THIS portable G-E Tube Checker contains sockets for all American tube types . . . provides practically a complete service shop of tube analyzing equipment. Equipped with the ingenious PMT Circuit Switch, this instrument is just one in the new General Electric line of SERVICE TESTING EQUIPMENT.

Among the other sturdy G-E units available for testing electronic circuits and component parts are: G-E uni-meters, audio oscillators, oscilloscopes, condenser resistance bridges, signal generators and other utility test instruments. For complete details about these accurate instruments, please fill out the coupon below. . . .

**FREE
CATALOG**



**ELECTRONICS
DEPARTMENT
GENERAL ELECTRIC CO.
Schenectady, N. Y.**

Please send, without obligation to me, the General Electric Testing Instrument Catalog, D-4 (loose-leaf), for my information and files.

Name _____

Company _____

Address _____

GENERAL ELECTRIC
Electronic Measuring Instruments

Sound Ideas . . .

Sound ideas! On the drafting board . . . in practical engineering . . . in production "know-how". These form a strong union out of which come many Electro-Voice developments. And the latest of these is the Model T-45 "Lip Mike" . . . a noise-cancelling Differential Microphone.

The soundness of Electro-Voice design refinements will be even more effectively demonstrated in peacetime. We have grown up with the field. We know its needs and its possibilities. You may be sure that products born of Electro-Voice ideas will perform a sound function.

Electro-Voice distributors are giving greater understanding to your requirements than ever before. If your limited quantity needs can be filled by any of our Standard Model Microphones, with or without minor modifications, we suggest that you contact your nearest radio parts distributor.

DON'T WASTE WASTEPAPER . . . TURN IT IN TO FIGHT FOR OUR SIDE



Electro-Voice MICROPHONES

ELECTRO-VOICE MANUFACTURING CO., INC.
1239 South Bend Ave. • South Bend 24, Indiana
EXPORT DIVISION: 13 EAST 40th ST., NEW YORK 16, N. Y. — U. S. A. CABLES: ARLAB

tremely favorable conditions or for a very short time after the unit starts up should there be any appreciable difference in the temperature of the various sections of the condenser.

3. *Drier*—While the unit is operating the drier will ordinarily be at much the same temperature as the condenser itself since condensation is actually taking place in this particular part. However, when a unit is shut off it will be noted that the drier cools considerably more rapidly than the condenser or other parts of the unit. The reason for this is that a small amount of liquid is held in this part of the unit during a normal cycle, and therefore vaporizes when the unit is shut off and the pressure equalized throughout the system.

New Meissner Record Player and Radio Set

A radio set and record player that will offer tone control far superior to anything heretofore available and including many applications of new discoveries in electronics is in prospect for music lovers and record enthusiasts immediately after the war.

This is the promise held out by G. V. Rockey, vice president of the Meissner Manufacturing Co., Mt. Carmel, Ill., whose firm had completed extensive research and was on the verge of bringing out its new radio-phonograph when war halted further work on it. The

company is now 100% engaged in war work.

Entry of the Meissner firm into the radio-phonograph market represents a new development. Only one set had been completed when the United States entered the war. This set was recently demonstrated in New York before a professional audience including headline artists in the musical world, symphony directors, newspaper music critics, radio engineers and recording officials. These men of music heard the set perform on records covering everything from "boogie woogie" to Tschaiakowsky's Fifth, and their favorable criticism and response to it was expressed in terms of the manner in which it accurately reproduced both vocal and instrumental music with absolute fidelity. Many of the world's greatest musicians pronounced it the finest reproducing instrument they had ever heard—"a musician's instrument."

Tone control and the reproduction of music exactly as it is played or sung is the manufacturer's own special secret, of course, but according to Mr. Rockey, the set has a number of other exclusive features which set it apart. Chief of these is the record-changing device itself. The phonograph will play continuously for two hours or more without the necessity of touching records or set. The record-changer may be set to play all records on one side, then turn them over and play the reverse side of each. Or, it may be set to play both sides of each one before going on to the next. It is possible, also, to reject any record in the series whether the machine is set to play in a straight run or on a work and turn basis. When the entire magazine of records has been played off, the records are returned in the same order and rotation. The device handles the records without jarring or damage.

Baker of G.E. Boosts F-M

When business, industry, and science team up after the war, Dr. Walter R. G. Baker, Vice President of the Electronics Department of General Electric Company, predicts that electronics will play an important role in providing new jobs for our returning service men and women.

In making a forecast on post-war radio and television, Dr. Baker declared that when post-war radio hits its stride we are going to have programs of higher fidelity and lower noise level as a result of a new type of broadcasting system. "I think," he said, "we can count on a sizeable increase in the number of international short wave stations, and a big boost in their power."

"Unless I am far wide of the mark," Dr. Baker asserted, "the advantage offered to the listener by FM will eventually obsolete the 60,000,000 radio sets in American homes."

Certainly, television will come after the war, he emphasized, but how soon cannot be stated definitely. "It will not blossom nationwide at once, since first, a large investment must be made in television transmitters and in a system of television transmission for network television. Whether the network will use radio, coaxial cable, or wave guides depends upon many factors," he said.

ADVERTISERS

Aerovox Corporation	34
Agency: Austin Lescarbourea & Staff	
All-American Electronics Co.	36
Astatic Corporation, The	8
Agency: Wearstler Advertising, Inc.	
Bogen Co., The David	4
Agency: Shappe-Wilkes, Inc.	
Burstein-Applebee Co.	35
Agency: Frank E. Whalen Co.	
Centralab	8
Agency: Gustav Marx Advertising Agency	
Clarostat Mfg. Co., Inc.	26
Agency: Austin Lescarbourea & Staff	
Detrola Corporation, The	3rd Cover
Agency: Zimmer-Keller, Inc.	
Electro-Voice Mfg. Co., Inc.	35
Agency: Shappe-Wilkes, Inc.	
Fada of New York	36
Agency: Sternfield-Godley, Inc.	
General Electric Company	3, 34
Agency: N. W. Ayer & Son, Inc.	
Hallicrafters Co., The	23
Agency: Burton Browne Advertising	
Jensen Radio Mfg. Co.	12
Agency: Burton Browne Advertising	
Ken-Rad Tube & Lamp Corp.	28
Agency: Allen, Heaton & McDonald, Inc.	
Lafayette Radio Corp.	7
Agency: Shappe-Wilkes, Inc.	
Mallory & Co., Inc., P. R., 2nd Cover	
Agency: The Aitkin-Kynett Co.	
Murray Hill Books, Inc.	33
Agency: The Harry P. Bridge Co.	
Meissner Mfg. Co.	25
Agency: Gardner Advertising Co.	
Ohmite Mfg. Co.	7
Agency: Henry H. Teplitz, Advertising.	
Racon Electric Co.	10
Agency: Leon Allen, Advertising	
Radio Corp. of America, RCA-Victor Div.	5, 6
Agency: Kenyon & Eckhardt Inc.	
Raytheon Production Corp., 4th Cover	
Agency: Burton Browne Advertising	
Rider, John F.	30
Agency: Lansford King Advertising	
Sprague Products Co.	9, 32
Agency: The Harry P. Bridge Co.	
Standard Transformer Corp.	30
Agency: Burnet-Kuhn Advertising Co.	
Sylvania Elec. Prods. Inc.	1
Agency: Arthur Kudner Inc.	
Triplett Elec. Instru. Co.	32
Agency: Western Advertising Agency	
Universal Microphone Co., Ltd.	29
Agency: Ralph L. Power, Advertising	
Weston Elec. Instru. Corp.	27
Agency: G. M. Basford Company	

FADA

FACTORY SERVICE DEPT.

OFFERS you a completely equipped service organization to handle your repairs on Fada and all other make radios

FADA OF NEW YORK

928 Broadway, New York, N. Y.
Tel.: GRamercy 7-0951-2-0980

LARGE STOCK OF REPLACEMENT PARTS AND CABINETS ALWAYS ON HAND

IT'S HERE!

"Emergency War Service Radio Tube and Circuit Manual (Simplified)" with complete constructional details on the new Rectodyne Radio Tube Filament Welder.

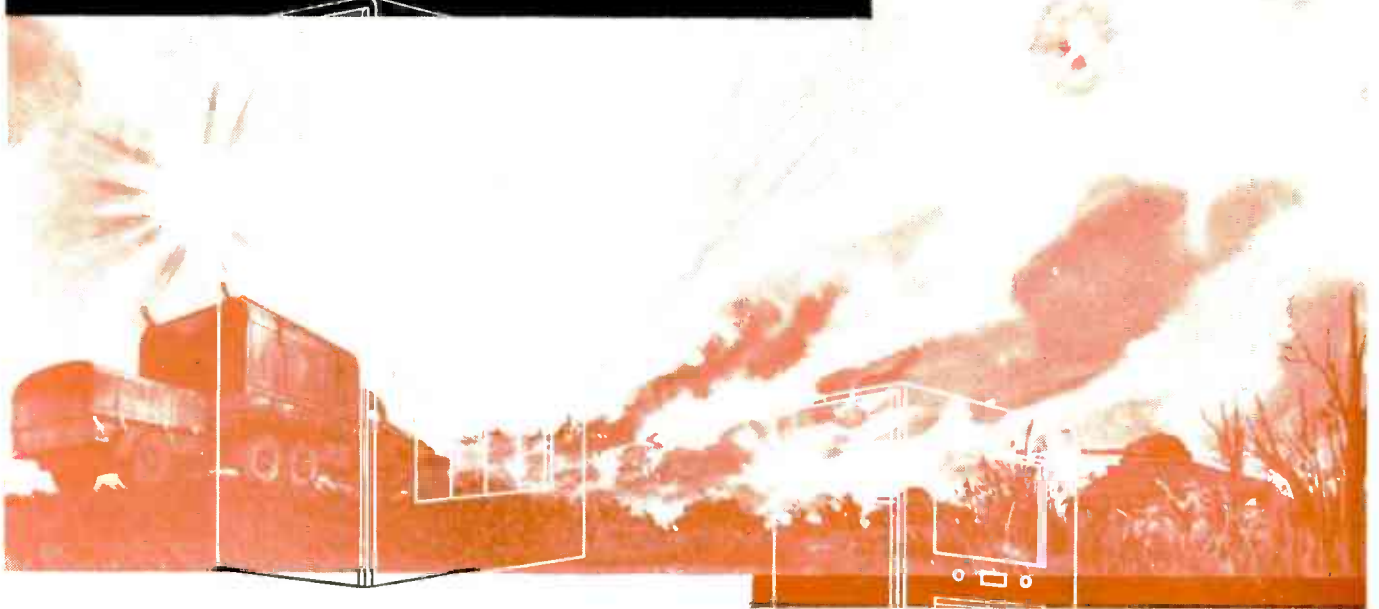
Twenty-two different tube types indicated as substitutes for 12SA7 alone! Eleven for 12A8-1A7 through 117Z6 and ballast tubes. No socket changes. The mere rearrangement of two or three wires in set facilitates completion of job in many cases!

Send for your manual today! Price \$3.00 per copy (Continental U. S. A.). Postage Prepaid.

THE ALL AMERICAN ELECTRONICS CO.
P. O. Box 1846 San Antonio, Texas

BUY MORE BONDS

from the Smoke of War..



finer Radios for Peace

War's demands for better weapons have added mightily to the progress of radio. Here at Detrola we are in the forefront of it. Detrola engineers are giving their knowledge and experience to the perfection of new and finer electronic equipment. Detrola production workers are learning and employing new short cuts in the mass manufacture of quality products. Our work today is providing us with ideas for a great variety of postwar radio-electronic devices . . . and new ability to translate them into products of finest quality. *Every War Bond You Buy Helps Bring Victory Closer. Buy Another Today.*

DETROLA RADIO

DIVISION OF INTERNATIONAL DETROLA CORPORATION • BEARD AT CHATFIELD, DETROIT 9, MICH.

C. RUSSELL FELDMANN  PRESIDENT





The FUTURE is Founded on TODAY

LONG before Pearl Harbor, Raytheon tubes were serving in the Army and Navy. Many Raytheon dealer-servicemen joined the armed forces as expert technicians, and found Raytheons on the job giving the same "Plus-Extra" performance that they had known so well in civilian life.

After Victory manufacturers of radios and of industrial electronic equipment will reap the bene-

fit of Raytheon's wartime experience and exceptional production record. Indeed, this wartime experience is an extra assurance of the "Plus-Extra" performance of *postwar* Raytheon products.

Victory is first—but the future is a-building now.

Raytheon Production Corporation

Newton, Massachusetts · Los Angeles · New York · Chicago · Atlanta

DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES FOR THE NEW ERA OF

ELECTRONICS



All Four Raytheon Divisions Have Been Awarded Army-Navy "E"—Plus Stars

RAYTHEON
High Fidelity
RADIO & ELECTRONIC TUBES

