DECEMBER 1949 25c

RADIO AND DISTRIBUTION MAINTENANCE

DEVOTED TO SALES AND SERVICE OF RADIO - VIDEO - AUDIO

Now! Two great volumes...

For quick and accurate TV trouble shooting...

Cunningham brings you the indispensable Pict-O-Guide

For full details, see your Cunningham Distributor

A QUALITY PRODUCT OF THE RADIO CORPORATION OF AMERICA

RADIO DISTRIBUTION AND MAINTENANCE

WILLIAM F. BOYCE
Publisher

JOSEPH J. ROCHE
Editor

ISIDOR I. GROSS
Assistant Editor

VICTOR M. TURNER
Art and Sales

MORTON SCHERAGA
Contributing Editor

FRANK VAN SEETERS
Circulation Manager

Volume 5 December 1949 Number 12

CONTENTS

ADVERTISING REPRESENTATIVES

Eastern
Herbert J. Olsow
480 Lexington Ave.
New York 17, N. Y.
Plaza 9-7864

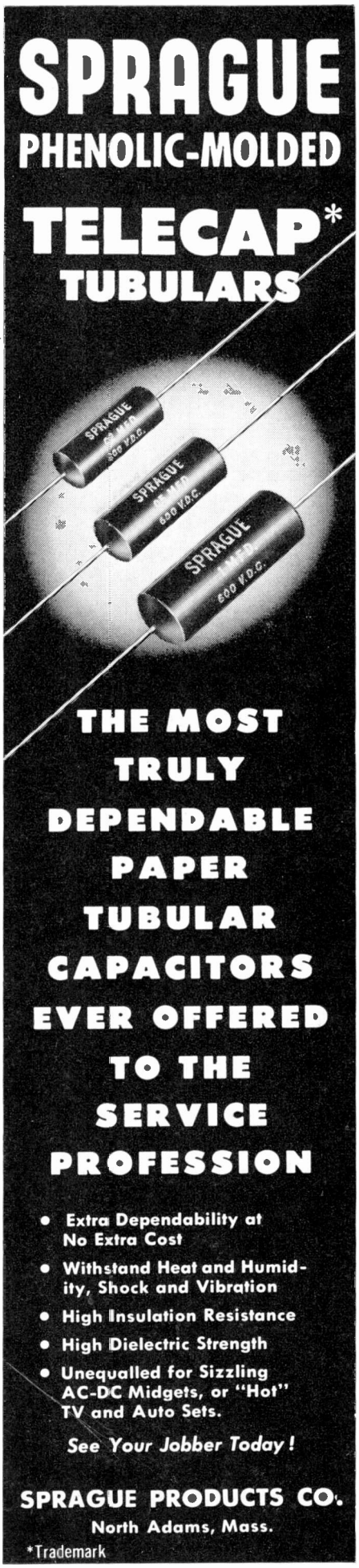
Midwestern
Stuart J. Osten
333 No. Michigan Ave.
Chicago 1, Ill.
Dearborn 2-3507

Copyright 1949, Boland & Boyce, Inc.

Radio Distribution and Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S., Mexico, South and Central America, and U. S. possessions, $3.00 for 1 year, $5.00 for two years, single copies 25 cents; in Canada, $3.50 for 1 year, $6.00 for 2 years, single copies 30 cents; in British Empire, $4.00 for 1 year, $7.00 for 2 years, single copies 45 cents; all other foreign countries, $5.00 for 1 year.

Entered as second class matter June 15, 1949, at Post Office, East Stroudsburg, Pa., under the Act of March 3, 1879.

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



Good Listening! for EVERYONE!

with the NEW Genuine JENSEN WIDE-RANGE LOUDSPEAKERS

16 COMPLETELY NEW MODELS
Three 15-inch Coaxials, one 12-inch Coaxial
Eleven 5-inch to 15-inch Single-Radiator Models

● No longer is truly *good* listening ruled out by cost or size restrictions. Now music can come to life for everyone, for Genuine JENSEN Wide-Range Loudspeakers include *small sizes* as well as large . . . *low cost units* as well as more expensive models.

● Not alone in frequency range but also in smooth response, wide-angle distribution, low distortion, good efficiency and power handling capacity . . . in all 7 Performance Points Genuine JENSEN Wide-Range loudspeakers establish new standards of reproduction quality.

● So whether you choose a 5" single-unit direct-radiator type loudspeaker at $8.00 list, a 12" Coaxial at $33.40 list, or a 15" Coaxial with the new JENSEN Wide-Angle Acoustic Lens, you get superior performance all the way . . . in every attribute that makes for enhanced listening pleasure.

New WIDE-ANGLE ACOUSTIC LENS

Typical of JENSEN leadership in loudspeakers engineering is the Acoustic diverging Lens used on Model H-510 illustrated at the left. Adapting optical principles to acoustics, this lens acts in conjunction with the h-f horn to distribute h-f radiation uniformly over a wide angle . . . insures constant balance and high quality reproduction throughout the whole room.

Write now for Data Sheet No. 152 describing all the new loudspeakers in the new Genuine JENSEN Wide-Range series, and booklet, "Let Music Come to Life."

GENUINE Jensen WIDE RANGE

This trademark identifies an advanced-design loudspeaker . . . with performance to meet today's exacting requirements for faithful music reproduction . . . achieved through the most modern applications of acoustics.

JENSEN MANUFACTURING COMPANY
Division of the Muter Company
6637 SOUTH LARAMIE AVENUE • CHICAGO 38, ILLINOIS
In Canada: Copper Wire Products, Ltd., 351 Carlaw Avenue, Toronto

RADIOINDUSTRYNE

RADIO INDUSTRY NEWSLETTER

Edited by Joseph J. Roche

COLOR DEMONSTRATED—RCA and CBS have demonstrated their color TV systems to the FCC in Washington. While opinion has varied greatly, the systems stack up in about this way: The CBS system gives good color registration and definition. Color fidelity is said to be very good (equivalent to color motion picture film). On the debit side, it is partly mechanical, and cannot produce good pictures larger than twelve inches in size.

The RCA system gives good registration and definition. It is an all-electronic system capable of producing pictures of any size desired. Color fidelity is said to be poor at this time, and it is not yet possible to transmit RCA's color signals over coax cables.

Observers at the demonstrations generally concluded that CBS's system outperformed RCA's. But experts who have studied both systems feel that RCA's has fewer inherent limitations and is therefore capable of greater future advancements.

COMPATIBILITY—The term "compatibility" is being used often at the Washington hearings. Most of the industry is urging FCC not to adopt a color system unless it will permit the reception of color transmissions by present receivers without modification. Transmissions would, of course, be received in black and white, protecting the public's investment in the more than 2 million telesets now in use.

CONTROVERSY— The industry is divided over the question of color. Some want a decision on color standards now, others feel that the decision should be postponed until the various color systems are developed further. Both groups have points in their favor and are presenting strong arguments to the FCC. The Commission has decided to hold further demonstrations of the RCA, CBS, the Color Television, Inc. systems. These demonstrations are to be completed in February.

THE DECISION— The color hearings will probably not be completed until late March or April, at which time the allocation hearings can begin. Assuming that an allocation decision is reached within three or four months, new stations will not be coming on the air until the middle of 1951. So if you don't have a station operating or under construction in your area now, don't expect one for at least a year and a half.

STATISTICS— Figures from several sources give an overall view of the industry's progress. NBC estimates that 2,310,000 telesets were in use at the end of September. 31% of all sets are in the New York area, a drop from the 46% of last year. RMA estimated that 265,000 telesets were produced in September, setting a new record. 88 TV stations are now on the air.

SHORTAGE—Behind the new teleset production record were reports from dealers indicating that sales have risen so sharply that in many instances they can't get enough sets to satisfy demand. September sales in some areas were three to four times those of August. And teleset manufacturers, who have been allocating their production, are faced with shortages of picture and receiving tubes. They believe that the shortages will continue for the balance of the year.

AM— While television has been getting most of the attention, things have been looking better for AM too. Sales have improved in recent months, and many dealers are finding it difficult to keep sets in stock.

PICTURE TUBE PREFERENCE— At the RMA-IRE meeting in Syracuse, Sylvania engineers revealed that a series of tests indicated that people prefer "dark-faced" to clear picture tubes. The results of a study of teleset simplification were also presented at the meeting. According to the engineers, the way to better telesets is through simplified circuits and multipurpose tubes, capable of performing three distinct functions.

Television Arithmetic

$200 Television Set + $5 Antenna = $5 Picture
$200 Television Set + $25 Antenna = $225 Picture

Yes... it's as simple and basic as that. Just like 2 plus 2 equals 4. Let all of us square up our thinking and recognize OPENLY that in a great, great majority of cases, the television buyer can get the full value from his set ONLY with a good outdoor antenna properly installed.

Certainly, there is great value for the indoor antenna. We make them ourselves, and good ones, too, BUT . . .

We'll be the first to admit that the best indoor antenna cannot compare with even the poorest outdoor antenna for picture quality. In certain "ideal" conditions, an indoor antenna will perform satisfactorily, BUT...

Let us not abuse this "condition" by recommending indoor or "built-in" antennas where they will not give the customer his full dollar's worth. It is up to the Television Industry to see that the American Public gets its money's worth in television and that means simply... A GOOD OUTDOOR ANTENNA SHOULD BE INSTALLED WHEREVER POSSIBLE.

The indoor antenna is a good short cut to quick consumer sales, BUT DOES NOT GIVE THE CUSTOMER THE PICTURE HE IS PAYING FOR! This is the truth about television antennas . . . as related to picture quality. Tell it to your customers, let them decide for themselves.

***THE MAKERS OF THE* COMPLETE *LINE OF* GOOD *TELEVISION ANTENNAS THAT MAKE GOOD TV SETS* EVEN BETTER!**

THE RADIART CORPORATION • CLEVELAND 2, OHIO

Reprints of this advertisement available upon request.

5000 SERVICEMEN HAVE PROFITED FROM SYLVANIA'S DEALER ADVERTISING CAMPAIGNS

. . . and YOU can do the same by ACTING NOW!

Another of Sylvania's famous profit-building campaigns is getting under way! The campaign runs through the months of January, February, March and April—with half-page ads like this in LIFE, THE SATURDAY EVENING POST, LOOK, COLLIER'S, and RADIO AND TELEVISION BEST. The ads tell *your* customers and prospects to come to you for radio and television service.

But that's just the start! THEN . . . *you* tie in with this national advertising by using Sylvania's complete kit of display and direct mail material—all built *around* the ads—designed for *you*—and ready for you *now!*

Sylvania's previous campaigns paid off in a big way for thousands of dealers and servicemen. Be ready to cash in on this latest big push!

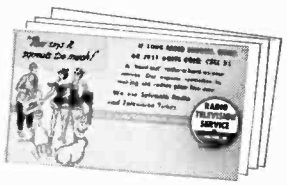
RADIO TELEVISION SERVICE
SYLVANIA RADIO TUBES
Authorized Dealer

LOOK FOR THIS SIGN OF DEPENDABLE RADIO SERVICE

Does your radio give out with squeals and grunts? Then call the serviceman who displays the Sylvania sign. Because your radio needs expert care, the kind this fellow is trained to give. He has Sylvania test equipment to root out trouble spots . . . high-quality Sylvania radio tubes to bring you the crystal-clear reception you want. Hear your old set perform as it did the day you bought it. Get it fixed at the Sylvania sign of dependable service.

SYLVANIA RADIO TUBES
PRODUCT OF SYLVANIA ELECTRIC PRODUCTS INC.

HERE'S WHAT YOU GET IN THE SYLVANIA KIT:



1 POST CARDS. You get 4 sets of Postal Card Mailings—one for each month in the campaign. They're in 3 colors—imprinted with your name and address! You pay *only* the government postage on each card—that's *all* you pay for the entire kit! EVERYTHING ELSE IS FREE.

2 WINDOW DISPLAYS. You get 2 Window Displays—featuring the same illustrations as the Sylvania national ads. 3-dimensional—4 colors—2 by 3 feet. 2 COUNTER CARDS, too, 12 by 18 inches.

3 AD MATS. You get 4 Newspaper Ad Mats—two sizes for each 2-month period. Sizes are one and two columns wide, 7 inches deep. Easy way to tie your local newspaper advertising in with Sylvania's national ads!

4 STREAMERS. You get 2 Window Streamers—in 2 colors—11 by 26 inches. Like the other items in the campaign, Streamers feature *both* radio *and* television service.

5 RADIO SPOT ANNOUNCEMENTS. You get 4 booklets of Radio Spot Announcements—one for each of the 4 months in the campaign. When you've planned your schedule, just hand the spots to your local radio station—they're all ready to use!

Mail coupon today for full details on the complete campaign!

Sylvania Electric Products Inc.
Advertising Dept. R-2012, Emporium, Pa.

Please send full details of your new 1950 January, February, March and April Service Dealer Campaigns.

NAME .....

COMPANY .....

ADDRESS .....

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

RADIO TELEVISION SERVICE
SYLVANIA RADIO TUBE
Authorized Dealer

DECALS. You get as many Decals as you need—in 8 or 12 inch diameter. Your choice of wording—RADIO SERVICE or RADIO TELEVISION SERVICE. Sylvania's ads make these Decals nationally known—cash in on their familiarity!

SYLVANIA ELECTRIC

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

Representatives for Boland & Boyce Publications: Radio Distribution and Maintenance, Radio Data Book, Video Handbook, Radio & Television Library Set, Technical Manuals.

THOMAS A. BYRNES
Director of Field Services
460 Bloomfield Ave., Montclair, N. J.

•

WILLIAM E. TUCKER
Manager, Book Sales
460 Bloomfield Ave., Montclair, N. J.

•

VICTOR M. TURNER
Manager Circulation Sales
460 Bloomfield Ave., Montclair, N. J.

•

ROBERT STANG
79 Storer Ave., Pelham 65, N. Y.
Area 1 & 5: N. Y., N. J., E. Pa., Md., Del., D.C.

•

ROY M. HOWARD
Midwest Sales Co. Mfgs. Agents
Hanna Bldg., Cleveland 15, Ohio
Tel: Main 9392
Area 2: W. Pa., W. Va., Ky., Ohio, Ind., Mich.

•

NORMAN R. MACINNIS
53 Youle St., Melrose 76, Mass.
Tel: Melrose 4-0879
Area 4: New England

•

FLOYD FAUSETT & SON
1347 Beecher Street S. W., Atlanta, Ga.
Tel: Cypress 4646
Area 6: E. Tenn., S. C., N. C., Va., Ala., Fla., Ga.

•

MICHAEL ALFEND
3100-06 Choutean Ave., St. Louis 3, Mo.
Tel: Sidney 7616
Area 7: E. Nebr., W. Iowa, Kansas, Mo., S. Ill., N. Ark.

•

AL J. RISSI
1169 S. Bway., Los Angeles 15, Calif.
Tel: Prospect 2105
Area 10: California

•

FRANK WEDEL CO.
8041, 12 Ave., N.E., Seattle 5, Wash.
Area 11: Wash., Ore., Idaho, Mont.

•

GEORGE H. PIERCE
715 Camp St., New Orleans 12, La.
Tel: Raymond 9009, Magnolia 2643
Area 12: S. Ark., La., W. Tenn., Miss.

•

FRANKLIN Y. GATES
Gates Co.
200 South Main, Salt Lake City 1, Utah
Tel: 9-1101
Area 14: Wyo., Utah, Colo., Nev., N. M., W. Nebr.

•

TELETRONIC CORP. LTD.
1171 St. James St., N.W., Montreal 3, Que., Canada

MERCHANDISING CORNER

by Victor M. Turner

WITH this issue we inaugurate the Merchandising Corner, a new column devoted to the presentation of sales and merchandising ideas. Its purpose is to keep you informed of the latest merchandising ideas, such as sales aids, displays, advertising campaigns, etc. It will contain many hints to increase your business.

You are invited to send in your questions on merchandising. The writer will be happy to answer them. In order that all may benefit, questions of general interest will be published, together with their answers.

To begin with, let's take up . . .

TV Display

A TV receiver is its own best salesman when it is in *proper operation.* By taking a short stroll around almost any neighborhood we can find several sales and service organizations featuring television sets in their windows, but very few who have one or more turned on. You will also notice that people invariably take more than a passing interest in the store window featuring a video broadcast. Don't expect a crowd to gather in front of your store just because your set is on. That may have happened a few years ago, but is no longer true today. But that doesn't mean that your display has no effect. A passerby by merely glancing at a well-focused and perfectly tuned television set in your window becomes subconsciously susceptible to being sold on just such a set. And if he already owns one he may wish to get his receiver to operate as well as the one you have in the window. It won't be long before he comes in for a service job.

Window display men have always been racking their brains for a better moving device to attract the passerby. TV is providing the technician with one of the best. Let's use it. The small cost of keeping a receiver in perfect operation in the window will pay off handsomely.

Du Mont Sales Training Program

Walter L. Stickel, national sales manager for the television receiver sales division of Allen B. DuMont Laboratories, 1000 Main Ave., Clifton, N. J., announced the inauguration of a training program for their salesmen, distributors, and dealers.

The program is the result of a 10-months survey of the requirements for selling TV to the public —how to translate technical language to the prospective customer, etc. A six weeks sales training drive opened the program during which time a 64-page booklet containing the essence of the program was distributed. Periodic refresher meetings are planned as follow-ups to the program, as well as a new series of point-of-sale counter displays.

New Littelfuse Display Case

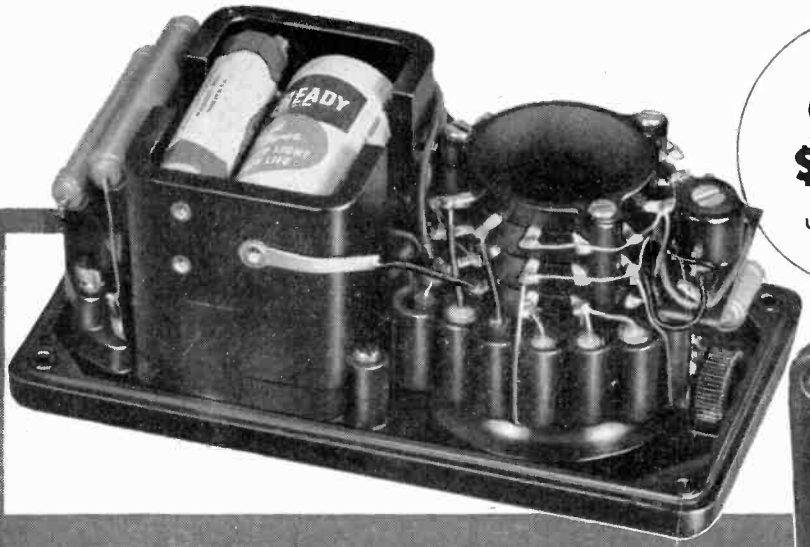
A handsome new plastic display case for the Littelfuse electronic assortment of fuses and holders has been announced by Robert Abbott, adv. mgr. of Littelfuse, 4757 N. Ravenswood Ave., Chicago 44, Ill. The plastic box is transparent for quick visual inventory check. It is designed to contain the fuses and holders most frequently used by service-dealers and also has several handy compartments for storing screws, nuts, bolts, and other easy-to-lose items.

Free Platter Kits from RCA to Dealers

To spur point-of-sales demonstrations of its 45-rpm music reproduction system, RCA Victor, Camden, N. J., is making available to its instrument dealers free kits of sample 45-rpm records for each 45-rpm phonograph sent to dealer.

The kit contains seven records, each in a different color to illustrate the color code used to identify each type of music. The object of these kits is to facilitate dealer demonstrations. The records may then be passed on to customers purchasing the instrument. Record kits for instruments already in dealer inventory may be obtained through arrangement with distributors.

For additional information about any of the above items, address your inquiries to Victor M. Turner, RADIO DISTRIBUTION & MAINTENANCE, *460 Bloomfield Ave., Montclair, N. J.*



MODEL
666-R
$24.50
U. S. A. Dealer Net

A *New* TRIPLETT POCKET-SIZE VOLT-OHM-MIL-AMMETER

with self-contained Resistance Ranges to 3 Megohms

Note the special features of this New handy-size tester

(1) RESISTANCE RANGES from 0-3000 Ohms (.5 Ohm low reading) to 3 Megohms, self-contained. Also A.C.-D.C. Volts to 5000, 10 ranges; and 3 Direct Current ranges.

(2) ENCLOSED SELECTOR SWITCH, molded construction. Keeps dirt out, and retains contact alignment permanently.

(3) UNIT CONSTRUCTION - Resistors, shunts, rectifier, batteries are housed in a molded base integral with the switch. Direct connections without cabling. No chance for shorts.

(4) RESISTORS are precision film or wire-wound types, each in its own compartment.

(5) BATTERIES EASILY REPLACED - Positive grip coil spring assures permanent contact. Makes replacement of batteries a simple procedure.

(6) STREAMLINED STYLING. Handsomely designed, pocket-size case. Only two controls, both flush with panel.

For Detailed Information
See your Radio Parts Distributor or write . . .

RANGES:

D.C. VOLTS: 0-10-50-250-1000-5000, at 1000 Ohms/Volt

A.C. VOLTS: 0-10-50-250-1000-5000, at 1000 Ohms/Volt

D.C. MILLIAMPERES: 0-10-100, at 250 Millivolts

D.C. AMPERES: 0-1, at 250 Millivolts

OHMS: 0-3000-300,000
. . . . . (20-2000 at center scale)

MEGOHMS: 0-3
. . . . . (20,000 Ohms center scale)

(Compensated Ohmmeter circuit for greatest accuracy over wide battery voltage variations.)

Precision first . . . to Last

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

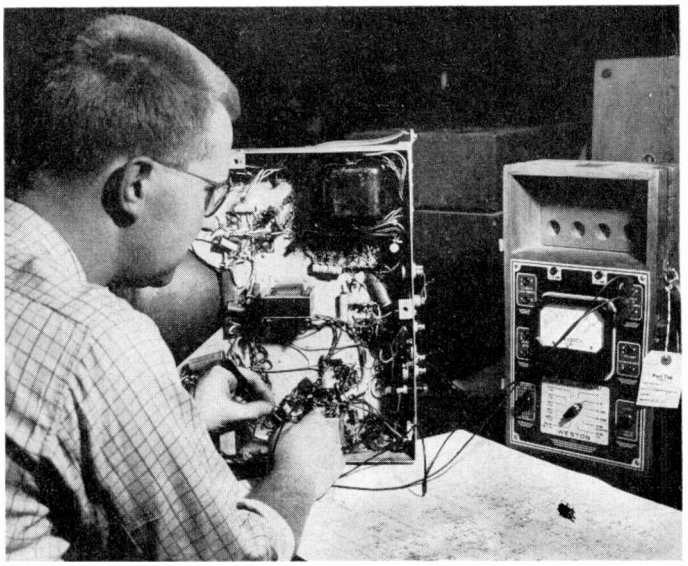
In Canada: Triplett Instruments of Canada, Georgetown, Ontario

TRIPLETT

by Cyrus Glickstein
American Radio Institute

First in a series of articles dealing with latest troubleshooting techniques

A review of up-to-date methods for



Courtesy RMA

Troubleshooting TV Receivers

AN experienced radio serviceman can often listen to a defective receiver and from the sound know where to look for the bad part. But when he doesn't know immediately where the trouble is, he usually has a systematic way of going about finding it. Generally, he will try first to locate the defective stage and second to locate the defective component.

Exactly the same procedure is followed in television, except that, because of the larger number of circuits, one preliminary step is necessary. Television receiver servicing usually involves three basic steps, when the fault is not immediately evident:

1. Locate the defective section.
2. Find the defective stage.
3. Locate the defective component.

For each of the 3 steps mentioned here, the TV serviceman has definite tools at his disposal.

In step #1, locating the defective section, he usually relies on his eyes and ears. That is, he observes the indications on the screen and listens to the sound. These indications, plus his knowledge of the block diagram of a given set, are generally enough to localize the trouble to a definite section. To confirm his suspicion and to make certain it is not caused by an incorrectly set control, it will usually be necessary to manipulate various controls on the receiver to watch and hear the effect.

For example, suppose we take the simplified block diagram of an electromagnetic type of receiver using the fly-back high voltage system. There are 7 main sections to the receiver: (Fig. 1)

1. Front end
2. Video strip
3. Audio strip
4. Sync circuits
5. Sweep circuits
6. High voltage system
7. Low voltage system

The block diagram of a TV receiver is simply a roadmap of the path a signal takes in going through the receiver and of how the various stages of the set are related to each other. Where there is trouble, as indicated on the screen or loudspeaker, consulting the roadmap—either directly or mentally—shows which road is torn up.

Using the block diagram and analyzing the information on the screen are so important in trouble-shooting that separate articles will discuss each of these points in detail.

Once the trouble has been localized to a definite section, the next main step is tracking it down to a particular stage in that section, since most sections consist of several stages. Here, the serviceman has a choice of methods to help him—and the choice will usually depend on the nature of the fault and which method is most convenient and fastest. (See Table I) These methods include:

1. Tube tests
2. Disturbance tests
3. Signal injection
4. Signal tracing
5. Voltage and resistance checks (where the section consists of 1 or 2 stages)
6. Visual checks (charred or shorted components, broken leads, etc.).

Tube Tests: When the trouble has been tracked down to a given section, the first step after that is usually to examine each tube in that section. If one is not lit (or if a metal tube, is felt and is cold after the set has been on for a time) we very likely have found the trouble. As in radio servicing, tubes are the first items to be suspected because they provide a large percentage of failures.

It may even be advisable, although all tubes in the suspected section light up, to replace each one with a known good tube and then re-check operation, before taking the chassis out of the cabinet. If that does not clear up the fault, one of the other methods may then be tried.

Disturbance Tests:

To find a dead or very weak stage in the signal circuits, a homemade signal (disturbance test) is injected instead of using a signal generator. If the stage passes through

the disturbance signal, it is considered O.K. If not, the defective stage has been found.

To check the last half of the video strip: 6.3 v. a.c. is taken off any hot filament pin and fed through a .1 mmf condenser to the grid of each video amplifier and to the detector load resistor. In each case, a 60-cycle signal should be seen on the screen (broad horizontal black and white bar) if the stage is functioning.

To check the video i.f.'s: Screwdriver scratched across each grid of the i.f.'s beginning with the last and moving forward. Flashes of light should be seen on the screen.

To check the last half of the audio strip: The finger on top of the volume control should give a 60-cycle hum in the speaker. If not, there is trouble here. 6.3 v. a.c. can be fed through a .1 condenser to the grid of the power tube and grid of the voltage amplifier in turn to check if each is operating. Of course, 60-cycle hum should be heard in the speaker if they are functioning.

To check audio i.f.'s: Scratch grids or remove preceding tube several times. Noise should be heard in the speaker.

To check front end: Disconnect antenna and draw screwdriver across antenna terminals. Noise should be heard in speaker and flashes of light seen on the screen if front end is working.

Also, similar tests can be used to check the sweep circuits and the high and low voltage systems.

To check the operation of the sweeps: Saw-tooth output can be fed to the grid of the voltage amplifier in the audio section through a coupling condenser. Both the vertical (60 cycles) and the horizontal (15,750 cycles) are audio frequencies and should be audible if the saw-tooth oscillators are operating. Varying the hold controls, especially the horizontal, should vary somewhat the pitch of the audio output.

To check the high voltage output: The rubber cap with the high voltage output is held very carefully at the base with one hand and brought close to its connection point on the CRT. A thin arc should appear when the cap is about ¼" away. If no arc appears, there is no high voltage D.C. output.

To check the low voltage, B+ is shorted to ground with a screwdriver. The type of spark will indicate roughly the amount of B+.

Signal Injection:

This method is also used to find a dead or weak stage in the the signal circuits. The procedure

→ to page 24

TABLE I - METHODS OF LOCATING DEFECTIVE STAGE

METHOD	TO LOCATE DEF. STAGE IN FOLLOWING SECTIONS	EQUIPMENT NECESSARY	ADVANTAGES	INCONCLUSIVE UNDER FOLLOWING CONDITIONS OR IN FOLLOW. STAGES
Disturbance Tests	All except sync	1 Screwdriver 2 1 condenser & clip lead.	Quickly localizes a dead or very weak stage using a minimum of test equipment.	1. Does not give very clear-cut indication in video i-f stages. 2. Does not check a) distortion, mistuning b) non-linearity in sweeps.
Tube Tests	All	Known good tubes for substitution, or tube checker	Excellent for finding defective tube.	R-F oscillator tube switch or check may not be conclusive. Several may have to be tried
Signal Injection	1. Front End 2. Video Strip 3. Audio Strip	A-M Signal Generator (plus output meter for gain checks). Also, sweep generator plus scope for video i-f check.	To locate dead or weak stage in any of 3 sections noted. To check mistuning & gain in video i.f.'s.	If injected signal is too large when making gain checks, result will not be accurate because of overloading stages under test.
Signal Tracing	1. Part of video strip (video det. & video amplifiers. 2. Sync. 3. Sweeps	Oscillograph	To check for dead, very weak, or low gain stage; distortion; non-linearity in sweeps.	Low output cannot be checked unless the scope is first calibrated by using test signal of known amplitude.
Voltage & Resistance Checks	All	ac-dc voltmeter & ohmmeter	Most useful single servicing method, particularly in last step: Finding defective component.	VTVM necessary to measure negative voltage on r-f oscillator grid. Time consuming when section consists of many stages. Will not show all defects
Visual Checks	All	Eyes	Time saver when fault is visible.	Auxiliary method: not all faults show up visually; when they do, other checks are usually necessary, since visible fault may be caused by another defect not visible.

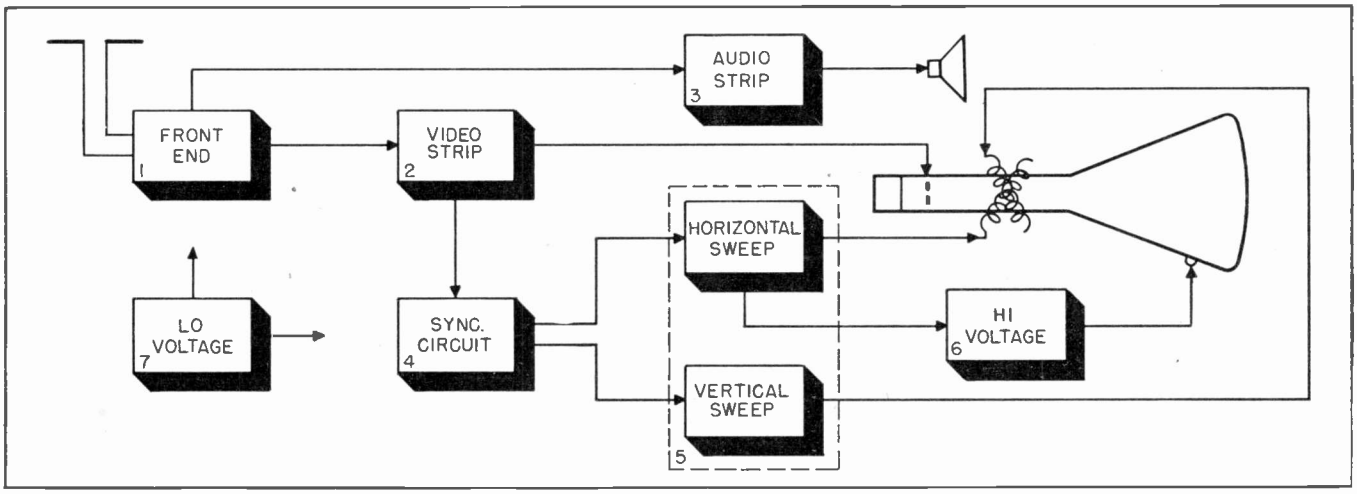
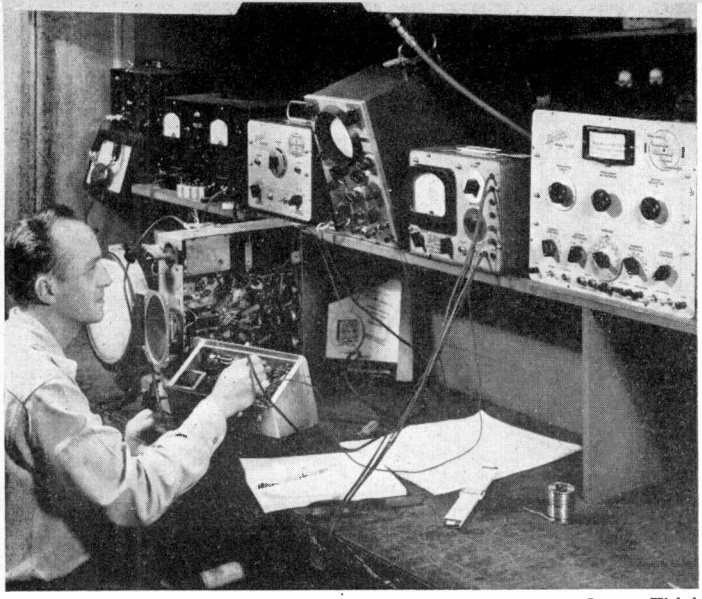


Fig. 1 Block diagram of the seven main sections of the television receiver. A breakdown as this makes troubleshooting easier.



Courtesy Hickok

f-m and tv test equipment

requirements which must be met by a good

CATHODE RAY OSCILLOGRAPH

IN the previous articles on the cathode-ray oscillograph, the Y-axis, X-axis, and sweep generator circuits were covered. To complete the discussion of this instrument, the power supply circuits, which furnish the operating voltages for all the sections of the oscillograph and for the cathode-ray tube, are described. At the completion of the circuit description, techniques of employing the oscillograph for servicing f-m and television receivers are outlined.

Low-Voltage Power Supplies

The oscillograph may have several low-voltage supplies for the deflection amplifiers and other circuits. Often all of them are derived from the same transformer. The supply will usually have positive and negative sections, either or both of which may be regulated or unregulated.

The supplies which furnish power to the first stages of the X and Y amplifiers must be well filtered and regulated. Spurious signals or power-line fluctuations appearing in the power supply potential would be amplified by subsequent stages and would appear as deflections superimposed upon the pattern on the cathode-ray tube screen.

A typical regulated, low-voltage power supply is shown in Fig. 1. Tube V1 is connected in a full-wave rectifier circuit. For the positive voltage, the output is taken from the filament and fed to a filter network consisting of capacitors C1, C2, C3, and chokes L1 and L2. Connected across the output of the filter is a resistor, R1, in series with a gas-filled, voltage regulator (VR) tube which maintains a constant voltage between its plate and cathode, despite changes in currents flowing through it. The resistor R1 must be used in series with the VR tube to adjust the current to the tube's operating range (5 to 40 ma).

The regulator circuit operates in the following manner. Suppose a type VR 150 tube is used. It maintains a constant voltage of 150 volts across its terminals. This constant voltage then becomes the output of the power supply and is fed to the amplifier circuits. If the line voltage suddenly increases, the d-c voltage at the output of the filter circuit rises. This voltage also appears across R1 and the VR tube, and increases the current flowing through the regulator. However, despite the change in current, the voltage across the tube remains constant. Thus, no fluctuations in d-c voltage are produced, despite changes in the a-c line voltage.

Some oscillograph circuits also require a negative voltage. In the power supply shown in Fig. 1, a separate rectifier tube and filter circuit is used to obtain a negative voltage. The rectifier is connected in a half-wave circuit and the rectified negative d-c is taken from the plate of the tube. An RC filter, consisting of C4, C5, and R2, is employed. The negative voltage is regulated with the same type of VR tube circuit found in the positive supply.

High-Voltage Power Supply

To operate the cathode-ray tube, accelerating potentials ranging from 1000 volts up to 3000 volts or more are applied to the accelerating electrode. The high-voltage is often derived from a separate, secondary winding in the transformer of the low-voltage supply. This winding feeds a half-wave rectifier, which is ample because filtering requirements are not nearly as strict as for the low-voltage supplies. The rectifier output is usually filtered by a resistance-capacitance combination. Resistance can be used in this filter because the current furnished by the high-voltage supply is very small, and the resultant drop across the resistor is not large.

A typical high voltage power supply is shown in Fig. 2. This supply furnishes a negative 1400 volts. The reason for the negative high voltage will be explained later. Note that the high voltage winding is an extension of the low-voltage, secondary winding. Also apparent in this typical oscillograph power supply is the unregulated +390 volts, tapped ahead of the regulator tube. This higher voltage is used for the sweep generator and other circuits where regulated potentials are not necessary.

- **For signal tracing horizontal sweep circuits: X-axis amplifier should have high freq. response uniform to approximately 2 Mc.**
- **For signal tracing vertical sweep circuits: Oscillograph should have good 60-cycle response, sensitivity of 0.1 volts/inch.**
- **For aligning r-f tuners: Oscillograph should have high gain and good low frequency response.**
- **For aligning video amplifiers: Y-axis amplifier should be uniform from 5 cps to 4 Mc, have sensitivity of about 0.1 rms volts/inch.**
- **For aligning video, audio i-f's & detectors: 'scope should have good low freq. response, sensitivity of 20 rms millivolts/inch.**

Final article on CRO requirements lists specifications for service needs

by Morton G. Scheraga

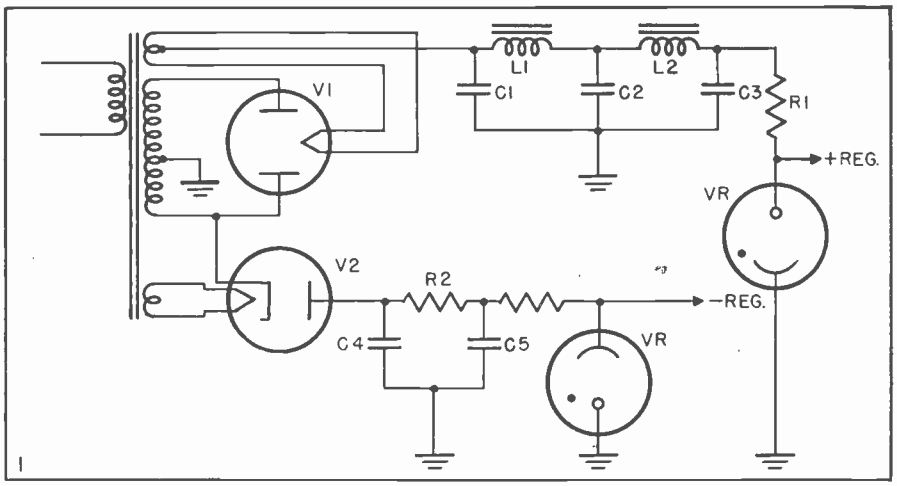
Allen B. DuMont Labs.
Co-author *Video Handbook*

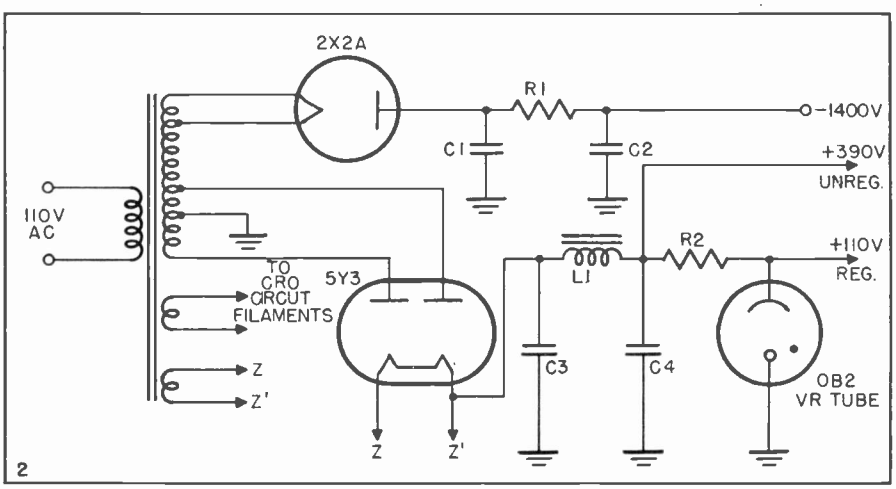
Cathode-ray Tube Circuits

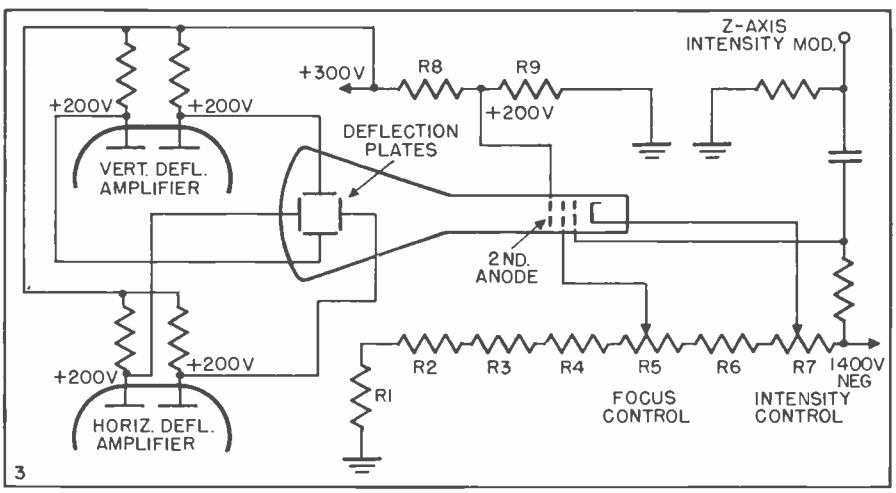
The voltages that are required for the cathode-ray tube are tapped from the low and high voltage power supplies. The manner in which the power supply and deflection circuits are connected to the CRT is shown in Fig. 3.

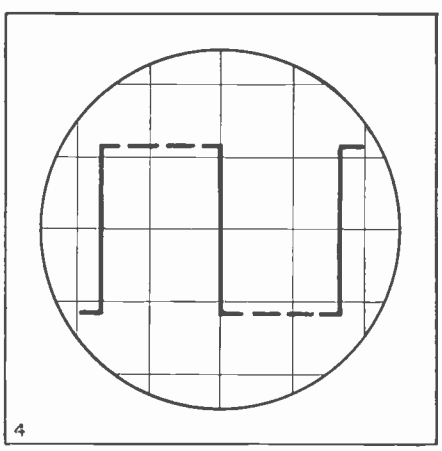
In cathode-ray oscillographs, the accelerating electrode (second anode) and deflection plates must operate at about the same potential in order to avoid setting up a disturbing electrostatic field which would distort the electron beam. Since external signals are often connected directly to the deflection plates, these plates are operated near ground potential to reduce the hazard of shock when connecting to them. Therefore, the second anode is also operated near ground potential. In order to obtain the necessary high potential difference between the second anode and cathode, the cathode must be operated at a negative potential with respect to the second anode. This explains the need for a negative high voltage supply. Another way of stating this is that, since the cathode is at a high negative potential, the second anode (which must always be more positive than the cathode in order to pull the electrons toward the screen), although at ground potential, is positive with respect to the

→ to page 31









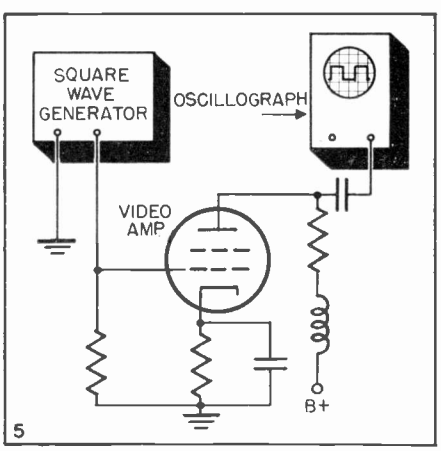


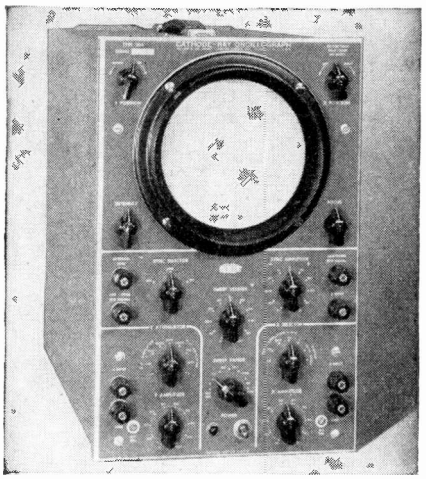
Fig. 1 A gas-tube regulated low voltage power supply.

Fig. 2 High and low voltage power supplies for a cathode ray oscillograph.

Fig. 3 Cathode-ray tube circuit.

Fig. 4 10-cycle square wave with 60-cycle timing signal superimposed.

Fig. 5 Connection used to adjust video amplifier using square wave generator and oscillograph.



Just Announced:

SUCCESSOR TO THE 208-B

new instrument features a-c and d-c amplifiers, base line expansion, several other improvements

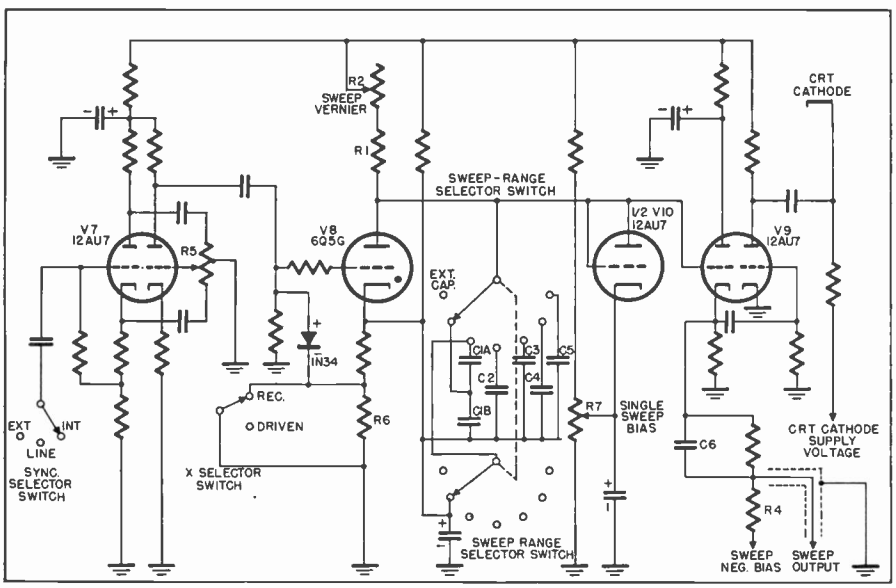


Fig. 1 Shown are the sweep circuits of the types 304 and 304-H oscillographs. Both expanded and driven sweeps are available.

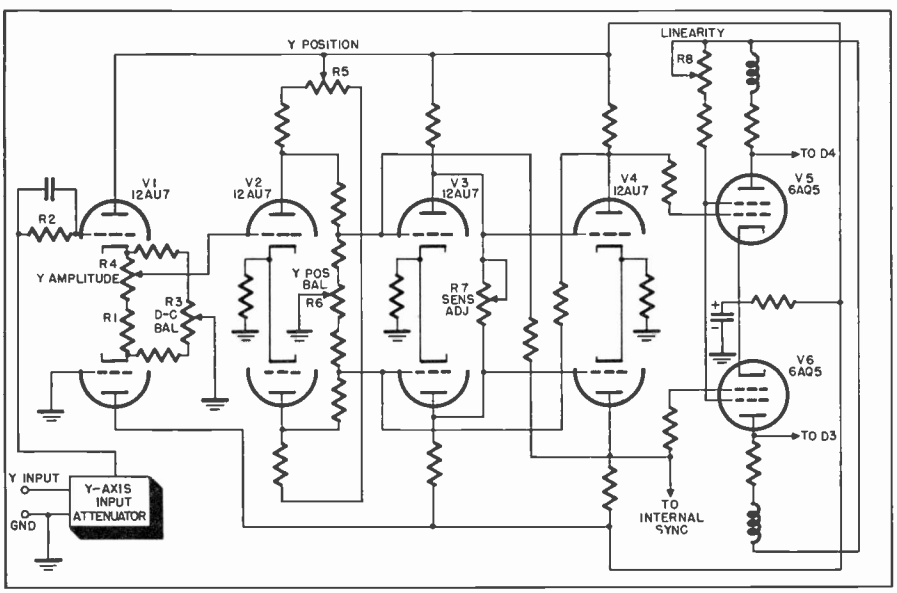


Fig. 2 Y-axis amplifier circuits of the instruments.

MANUFACTURERS of test equipment keep their engineering staffs constantly busy with work on improved instruments. This is especially true for equipment used for television maintenance. The rapid development of TV (the number of new TV circuits developed during the past few months exceeds those designed for f-m over the last few years) makes better service instruments actually necessary.

The new oscillograph models, type 304 and 304-H, placed on the market by DuMont Labs., constitute a decided advance over the familiar type 208-B, work horse of the industry for many years. While retaining all the features of the earlier model, as well as its price, the new instrument incorporates several new circuits which promise to make it an even more popular piece of test equipment. This article will discuss some of these new features.

Sweep Circuits

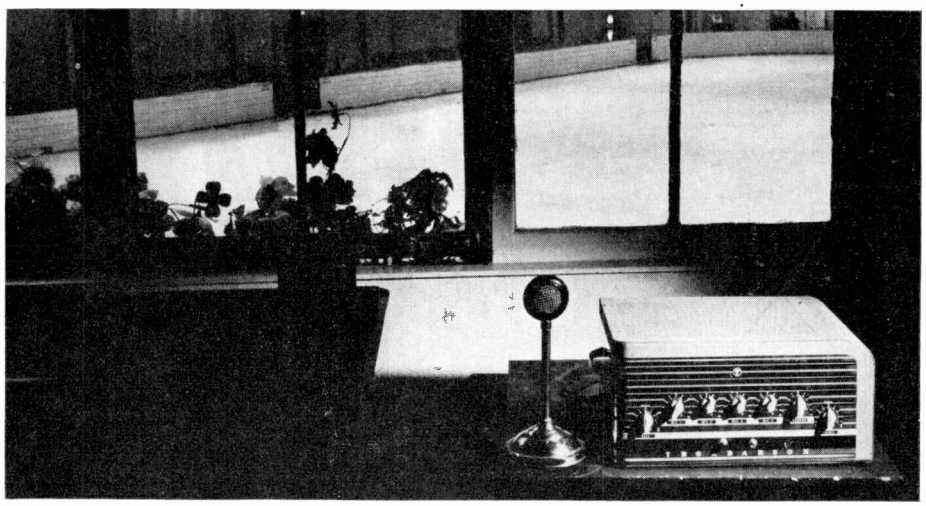
The new model has *both* recurrent and driven sweep, variable from 2 to 30,000 cps. As you know, in recurrent sweep, sawtooth voltage is generated continuously, even when no synchronizing signal is applied. With driven sweep circuits, the sawtooth generator does not oscillate until fired by the incoming signal (these circuits were discussed in the November 1949 issue of RADIO DISTRIBUTION & MAINTENANCE, *CRO Horizontal Deflection Systems).*

The sweep voltage is generated by the gas triode V8 in Fig. 1. The plate voltage of this tube is obtained through resistors R1 and R2. Capacitors C1 to C5, selectively connected in parallel, determine the sweep frequency range. The output of the

→ to page 32

12 steps make for easy

P-A FAULT LOCATION



by John B. Ledbetter

When starting on a p-a job, the problem is very often where to begin. These preliminary steps will make it easier

THE increased use of public address systems has placed sales, installation, and maintenance of this equipment in the upper category of the electronic industry, and thereby provided an expanding lucrative field for the enterprising sales and service organization. As in radio receiver servicing, there are a number of short cuts and service methods which may be employed to save time and labor.

In this article we will discuss some of the everyday service problems peculiar to the p-a field and the various preliminary and routine testing methods which may be employed.

Although the essential test equipment in checking inoperative amplifier systems will consist of a tube checker and volt-ohm-milliammeter, audio oscillator and 'scope are also recommended. Other pieces of equipment which will be of value in p-a work are a condenser analyzer, vibrator checker, v. t. v. m., and signal tracer. Most shops have the required test equipment and need not invest in more. Others, not so equipped will find most of the instruments mentioned in the low and medium price field. Since each instrument does more than its share in speeding up repairs, it should be included as soon as possible.

In the course of checking an amplifier, a great deal of time can be saved by looking for the most obvious defects first. Intermittent operation, for example, may be due to a poorly soldered joint or faulty mechanical connection, yet may be completely overlooked until valuable time has been consumed in checking voltages, tubes, and components. The following tests, in the order described, are about as simple and efficient as any encountered in present-day servicing: Before applying voltage, make a rapid but thorough visual analysis. Some of the things to look for are: (1) a broken, frayed, or worn line cord, (2) broken or loose connection at the a-c plug, (3) a loose or blown fuse and corroded fuse terminals, (4) defective speaker leads, plug, etc., and (5) a shorted power transformer. The latter is usually evidenced by overheating (check by feel or smell). A blown fuse often indicates a shorted line cord or power transformer and should not be replaced until these have been checked for internal or external grounds or shorts. If these appear to be normal, check the fuse for correct rating. It may have been replaced at one time with a fuse of insufficient current rating to handle normal peak surges.

Turn on Amplifier

After this preliminary visual check, the amplifier should be turned on, with the speaker or normal load in place. The first point to examine is the rectifier tube. If its filaments are lighted and the plates appear normal, proceed to the output stage. If the filament is open or burned out, however, the trouble has at once been isolated. In like manner, red plates in the rectifier tube are an indication of a shorted input filter condenser. If this is the case, turn the amplifier off immediately. If the plates glow a dull red,

→ to page 26

PRELIMINARY TESTING

1. Inspect line cord, plug, and fuse.
2. Turn amplifier on.
3. Inspect condition of rectifier tube.
4. Examine tubes for burnouts.
5. Check transformer for overheating.
6. Listen for speaker hum.
7. Check speaker field "pull".
8. Pull output tubes out, listen to noise.
9. Pull out other tubes, listen to noise.
10. Open gain controls, listen for noise.
11. Touch control grid for click or hum.
12. Check microphone and cable.

Receiver Line incorporates several

NEW CIRCUITS

Keep up-to-date and posted on the latest in TV circuits

ONE of the outstanding features of the 1950 line of DuMont television receivers is the new 19 inch metal-cone tube. This tube, identified as the Type 19AP4, has thus far been manufactured only by DuMont and is featured exclusively in that company's sets. The Type 19AP4 replaces the all glass Type 20BP4 which was formerly used in DuMont's large-screen, direct-view models.

The 19 inch metal-cone tube, shown in Fig. 1, incorporates several new design details which improve its performance over that obtained with the Type 20BP4. A bent-gun ion trap is used in the Type 19AP4 to prevent discoloration of the tube screen due to ion bombardment. The bent-gun ion trap receives its name by virtue of the fact that the second anode of the gun is actually bent as shown in Fig. 2. The electron and ion beam is aimed by bending the gun so that the ions will be trapped by the anode barrel structure, and the electron beam is then brought to the axis of the tube by the action of a single magnetic field.

Because of the space saved by eliminating the double beam-bending magnet as used for conventional ion trap designs, the neck of the tube can be made shorter. This permits sealing the gun closer to the bulb without restricting neck length for the focus coil and yoke. Because the beam is bent only once, focused spot distortion is minimized. The short neck and 66° wide angle metal cone give the Type 19AP4 an overall length of 21½ inches, seven inches less than the Type 20BP4, and one inch less than most smaller diameter, sixteen inch metal-cone tubes.

The plate-glass face used on the Type 19AP4 is of uniform thickness and is covered with an anti-glare coating to reduce reflections from the viewing surface of the tube under conditions of high ambient lighting. A picture of 203 square inches is obtained on the large screen. An overall accelerating potential of 13,000 volts is used on the tube to provide a bright, sharply focussed image.

High sensitivity and stability

In addition to introducing the 19 inch tube in some of the receivers in its new line, DuMont has concentrated on improving the sensitivity and stability of all its models so that good reception is obtained even in weak signal areas. Contributing greatly to the stable operation of the higher-priced sets is a new type of self-regulating power transformer which is manufactured for DuMont by Sola Electric. The use of this regulating transformer makes the set immune from line bops and flicker. The d-c output voltage derived from the transformer remains constant within ±2%, despite variations of as much as ±10% in a-c line voltage. This means that the picture size, focus, contrast, brightness, position, and synchronization do not change with normal fluctuations of the line voltage.

Also contributing greatly to the stability of synchronization is a new type of "narrow-band sync" circuit that is incorporated into several of the models. This circuit even improves upon the performance of the "flywheel" sync circuit which is used in the horizontal sweep section. The primary aim of the narrow-band sync circuit is to remove noise signals, such as those due to ignition systems or neon signs, before they reach the sync circuits. In conventional circuits, the sync signals are separated from the composite video signal that is tapped from the video detector or one of the video amplifier stages. Any noise which overrides the video signal is also fed to the vertical and horizontal sync circuits, and makes them unstable in weak signal areas or in crowded urban areas where noise signals are great.

In the new DuMont circuit, a separate narrow-band video i-f amplifier is added for the sync circuit itself.

→ to page 34

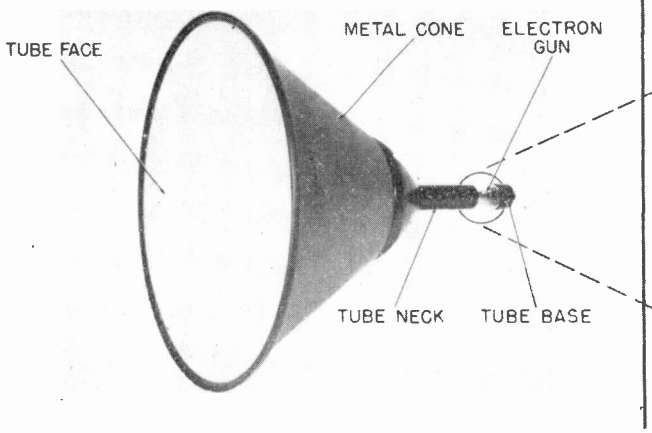


Fig. 1 Photograph of the 19-inch metal cone picture tube. Note that the neck is much shorter than that of earlier models.

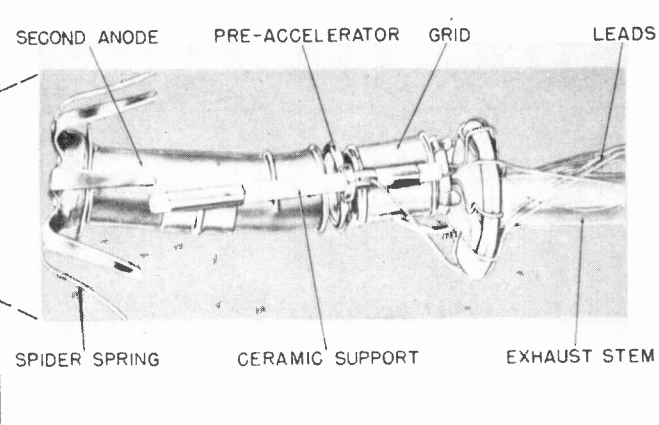


Fig. 2 Close-up of the bent-gun ion trap. Use of bent second anode barrel structure eliminates double beam bending magnet.

the RD&M Survey

Readers Pick Most Important Television Test Equipment

Find VTVM, 'Scope, Sweep Generator Essential

SOONER or later, most technicians must ask any or all of these questions: Which test instruments shall I buy? How much shall I invest in test equipment? How long will it be before my service instruments become obsolete?

These questions have become increasingly important with the growth of television, and they are being asked extensively throughout the country today.

In this month's survey, we made an attempt to find the answer to these questions. The results will be of particular interest to those who have just entered the television field, or are about to do so. At the same time, they will also hold important lessons for those technicians who have done television receiver maintenance for some time.

As a check on the value of the results, we included a question in the survey asking for the length of time the respondents had been in the service business. On the average, this was eleven years. The replies to the survey are therefore based on extensive experience on the part of the respondents.

Each piece of test equipment was classified into one of three categories: (1) those pieces which were considered **essential**; that is those without which, in the opinion of the respondents, proper servicing could not be accomplished. (2) instruments which, though **useful**, were **not** regarded as **essential.** This group included all those instruments which can be added to some advantage, but will not pay for themselves in all cases. And (3) those which were considered **not useful** by the respondents: that is, those which the technician did not feel contributed anything to good servicing work.

Which Instruments to Buy

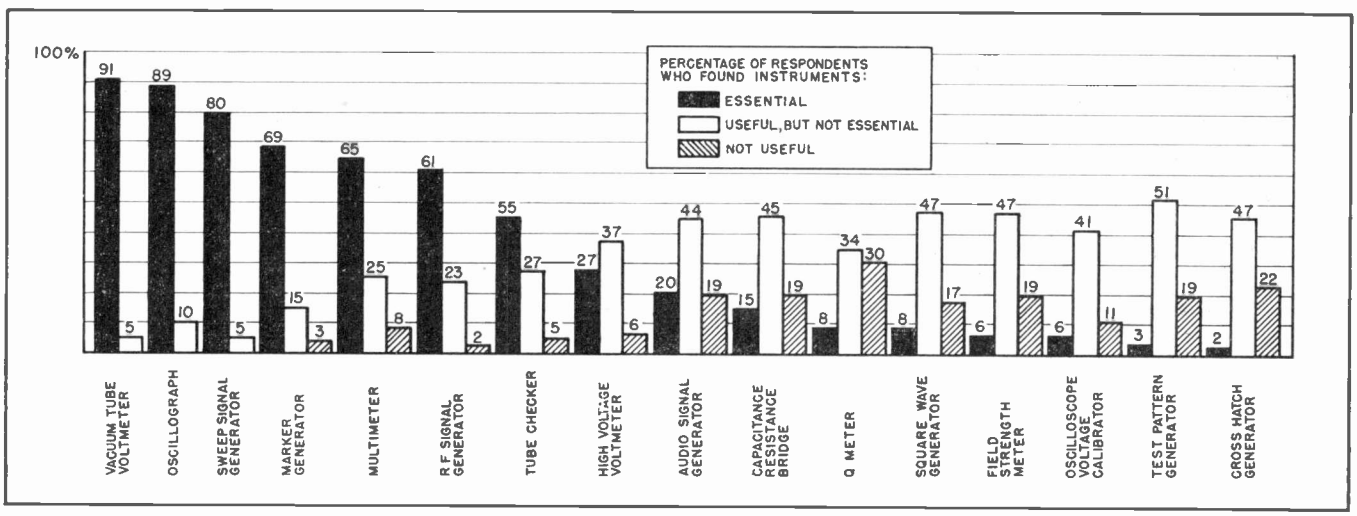
The instruments found **essential** by the vast majority of the respondents were the following: Vacuum Tube Voltmeter, Oscillograph, Sweep Signal Generator, Marker Generator, Multimeter, R-F Signal Generator, and Tube Checker, in that order. The VTVM was considered **essential** by 91% of the respondents. This figure decreased to 55% for the Tube Checker. It should be pointed out here that the question referred to servicing needs only. Tube checkers are of course necessities in shops which sell tubes. The exact percentages for the various instruments are shown in the accompanying table. From that table we can clearly see which instruments are absolute requirements for good television servicing.

The VTVM, the Oscillograph, and the Sweep Signal Generator constitute the top group. We may assume that Marker Generator should be included here too. Undoubtedly it was listed as **essential** by only 69% of the respondents because it is incorporated as part of other instruments in many cases.

Although the percentages go down rather drastically after Marker Generator, it is fairly safe to say that all instruments above the 50% mark may be considered **essential** to proper service.

Among the group of instruments considered **useful, though not essential,** we find Test Pattern Generator, Field Strength Meter, Square Wave Generator, Cross Hatch Generator, Capacitance - Resistance Bridge, Audio Signal Generator, and Oscilloscope Voltage Calibrator were high. The exact percentage figures

→ to page 28



"A" BATTERY
ELIMINATORS

for DEMONSTRATING AND TESTING AUTO RADIOS

New Models . . . Designed for testing D. C. Electrical Apparatus on Regular A. C. Lines. Equipped with Full-Wave Dry Disc Type Rectifier, Assuring Noiseless, Interference-Free Operation and Extreme Long Life and Reliability.

NEW VIBRATOR GUIDE FREE

ATR

AUTO RADIO VIBRATORS

A Complete Line of Vibrators . . .

Designed for Use in Standard Vibrator-Operated Auto Radio Receivers. Built with Precision Construction, featuring Ceramic Stack Spacers for Longer Lasting Life.

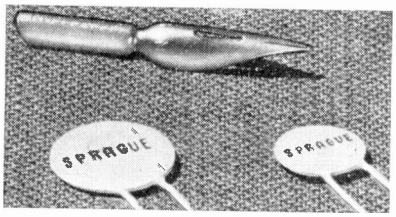
✓ NEW MODELS ✓ NEW DESIGNS
✓ NEW LITERATURE

ATR "A" Battery Eliminator, DC-AC Inverters, Auto Radio Vibrators

See your jobber or write factory

AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1931
SAINT PAUL 1, MINNESOTA—U.S.A.

the INDUSTRY Presents

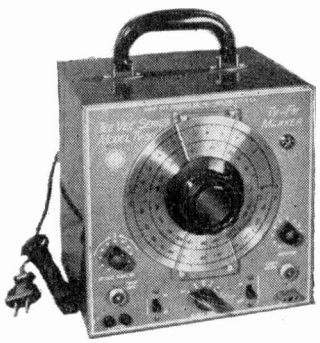


DISC CERAMIC CAPACITORS

Wafer-thin disc ceramic capacitors have just been introduced to the service industry by Sprague. They consist of half-dime or dime-sized ceramic plates of high dielectric constant, with silver electrodes fired on both sides of the disc. Leads are coated with moisture resistant resin. This construction makes the capacitors fit neatly across miniature tube sockets. The capacitors are particularly useful as high-frequency by-pass and low-frequency coupling capacitors. Sprague bulletin M-431 gives complete details. Get it free on post card request to **Sprague Products Co., North Adams, Mass.**

→ to page 23

NEW MARKER GENERATOR

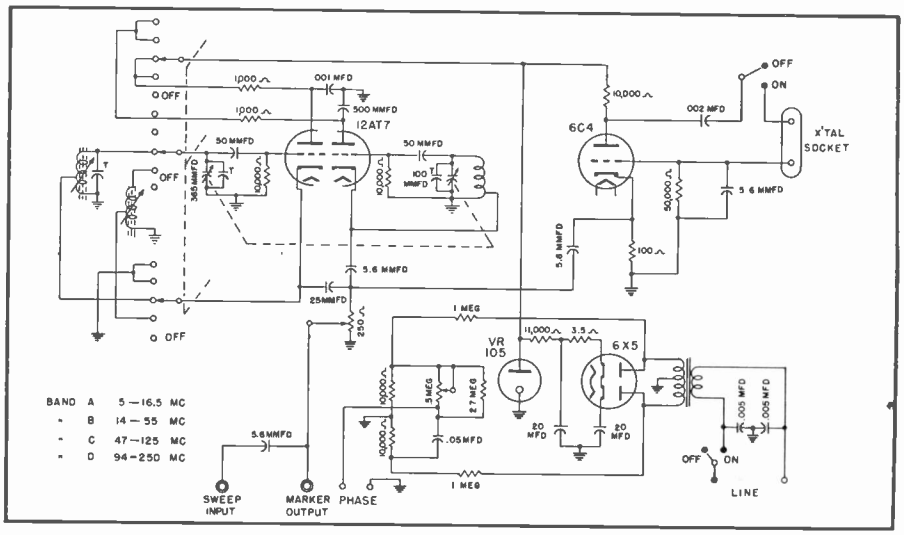


This marker generator offered by Radio City Products has a frequency range of 5 to 250 Mc. This covers all present f-m and television frequencies, and provides a safety factor for future allocation changes.

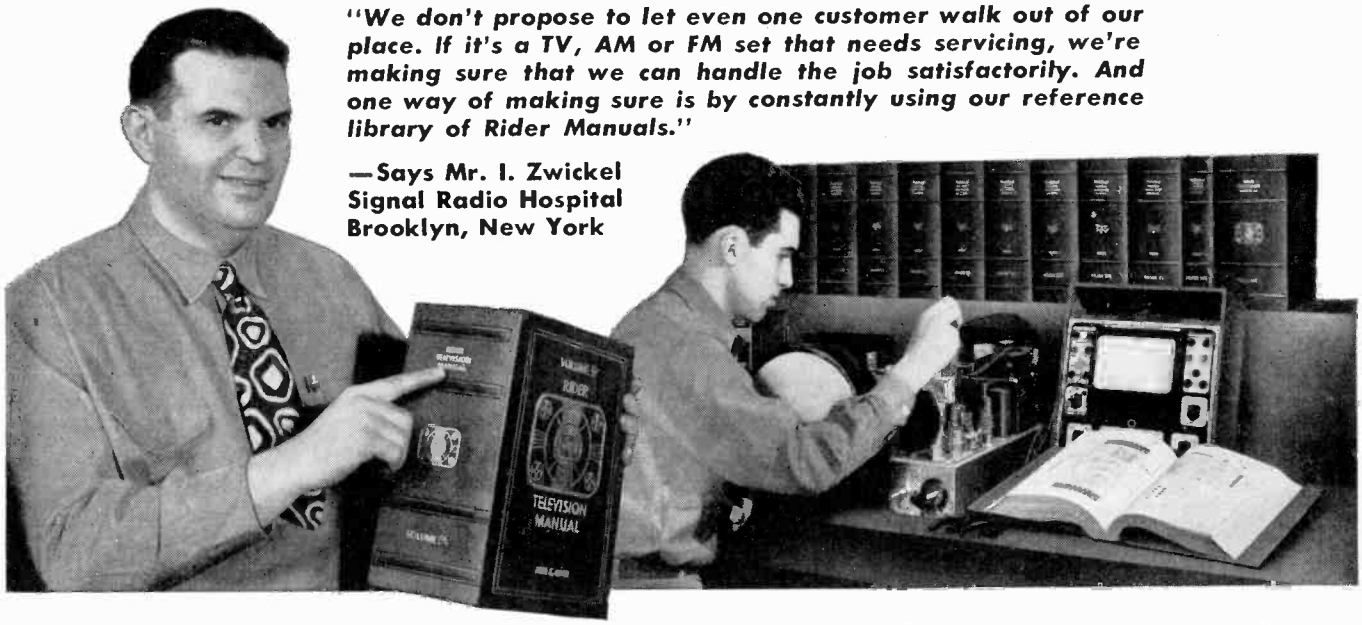
The heart of the instrument is a stable Hartley type oscillator (12AT7). Voltages supplied to the oscillator are regulated by voltage regulator VR105, preventing frequency drift with line variations from 95 to 125 volts. One half of the 12AT7 serves to produce marker frequencies up to 50 Mc, the other produces frequencies up to 125 Mc, the second harmonic of which sets the top limit of the instrument to 250 Mc. An additional Pierce oscillator (6C4) is incorporated, and provides harmonics of 100 Mc when used with an appropriate 5 Mc crystal. The crystal socket is located on the front panel, and is designed for ET-243 crystal holders. The oscillator is good with crystals of 2 Mc and up. The crystal oscillator output may be used simultaneously with the variable frequency marker.

A mixing feature enables the output of the conventional sweep generator to be fed into the marker, mixed with the marker output, and passed on to the TV set under test.

Although not a function of the marker, a phasing circuit is provided so that sweep generators not containing such a circuit can be properly phased in order to eliminate the back trace on the scope. **Radio City Products, 152 West 25th St., New York 1, N. Y.**



"TV+FM+AM... We're making sure that we get all of this business..."



"We don't propose to let even one customer walk out of our place. If it's a TV, AM or FM set that needs servicing, we're making sure that we can handle the job satisfactorily. And one way of making sure is by constantly using our reference library of Rider Manuals."

—Says Mr. I. Zwickel
Signal Radio Hospital
Brooklyn, New York

For Greater Efficiency...For More Information...For More Value For Your Money

Place Your Order Now for the NEW RIDER TV MANUAL VOL. 3

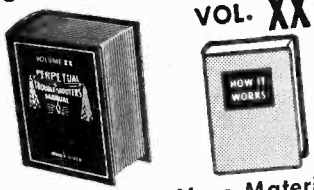
Larger Page Size! 12" x 15"! All Pages in Place! Easier to Use!

Here is accurate, authentic, reliable servicing information direct from 74 TV receiver manufacturers. New, enlarged page size, 12 x 15 inches, with all pages filed in position. Giant pages have been retained...but now have only one fold for greater convenience and durability. There's more ease in using, too, because there are fewer pages to turn and because diagrams and related text are more closely positioned. Order now from your jobber.

Equivalent of Approximately 2032 Pages (8½ x 11"), Plus Cumulative Index Volumes 1, 2 and 3, Plus the Famous "How It Works" Book

$21.00 Complete

Order Now From Your Jobber
New RIDER MANUAL VOL. XX



New Material! More Material! New Profit-Possibilities!

Reliable, authentic, factory-authorized servicing information covering the latest AM, FM radio, Auto Receivers, Record Changers, etc . . . Complete in every respect, but with the added advantage of text and double spreads assembled in position.

FREE! Eye-Stoppers For Service Shop Windows

A very clever Rider Display Idea, 14 x 17 inches, captioned "Which One Is The Phony?". It shows two greatly enlarged photos of postage stamps, one genuine, one a known counterfeit, with identifying characteristics and means of recognizing the forgery. This Display is a real traffic-stopper, and will help build more business for you. 2 Displays are issued each month, and you can get them FREE of CHARGE from your Jobber.

NOTE: Are you receiving your copy of "Successful Servicing"? It's Rider's own publication of interest to every Serviceman. Write for it... it's FREE!

RIDER MANUALS

Television Manual Volume 3 (Plus "How It Works" Book and Index)	$21.00
Television Manual Volume 2 (Plus "How It Works" Book and Index)	$18.00
Television Manual Volume 1 (Plus "How It Works" Book and Index)	$18.00
Volume XIX	$19.80
Volume XVIII	$19.80
Volume XVII	$16.50
Volume XVI	$ 8.40
Volume XV	$19.80
Volume XIV to VII (each volume)	$16.50
Volume VI	$12.50
Abridged Manuals I to V (one volume)	$19.80
Record Changers and Recorders	$ 9.00
Master Index, Covering Manuals, Vols. I to XV	$ 1.50
PA Equipment Manual, Vol. 1	$18.00

FM TRANSMISSION and RECEPTION
by John F. Rider and Seymour D. Uslan

A "must" book for the radio serviceman who looks to FM and television as an important part of his future earnings. Covers all types of frequency modulation systems employed in TV, radio, amateur radio, railroad, aviation, marine, police, point-to-point and mobile receivers. 416 pages, profusely illustrated. $3.60

TV PICTURE PROJECTION and ENLARGEMENT
by Allan Lytel

Timely . . . Complete . . . Authoritative Combines theory with practice, and offers a clear and well-organized explanation of the fundamentals of light, optics and optical systems as employed in home television receivers, with emphasis on projection types and front lens enlargement. 192 pages; 119 illustrations, charts..... $3.30

BUSINESS HELPER
by Leslie C. Rucker (Rucker Radio Wholesalers)

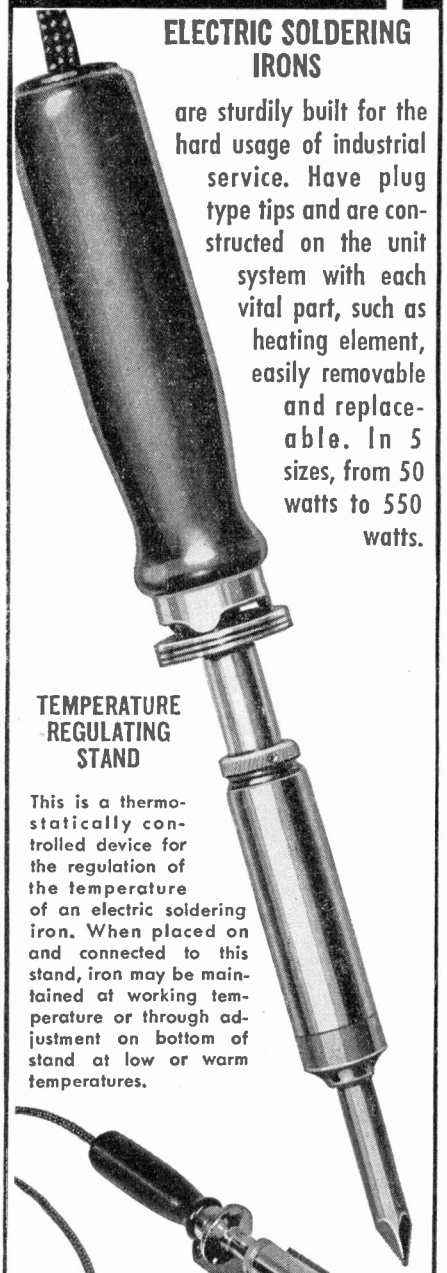
Written by a successful business man who started from scratch and worked his way up to a chain of 3 stores. Any one of his many worthwhile ideas can mean fifty times the cost of this book in your pocket. 144 pages; 22 chapters. $2.00

JOHN F. RIDER PUBLISHER, Inc., 480 Canal Street, New York 13, N. Y. • Export Agent: Rocke International Corp., 13 E. 40th St., N.Y.C., Cable, ARLAB.

RIDER MANUALS *mean* SUCCESSFUL SERVICING

NOTE: The Mallory TV Service Encyclopedia, 1st TV Edition, makes reference to only one source of TV receiver schematics—Rider TV Manuals.
NOTE: The Mallory Radio Service Encyclopedia, 6th Edition, makes reference to only one source of radio receiver schematics—Rider Manuals.
NOTE: The C-D Capacitor Manual for Radio Servicing, 1948 Edition No. 4, makes reference to only one source of receiver schematics—Rider Manuals.

American Beauty

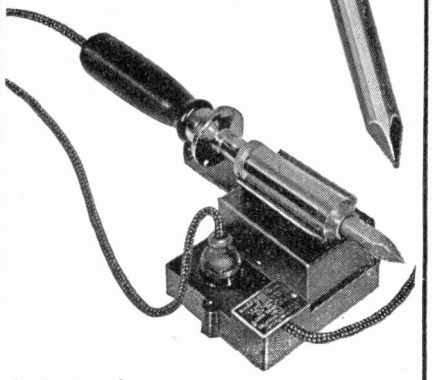


ELECTRIC SOLDERING IRONS

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

TEMPERATURE REGULATING STAND

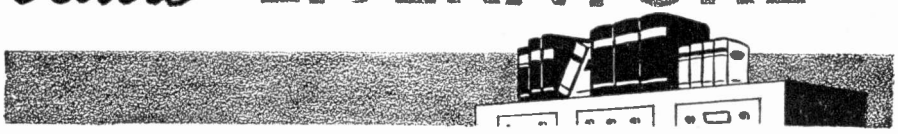
This is a thermostatically controlled device for the regulation of the temperature of an electric soldering iron. When placed on and connected to this stand, iron may be maintained at working temperature or through adjustment on bottom of stand at low or warm temperatures.



For descriptive literature write 110-

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

trade LITERATURE



The Business Helper, *by* LESLIE C. RUCKER *(John F. Rider Publisher, Inc. pp 138, $2.00)*

In our contact with service technicians, we've always been impressed by one fact: Most of them are top-class when it comes to technical problems, but many are often at a loss about questions of business management. These contacts have made it clear that one of the most important things the technician needs today is help in running his business efficiently and successfully.

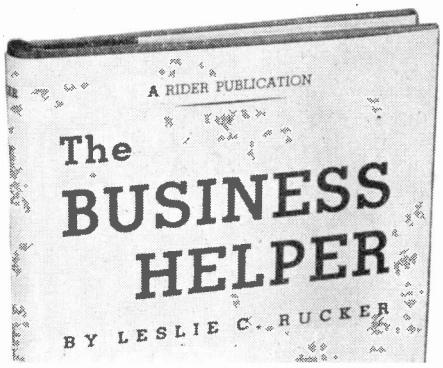
Until now, there has been no book which dealt specifically with the management problems of the small businessman, and the technician has had little opportunity to obtain the necessary information for sound business techniques, written for and to be applied by, him.

This book, which John F. Rider has just published, goes a long way to fill that need. Although written for the small businessman in general, all the information it contains applies to the radio service trade. It is based on notes collected by the author in over 20 years of association with other business men, and thus has a solid foundation in pertinent experience. Its 23 chapters cover such subjects as Location, Buying, Selling, Overhead, Advertising, Collection Insurance, Use of the Telephone, and many others.

Starting with the problem of deciding which type of business to go into, the author proceeds to discuss the general characteristics of the small businessman, stressing here the importance of appearance (proper dress, cleanliness, correct speech, etc.). From there he leads the reader to such considerations as choosing the proper location for a business, ways in which customers should be treated, and most of those other specific problems which the small businessman encounters daily.

Typical of the way in which the book is written is the chapter on banking. Aside from general comments about the relationship between shop owner and banker, the author gives some specific suggestions concerning the use of banking facilities. He points out, for instance, that most firms from whom the small businessman buys offer a 2% discount for prompt payment of bills. This amounts to 24% over a year. On the other hand, the bank will make loans for 6% a year. It is therefore good business, the author concludes correctly, to borrow from the bank at 6% to pay bills promptly, and thereby save 18%.

In the chapter on selling, the reader is given such specific suggestions as: Don't argue with the customer, stick to the point in your sales story, etc. In the section on advertising, the author presents many concrete ideas on how to write copy, what to write on blotters, on matchbook covers, what other materials to use for advertising purposes.



However, not all chapters are that specific. The discussion on keeping inventory, though sound, leaves it strictly up to the businessman to devise his own inventory system. Although it may be true that space limitations prevented the author from going into the subject in detail, it might have been well to refer the reader to the proper source where he could find specific information on setting up such a system. The section on bookkeeping suffers from the same shortcoming. It stresses the importance of keeping books, and of storing them in such a manner that they will neither get lost nor destroyed. But a good system of bookkeeping is not suggested.

To the man just starting out in

business, the book will contain many pointers which will save him later trouble. Even the experienced small businessmen will find quite a number of suggestions which he might apply profitably. Although not written specifically for the radio service industry, the contents of the book is general enough to be of value to the radio sales and service trade.

Being based on notes, the book is rambling in style, going quickly from subject to subject, illustrating a particular point with a story, never dwelling too long on any single issue. It's well written and makes easy reading; and is worthwhile owning.

Tube Data Book. Sylvania has issued the 7th edition of its receiving tube data book. It contains basic application data for 637 radio receiving tube types and cathode ray tubes. Data include characteristic curves for tube types in common use, resistance coupled amplifier data, interchangeable tube charts, instruction on the use of characteristic curves (this is a rather informative section), and a dictionary of terms. Loose-leaf bound, indexed, easily used, 418 pages. Price is 85 cents a copy at Sylvania Distributors, or from Sylvania direct: Emporium, Pa.

Receiver Parts Catalog. A new catalog and price list of all receiver replacement parts for General Electric radio and television receivers is now available through all distributors of G-E Receiver division. 52 pages, lists all replacement parts for every G-E receiver manufactured prior to August 1, 1949.

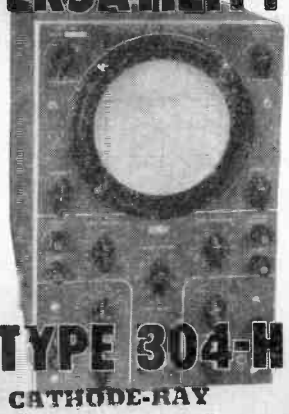
New Allied Catalog. Allied's Catalog No. 120 for 1950 is a 196-page buying guide to almost everything from 16-inch TV sets to phonograph needles. Fully illustrated and well indexed. It's free on request. Get it from Allied Radio Corporation, 833 West Jackson Boulevard, Chicago 7, Ill.

Photoelectric Cell Bulletin. International Rectifier Corp. has just published bulletin PC-649 describing its line of selenium self-generating photoelectric cells. Construction, performance characteristics and applications are covered. Also curves illustrating cells' current sensitivity, voltage output, internal resistance. You can have it for free by writing to the company at 6809 S. Victoria Ave., Los Angeles 43, Calif.

DUMONT *presents...*

NEW STANDARDS OF PERFORMANCE

with increased VERSATILITY



TYPE 304-H

5" CATHODE-RAY OSCILLOGRAPH

Cathode-ray Tube: Type 5CP-A operated at overall accelerating potential of 3000 v. in Type 304-H; 1780 v. in Type 304. With this exception, both types are identical.

High-gain a-c and d-c Amplifiers: Sensitivity of 10 millivolts rms/in. for Y axis; 50 millivolts rms/in. for X axis.

Frequency Response: d-c amplifiers uniform within 10% to 100,000 cps.; a-c amplifiers uniform within 10% from 20 to 100,000 cps.; Amplifiers recover instantaneously after overloads at high gain.

Expansion of Detail: Over four times full screen deflection available on both X- and Y-axes, equaling visibility of 20" tube yet with high resolution of 5" tube.

Recurrent and Driven Sweeps: Variable from 2 to 30,000 cps. Sweep speeds faster than 1 in./microsecond; slower than 10 seconds using external capacitors at front panel.

Intensity Modulation: 15 v. peak blanks trace at normal intensity.

Size: 13¾" h.; 8⅝" w.; 19" d.
Weight: 50 lbs.

Additional Features: Permanently mounted calibrated scale for precise measurements. Mu-metal magnetic shield for cathode-ray tube. Du Mont Type 2501 Bezel for quick attachment of accessories.

PRICE: TYPE 304-H, $307.50
TYPE 304, $285.00

with increased PORTABILITY

TYPE 292

3" CATHODE-RAY OSCILLOGRAPH

Cathode-ray Tube: Extremely short length of new Du Mont Type 3RP-A contributes to portability. Overall accelerating potential, 1000 v. Flat face minimizes optical distortion.

Sensitivity: Y-Axis amplifier at full gain, 0.4 rms volt/in.; direct to deflection plates, 22 rms volt/in.; X-Axis amplifier at full gain, 0.56 rms volt/in.; direct to deflection plates, 31 rms volt/in.

Frequency Response: Both horizontal and vertical amplifiers uniform within 30% from 5 to 100,000 cps.

Balanced Deflection: Deflection amplifiers provide voltages 180° out of phase, eliminating astigmatic defocusing of trace.

Linear Time-Base: Gas-triode sweep-frequency output variable from 8 to 30,000 cps. Automatic beam-blanking on return trace.

Size: 10⅞" h.; 8⅛" w.; 11" d.
Weight: 21 lbs.

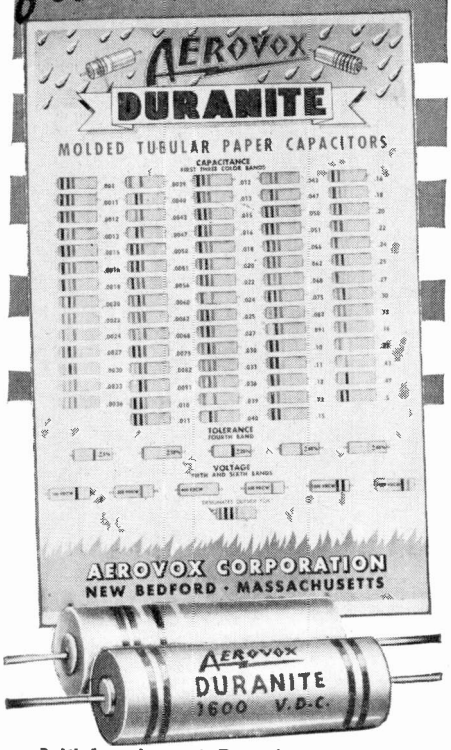
Additional Features: Test signal of 6.3 volts peak at line frequency available at front panel. Calibrated scale for quantitative measurements. Magnetic shield protects cathode-ray tube. Sturdy steel cabinet finished in durable gray wrinkle.

PRICE: TYPE 292, $124.50

DUMONT *for Oscillography*

ALLEN B. DU MONT LABORATORIES, INC. • INSTRUMENT DIVISION • CLIFTON, N. J.

PICK the RIGHT
DURANITE
CAPACITOR
from this chart



Initial-equipment Duranite — RMA color-coded — values immediately read on the wall chart.

Replacement Duranite available through jobbers — values stamped on units for direct reading.

• Save time, trouble, mistakes! This wall chart gives direct readings for those initial-equipment RMA color-coded molded tubulars — capacitance, tolerance, voltage — at a glance. Handsomely printed in full color. And it's FREE! Get yours from your Aerovox jobber. • Order the corresponding Duranites for profitable servicing.

AEROVOX capacitors

FOR RADIO-ELECTRONIC AND INDUSTRIAL APPLICATIONS

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

ELECTRONICALLY SPEAKING

BY ISIDOR I. GROSS

Picture Tubes. We had an invitation from Irving Rosenberg, in charge of DuMont's Tube Section, to visit their new plant; and we availed ourselves speedily of the opportunity.

When we arrived, we were taken in tow by Chester Burwell, Production Control Supervisor, who took us through the new plant as well as the old. He proved a very competent and informative guide indeed.

The new plant at Allwood, a modern two-story building with an area of over 160,000 square feet, was already in partial operation. Workmen were still finishing parts of the building on one side, while tubes were already coming off the line on the other. According to Frank Beldowski, who is Manufacturing Supervisor and whom we met in the new plant, the present rate of production is about 10,000 tubes per week, and he expected it to rise to 20,000 in the future.

When we were there, production of glass picture tubes was just about keeping up with demand. Output of the new 19-inch metal cone tube, however, has already begun to fall behind. Remembering well the shortage of picture tubes which developed about a year ago, they are trying their utmost to avoid repetition of that condition.

It's about two days from the time the glass envelope arrives at the factory to the moment it leaves as a cathode ray tube. During that period, the inside of the tube is blackened, the face glass is coated, the electrodes are assembled and mounted in the tube, the air in the tube is evacuated to a very high vacuum, the tube is tested and retested, and those accepted are packed and shipped out. The slowest process in this entire operation is evacuation. While the air is removed, the tube has to be kept under certain temperatures for certain periods of time. Any speeding up of the process would reduce quality.

One of the things that impressed us while we were wandering about was the interest the workers seemed to take in what they were doing. We were stopped several times by employees who had suggestions on improved procedures. We were also impressed by the thoroughness of the inspection process. The test equipment used for inspection is of DuMont design, and measures everything from foot lamberts to focus. Each tube is thus tested. Before it leaves the plant, each batch of inspected tubes is spot checked again to make sure that the initial inspection process was thorough.

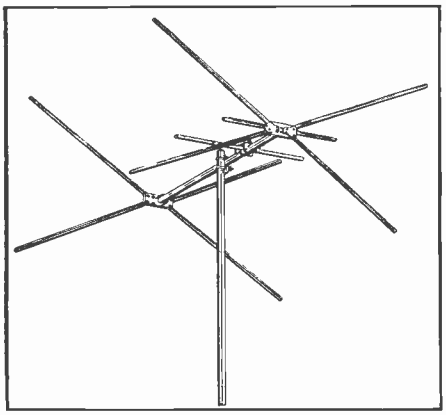
We asked about their plans with the new coatings that have recently become available. Mr. Burwell told us that there were no immediate plans to switch to any of them. The coating used by DuMont now is of their own composition and, beyond the fact that it takes about 7 minutes to coat a tube face, is kept a strict secret. There were a few dark-faced tubes around with which they experimented, but they failed to detect any great difference. However, he also pointed out that should the demand arise, they would certainly be ready to supply it.

When we left Allwood, it occurred to us that it was probably such high quality control as this which had been largely responsible for the success of television.

How big is television's future? Cornell Dubilier's Ken Burcaw believes that television offers man his last chance for survival in the atomic age. He feels that television's ability to disseminate knowledge will bring the peoples of the world closer together and create the understanding necessary for a permanent peace. He also believes that religious leaders are failing to take advantage of this new medium of communicaiton, although it is ideally suited for the presentation of their message.

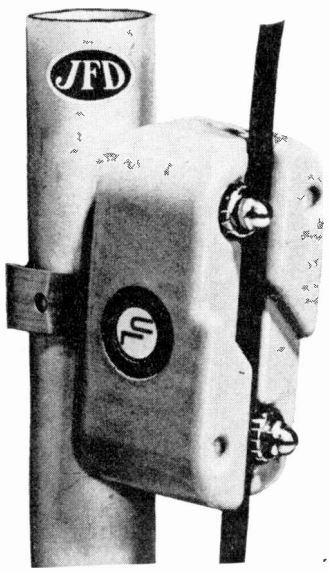
Industry Presents

→ from page 18



TELEVISION ANTENNA

A new television antenna of rugged construction, designed to withstand long exposure on rooftops without reduction of electrical performance is being marketed by Insuline. It is of the modified conical type with separate high-freq and low-freq reflector elements. For fringe areas, stacked array of two units, with half-wave spacing and suitable matching stub is recommended. Insuline Corporation of America, Long Island 1, N. Y.



LIGHTNING ARRESTER

The new "safeTVguard" twin lead lightning arrester produced by JFD, is designed to prevent damage resulting from lightning and static charges collecting on roof TV antennas. It bears the Underwriters' Laboratories seal of approval for both indoor and outdoor use. Installation is very easy, no cutting or wire stripping is necessary. The twin lead transmission line is slipped into a slot on top of the arrestor and tightened in place. Discharge contacts are sealed in rare gas tubes to dissipate charges. Further info available from JFD Mfg. Co., 6101 16th Ave., Brooklyn 4, N. Y.

One for the shop...One for the field...

means more business for you

RCA 195-A STANDARD VOLTOHMYST*

AC-Powered for the Shop

TV, FM, AM, and PA service require the modern features designed into the RCA 195-A Standard VoltOhmyst.

The 195-A measures dc and RMS ac voltages up to 1000 volts, resistance values from 0.1 ohm to 1000 megohms, and decibel values (db, vu, or dbm) from −20 to +52.

Its dc input resistance is 10 megohms on all ranges. Zero-center indication is available for FM work. The ac input resistance is 200,000 ohms.

An isolating resistor in the dc probe permits dc voltages to be measured without disturbance of high-impedance high-frequency ac circuits.

When the 195-A is used with the accessory RCA Crystal Probe WG-263, rf voltages can be measured up to 100 Mc. With accessory RCA High-Voltage Probe WG-288, dc voltage can be measured up to 30,000 volts.

An electronic bridge circuit protects the meter movement against burnout.

RCA WV-65A BATTERY VOLTOHMYST*

Self-Powered for the Field

Here is a portable electronic meter which measures dc and RMS ac voltages up to 1000 volts, dc current from 0.3 ma to 10 amps, and resistance values from 0.1 ohm to 1000 megohms.

The self-contained battery power supply lasts up to 10 months in normal service.

The WV-65A is supplied with an isolating resistor in the dc probe, and can be used with accessory RCA Crystal Probe WG-263, or with accessory RCA High-Voltage Probe WG-284.

The dc input resistance is 11 megohms on all ranges. This instrument will measure avc voltages, detect leaky coupling capacitors, and can be used to trace sync and deflection voltages in TV receivers.

At the sensational price of $59.50, the RCA WV-65A is your best buy for service of two-way car radios, farm sets, marine, airplane, railway, bus, and theatre sound equipment.

*Trade Mark "VoltOhmyst" Reg. U. S. Pat. Office

See your RCA distributor for further details about these famous electronic meters, or write RCA, Commercial Engineering, Section 51LX, Harrison, N. J.

See Your RCA Distributor For Test Equipment You Can Trust

RCA RADIO CORPORATION of AMERICA
TEST AND MEASURING EQUIPMENT HARRISON, N.J.

A Radically Improved New Type of

TELEVISION BOOSTER

Offering Great New

ADVANTAGES IN RECEPTION AND TUNING

LIST PRICE $49.50

THE ASTATIC Channel Chief

ADDITIONAL FEATURES

1 Self-contained power supply operating from 115 volt, 60 cycle AC power line.

2 On-off switch allows booster to be switched in or out of the circuit at will.

3 Recessed pilot light indicates when booster is on.

4 Beautiful, furniture-finish mahogany cabinet (8-1/2" wide x 6-1/2" high x 7-3/8" deep) to complement fine home furnishings.

5 Simple to install and operate—complete instructions with each unit.

THE NEW ASTATIC CHANNEL CHIEF, Model AT-1 Television Booster, eliminates the common failing of many boosters — showing a "peak" on some channels and "fall-off" on others. The Channel Chief provides extremely high gain, uniform on all 12 television channels. Its dual controls allow separate tuning of picture and sound, with no sacrifice of one for the other. A variable gain control permits reduction of signal strength to prevent picture distortion when the signal input is greater than that required for good definition. Altogether, the results are the considerable extension of fringe areas, good reception in areas previously rated as unsatisfactory, easier tuning and added selectivity on any receiver, elimination of the need for expensive outdoor antennas within service areas. The increased selectivity serves to reduce drastically, or eliminate, interference. No other booster can do so much . . . for you or for your customers. Write for added details.

THE Astatic CORPORATION
ASTATIC CONNEAUT, OHIO
IN CANADA: CANADIAN ASTATIC LTD. TORONTO ONTARIO

Leading Manufacturers of Microphones, Phonograph Pickups, Cartridges and Related Equipment.

Build YOUR OWN Heathkit TEST EQUIPMENT

Heathkit AUDIO GEN. KIT $34.50

Heathkit TUBE CHECKER KIT $29.50

Heathkit TELEVISION GENERATOR KIT $39.50

Heathkit 5" OSCILLOSCOPE KIT $39.50

Heathkit SIGNAL TRACER KIT $19.50

Heathkit BATTERY ELIMINATOR KIT $22.50

Heathkit CONDENSER CHECKER KIT $19.50

Heathkit ELECTRONIC SWITCH KIT $34.50

Heathkits are beautiful factory engineered quality service instruments supplied unassembled. The builder not only saves the assembly labor cost but learns a great deal about the construction and features of the instrument. This knowledge aids materially in the use and maintenance of the equipment. Heathkits are ideal for and used by leading universities and schools throughout the United States. Each kit is complete with cabinet, 110V 60 cycle transformer (except Handi-Tester), all tubes, coils assembled and calibrated, panel already printed, chassis all punched, formed and plated, every part supplied. Each kit is provided with detailed instruction manual for assembly and use. Heathkits provide the perfect solution to the problem of affording complete service equipment on a limited budget. Write for complete catalog.

NEW Heathkit IMPEDANCE BRIDGE SET $69.50

Heathkit R.F. SIGNAL GEN. KIT $19.50

Heathkit VACUUM TUBE VOLTMETER KIT $24.50

NEW Heathkit HANDITESTER KIT . . . $13.50

HEATH COMPANY
BENTON HARBOR, 10 MICHIGAN

EXPORT DEPARTMENT
13 EAST 40th STREET
NEW YORK 16, N.Y.
CABLE — ARLAB — N.Y.

TV Troubleshooting

→ from page 11

is the same as in disturbance testing, but instead of using a noise or 60-cycle signal, a signal generator is used to provide a signal of the proper frequency: 400 cycles to check the video amplifiers and audio amplifiers; a 400-cycle amplitude-modulated signal of the video i-f frequency to check the video i.f.'s; and a 400-cycle a-m signal of the center frequency of the channel the set is tuned to to check front-end operation. The 400-cycle modulation shows up on the screen in each case as several horizontal black and white bars.

A 400-cycle a-m signal of the audio i-f frequency can be used to check the audio i-f stages. Even though they are part of an f-m system, enough of the audio modulation will come through to be audible over the loud-speaker.

The signal injection method may be made more exact by using an output meter in conjunction with the generator. Hooked up in the plate of the power output tube or plate of the last video amplifier, gain checks can be made to determine if each stage is providing correct gain.

A further variation of this method is using a sweep generator and scope to check the over-all response and gain of the video i-f system.

Signal Tracing: This method employs an oscilloscope to check the incoming signal at the video, sync, and audio circuits, and to check the generated saw-tooth in the sweep circuits. In the service manuals provided by many television manufacturers, there are pictures of waveforms which can be observed at various circuit check points. These waveforms show not only the normal appearance of the signal but also the peak-to-peak voltage to be expected at that point.

In signal tracing, as well as in signal injection and in disturbance testing, the basic idea is to check each successive stage in a section. However, in signal tracing it is best to start with the first stage of a section and go toward the last. In signal injection and disturbance testing, it is preferable to start with the last stage and move forward. In all cases, between the point where a signal goes through and where it fails to do so, there we have the defective stage. A further check is then made to determine the faulty component.

In subsequent articles, common troubles in each of the main sections of the receiver will be analyzed together with the fastest and most effective methods of finding them.

Once the trouble has been isolated to the defective stage, by the use of any one or combination of the above methods, step #3 of our general trouble-shooting procedure is brought into play. The methods for finding a defective component are:

1. Voltage checks
2. Resistance checks
3. Condenser bridging

Voltage and resistance checks are familiar to all servicemen and need not be elaborated on at this point As noted above, they can often be used to locate a defective stage as well. But where there are a large number of stages in a section, it usually saves time to localize the bad stage by one of the other methods. It might be noted that it is not usually considered desirable to make voltage checks on the high voltage system unless absolutely necessary and unless proper precautions are taken. Most troubles here will show up in resistance readings.

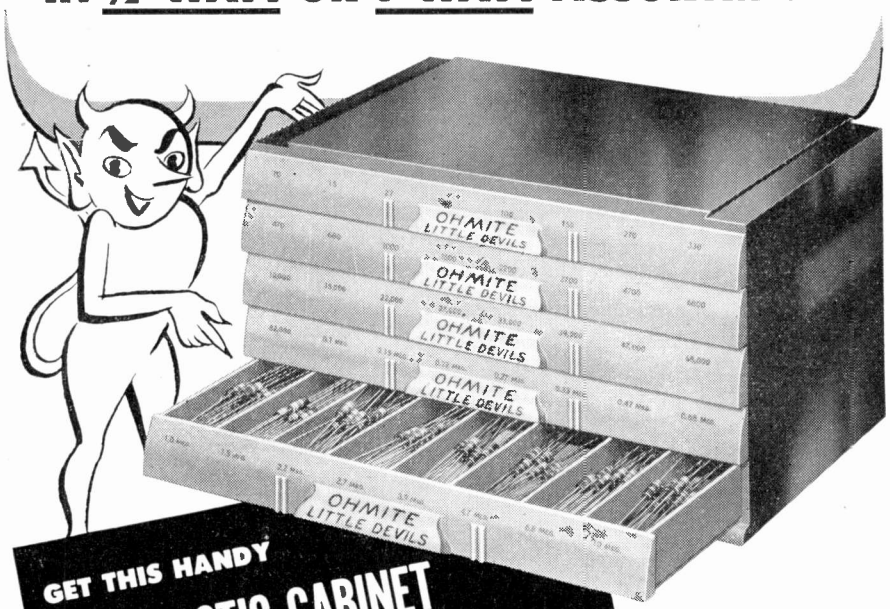
Correct voltage readings are generally indicated on the schematic of a set and sometimes in a separate chart in the service manual. In making checks, the voltages that are read are compared to the correct readings to determine faulty operation. Resistance readings can be readily checked against the resistance values provided in the schematic.

Where a stage is found to be defective and the tube, voltages and resistance readings all check O.K., it is reasonable to assume the trouble may be caused by a defect that usually does not show up in a voltage (except in a power supply) and resistance check—an open condenser. Bridging a condenser of the same value across the suspected part will indicate whether this is the fault. A shorted condenser will usually show up by either a voltage or resistance check.

Because of the comparatively large number of circuits in a television receiver, TV servicing requires the application of logical, step-by-step methods. A general knowledge of the operation of the receiver being repaired together with the knowledge of available servicing techniques makes it possible to repair TV sets in a reasonably short time.

Now...OHMITE Little Devils

IN ½-WATT OR 1-WATT ASSORTMENT



GET THIS HANDY
ALL-PLASTIC CABINET
Packed with 125 "Little Devil" Resistors
—FOR COST OF RESISTORS ALONE!

½-WATT ASSORTMENT
$12.50

1-WATT ASSORTMENT
$18.75

LITTLE DEVIL COMPOSITION RESISTORS

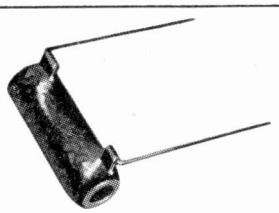
Guesswork's gone . . . when you use individually marked Ohmite "Little Devils." These tiny but rugged resistors are available in standard RMA values, ½, 1, and 2-watt sizes . . . 10 ohms to 22 megohms. Tol. ± 10% and ± 5%. Values to 2.7 ohms available in 1-watt size, ± 10% tol.

Each assortment, either ½-watt or 1-watt, is packed in its own rugged cabinet . . . and you pay only the regular price of the resistors, *nothing* extra for the cabinet!

Factory packed in each cabinet's 40 separate compartments are 125 carefully selected "Little Devils" (tol. ± 10%) . . . in the 40 values from 10 ohms to 10 megohms most frequently used by servicemen. It's no trouble to find the resistor you need . . . *fast!*

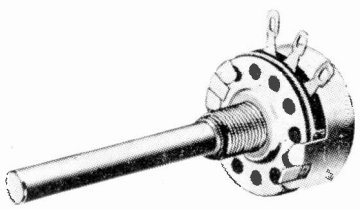
Molded of strong, lustrous plastic, and extremely compact—only 9" x 4¾" x 5¼"—Ohmite cabinets protect your resistors, too, and help you check inventory at a glance. You'll want to order both assortments, today.

SEE YOUR DISTRIBUTOR



BROWN DEVIL RESISTORS

A favorite with servicemen, these dependable, wire-wound, vitreous-enameled resistors are easily mounted by their tinned wire leads. Tol. ± 10%. In 5, 10, and 20-watt sizes.



MOLDED COMPOSITION POTENTIOMETER

Built to last, this Type AB Potentiometer has a heat-treated, solid-molded resistance element—not just a film—and provides unusually quiet operation. It has a 2-watt rating.

OHMITE MANUFACTURING CO., 4913 FLOURNOY ST., CHICAGO 44

Be Right with OHMITE

Reg. U. S. Pat. Off.

RHEOSTATS • RESISTORS • TAP SWITCHES

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, of RADIO MAINTENANCE, published monthly at East Stroudsburg, Pa.

State of New Jersey } ss.
County of Essex }

Before me, a notary public in and for the State and county aforesaid, personally appeared Joseph J. Roche, who, having been duly sworn according to law, deposes and says that he is the editor of RADIO DISTRIBUTION & MAINTENANCE, and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, William F. Boyce, 45 Hillcrest Rd., West Caldwell, N. J.; Editor, Joseph J. Roche, 598 Valley Rd., Upper Montclair, N. J.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Boland & Boyce, Inc., 460 Bloomfield Ave., Montclair, N. J.; William F. Boyce, 45 Hillcrest Rd., West Caldwell, N. J.; Joseph J. Roche, 598 Valley Rd., Upper Montclair, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of the total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOSEPH J. ROCHE,
Editor.

Sworn to and subscribed before me this twenty-second day of September, 1949.

(Seal) LEO S. ROWE,
(Advt.) Notary Public of N. J.

PA
Fault Location

→ from page 15

the trouble is probably due to a shorted output filter condenser, shorted screen bypass condenser in the output stage, or a possible short in the filter choke. This condition usually is accompanied by an overheated choke.

By the time these tests have been made, the tubes have reached normal operating temperature and may be checked for burned out heaters or filaments by placing the hand on metal tubes or by observing heater glow in glass tubes. A cold tube usually indicates an open or burned out filament, but can also be due to a defective socket connection or broken filament supply lead. Care should be exercised in handling, since internally shorted or overloaded tubes (and even normally operating power tubes) dissipate a great deal of heat. All tubes will be checked later with a tube tester, but in the preliminary examination, our main objective is to locate and correct the obvious defects as quickly as possible.

The preceeding tube should next be removed. If no pop is heard, look for trouble in the plate circuit of that stage or in the grid circuit of the output stage. Trouble will usually be found in a shorted, open, or leaky bypass condenser or defective tube, but can also be caused by excessive cathode bias in the output stage. In this case, these tubes are being driven past cut-off and hence are not capable of conducting.

With the main controls set at their normal positions, touch the microphone and phono input terminals. A loud hum will indicate whether or not the amplifier is operating properly. If the gain is normal, feedback should occur when the microphone is plugged in. The microphone cable should be checked for intermittent breaks, defective terminal connections, noisy plug, etc. by twisting and moving it about. Broken leads usually will be found within a distance of about six inches or so from the microphone or plug. If no sound can be obtained when the microphone is connected but

normal tube noise can be heard, try another microphone or cable.

Stage by Stage Check

If the trouble has not yet been found, make a quick stage-by-stage check by starting at the speaker and working back to the input stage. This is the most logical order of testing, since the speaker is being used as an indication of absence or presence of sound. A normal amount of hum in the speaker indicates that B voltage is present and that the field coil at least is not open. No hum could indicate either an open or shorted field coil or filter choke, a shorted filter condenser, or no B voltage. Excessive hum, which remains the same whether gain controls are open or closed is usually due to one or more open filter condensers. Hum which decreases or disappears when the gain controls are varied can be due to a shorted tube or defective condenser, or to a-c hum pickup by a particular stage. More detailed tests are necessary to locate the actual faulty component. These will be described later in this series.

The magnetic properties of the field coil may be checked by touching a screwdriver to the core. The field should exert a strong pull when this is done. Care should be taken to avoid damage to the speaker cone and spider as the screwdriver blade is freed. After the speaker is checked, proceed to the output stage. Pull one, or preferably both, of the output tubes from their sockets and listen for the momentary pop which accompanies this circuit interruption. If no noise is heard, look for an open voice coil or broken leads, open output transformer, shorted plate or screen bypass condenser, or a defect in the B supply circuit.

A rough approximation of the gain or loss per stage can be obtained by comparing the increase in noise volume as each successive tube is removed and replaced in the above tests. Tubes with grid caps may be checked simply by touching the caps. Absence of hum indicates a defective tube in the immediate stage, a defective component in the screen-grid or plate-coupling circuit, or lack of B supply voltage.

Later articles will discuss details of p-a servicing.

Kester Solder 1st choice of service men everywhere...

Standard for the Trade since 1921

Kester products have been in constant demand by service men since the early days of radio.

LABORATORY CONTROLLED

POSITIVE FLUX UNIFORMITY

In TV and radio repairs, use the same high quality solder that the manufacturer of the original equipment considers the standard in his field. Kester Plastic Rosin-Core Solder will do that repair job faster and more efficiently. Insist upon it from your jobber.

A New Kester Flux-Core Solder

Watch for the announcement of Kester's newest product, soon to be available to the service man, "Resin-Five" Core Solder.

1899 50th Anniversary 1949

KESTER SOLDER COMPANY
4201 Wrightwood Avenue, Chicago 39, Illinois

Factories Also at
Newark, New Jersey • Brantford, Canada

KESTER SOLDER

New Speaker Combines

HIGH Fidelity, LOW Cost

RCA Victor releases details on its latest speaker model

RCA's new 515S1 speaker incorporates almost all the features of the Duo-Cone design developed by Dr. H. F. Olson for the more expensive LC-1-A, which has proven very successful during the past two years in broadcast operations. It is therefore good news to the trade to learn that the new speaker costs only a fraction of the LC-1-A.

The new 15-inch speaker employs a unique magnet structure and vibrating system, consisting of a dual cone, each section of which is driven by its own voice coil operating in its air gap. A cutaway view of the speaker appears in Fig. 1.

Separate voice coils drive each cone section. The small cone section does not vibrate at the lower audio frequencies because its inner suspension is very stiff and its outer suspension to the large cone section is very flexible.

Over the range of cross-over frequencies, centered at about 2000 cps, both cone sections vibrate as a single cone. Thus, the speaker avoids cross-over interference characteristics of conventional high-low speaker combinations, and a multi-element cross-over network is not needed. Only an isolating capacitor is required to prevent excessive low-frequency power from damaging the high-frequency voice coil.

The magnetic structure consists of a single Alnico V permanent magnet, arranged with pole pieces and yoke so that the magnetic paths form a bridge network to provide each air gap with equal flux density. Both air gaps are excited by it. The directivity of the 515S1 is approximately uniform over the entire frequency range within a total angle of approximately 60°.

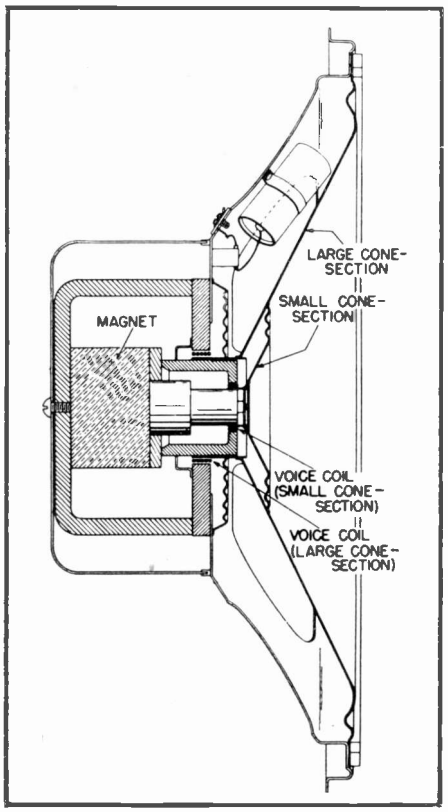


Fig. 1 Cutaway view of new speaker model.

Data

The power handling capacity of the speaker is 25 watts. Its input impedance—at 400 cps—is 16 ohms. The diameter of the low frequency voice coil is 2 inches, that of the high frequency voice coil ¾ inch. The magnet weighs two pounds, and the weight of the speaker is lb. 15. Speaker resonance, with baffle, is 40-50 cps.

The frequency response characteristic of the new speaker is shown in Fig. 2. This curve was obtained with an input power of 0.1 watt at 400 cps, and a voltage constant at all frequencies, with the speaker flange-mounted on infinite-type baffle. Sound pressure was measured with a ribbon type microphone located on speaker axis at a distance of 24 inches in an acoustically dead room.

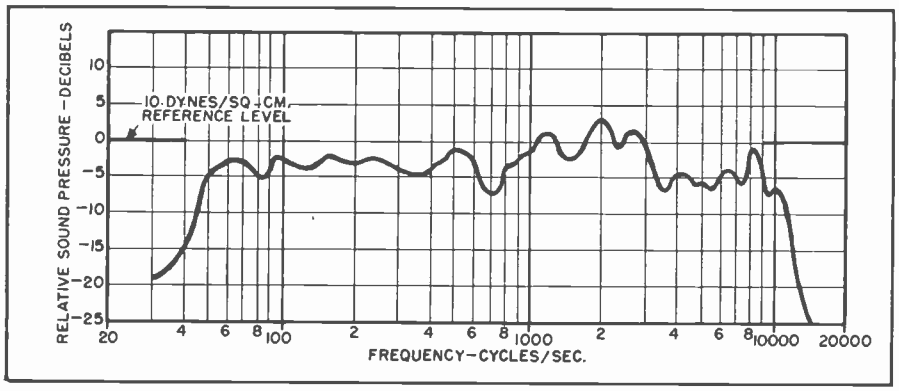


Fig. 2 Graph illustrating uniform frequency response characteristics of model 515S1.

RD&M Survey

→ from page 17

for this category also appear in the accompanying chart.

It is interesting to note that none of the instruments which were listed as **essential** appear in the top group of **useful, though not essential** instruments. This is further proof of their **essential** character.

We finally come to those instruments which were considered **not useful** by the respondents. We note that the first three instruments of the **essential** group do not appear at all in this category. The Marker Generator was shown as **not useful** by 3% of the respondents, but possible reasons for this have been pointed out above.

Instruments listed most frequently as **not useful** included: Q-Meter, Cross Hatch Generator, Field Strength Meter, Audio Signal Generator, Capacitance - Resistance Bridge, and Test Pattern Generator.

As you will notice, there is considerable divergence of opinion about the usefulness of a number of instruments, particularly about those appearing in both the **useful, though not essential** and the **not useful** group. For example, Test Pattern Generator was listed as **useful, though not essential** by 51% of the respondents. At the same time, 19% of the replies showed it as **not useful** (it was considered **essential** in 3% of the cases). Similarly, Field Strength Meters appear as **useful, though not essential** in 47% of the replies, and as **not useful** in 19% of the cases.

The basic considerations in purchasing test equipment are two: The technician should be able to afford it, and the instruments should pay for themselves in providing more ef-

ficient tools for servicing. An instrument which may be found profitable by a large organization, may not pay for itself in a one-man shop.

We should also keep in mind that instruments in themselves do not service the receiver. It is the technician who uses it. Naturally, equipment with which the technician is not familiar will not be considered essential by him. Once he becomes acquainted with its operation, however, he may find very many uses for it. Test Pattern Generators and Cross Hatch Generators may be cases in point. They have been introduced to the market fairly recently and a considerable number of technicians may not be familiar with the advantages which these instruments provide.

It will be worth the technician's while to look into the possible uses of all the pieces of test equipment. In many cases he will discover that they pay for themselves in making for better service. However, he should be sure that they do so before acquiring them.

One word about the figures. You will see that the percentages in the three categories for each instrument do not add up 100% (as they would under ideal conditions). The reason for this apparent discrepancy is found in the fact that some respondents indicated no opinion for some of the instruments listed.

How Much Equipment

To find out what the approximately proper amount of investment in test equipment is, we asked our readers two questions: What **should** the minimum investment in test equipment be? and How much did they **actually** have invested?

As an overall figure, the replies gave $622 as the average amount that **should** be invested in test equipment as a minimum, and $733 as the average amount which **actually** was invested in such instruments by the respondents. 67% of the respondents had invested more money in test instruments than the amount which they regarded as minimum, 32% had invested less. For the remaining one per cent, the two figures coincided.

Of the respondents, 87% said that they were planning to buy additional test equipment in the near future, 9% were not and 4% were undecided.

DEPENDABLE SERVICING STARTS HERE

Advanced type BT resistors

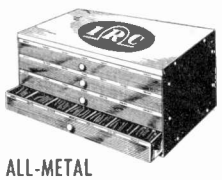
You have never seen the equal to the way these new IRC resistors perform! Advanced BT's are so superior to conventional resistors of this type, they have established new standards of performance throughout the industry.

Advanced Type BT Resistors have extremely low operating temperature, and are especially suited to television servicing. They are supplied in RMA ranges in 5 small sizes: BTR ⅓ watt, BTS ½ watt, BTA 1 watt, BTB new miniature 2 watt, and BT-2 2 watt.

Full details are given in new catalog DC8—write for your free copy. International Resistance Co., 401 N. Broad St., Phila. 8, Pa., *In Canada:* International Resistance Co., Ltd., Toronto, Licensee.

ADVANCED BT's
are tiny, light-weight and fully insulated.

NEW METAL RESIST-O-KIT
pocket-size, furnished at no extra charge with inexpensive ½ and 1 watt assortments.



ALL-METAL RESIST-O-CABINET
with 28 compartments in a choice of 3 assortments. Nothing extra for cabinet.

ALL-METAL BASIC KIT
meets daily resistor requirements of average service shop. No extra charge for cabinet.

INTERNATIONAL RESISTANCE CO.
Wherever the Circuit Says

IRC

Obsolescence

The question of obsolescence was difficult to ask as well as to answer. Each instrument has its own lifespan, and it is hard to generalize. Space limitations on the questionnaire prevented us from asking for the obsolescence of each instrument, and we therefore asked this question in a general way.

The consensus of replies was that instruments can be used, on the average, for 5 years before they become obsolete. It should be pointed out, however, that 37% of the respondents shared our trepidations concerning this type of question, and did not answer it.

From the above information we get a pretty clear picture of the test equipment needs for the average television sales and service organization. As we pointed out earlier, there always are individual considerations which will enter into decisions as to which type and how much test equipment to acquire. The answers to this survey constitute a general guide to those practices which the working technician has found most profitable.

A COMPACT AND COMPLETE LIBRARY!

The BIGGEST Book Value in the Industry!

THE

RADIO & TELEVISION LIBRARY

CONSISTING OF

THE VIDEO HAND BOOK

The complete television manual . . . over 900 pages . . . over 860 illustrations . . . in 14 big sections.

Now in this great one volume book—all the essential knowledge of television! Inside the covers of the VIDEO HANDBOOK is presented complete up-to-the-minute information on television arranged for quick reference—in easy to read, non-mathematical style.

The VIDEO HANDBOOK is designed to give you the practical . . . answers to all your questions on television—the complete, detailed procedures on all phases of television work—step-by-step explanations for everyday problems. This book provides the ready information to make your television education complete.

The VIDEO HANDBOOK will save you time—improve your efficiency and make your work easier. It provides the knowledge that means more profit for you. Every page adds to your background for greater prestige and income. Here is the means for everyone in television—employed and executive—to increase his value to his firm.

This book is more than a source of information and interesting reading—it is an investment in your future in television.

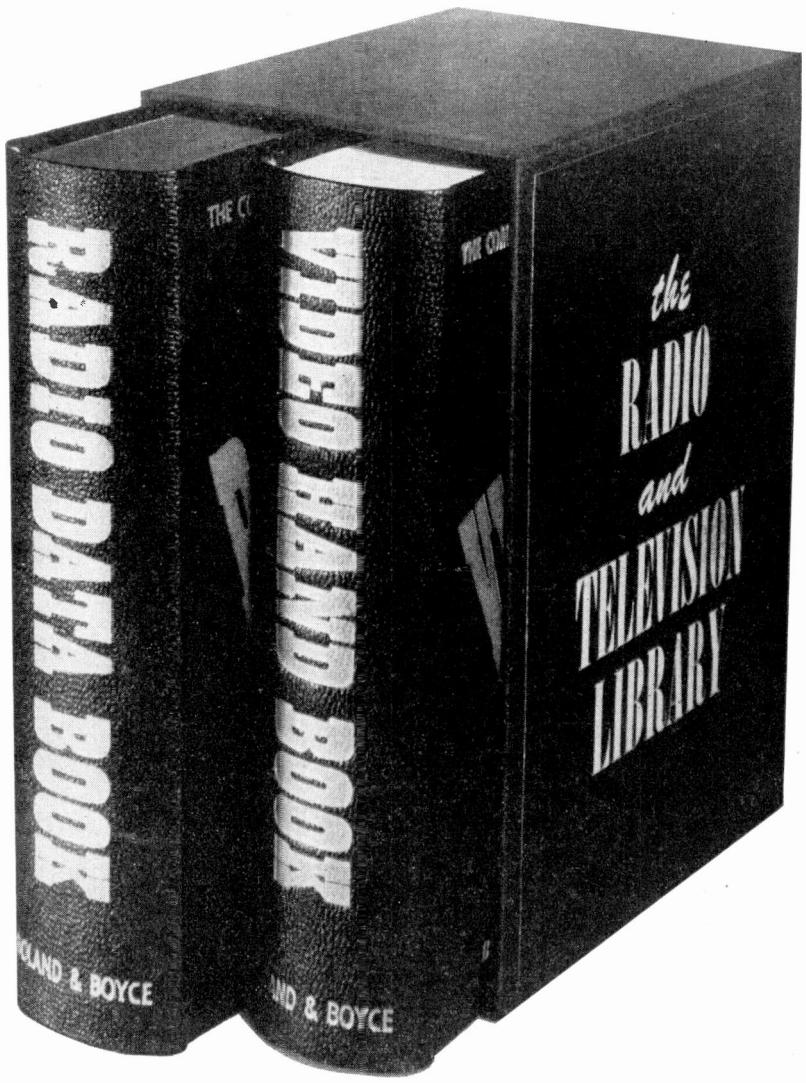
THE RADIO DATA BOOK

the only radio handbook of its kind . . . over 900 pages . . . 12 sections, each covering a radio subject more completely than any other book!

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

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

Plan every operation in radio and electronics with the *Radio Data Book*. This new radio bible will be your lifelong tool . . . you will use it every day, on the board, at the bench, in the field! Use it for engineering, construction, troubleshooting and testing. The RADIO DATA BOOK will be your invaluable aid in design, experiment and in layout. It will help make your production better, faster and easier. In any and every operation in radio and electronics, you will use the RADIO DATA BOOK!



CONTENTS:

Section 1. THE 150 BASIC CIRCUITS IN RADIO
Section 2. COMPLETE TEST EQUIPMENT DATA
Section 3. TESTING, MEASURING AND ALIGNMENT
Section 4. ALL ABOUT ANTENNAS
Section 5. SOUND SYSTEMS
Section 6. RECORDING
Section 7. COMPLETE TUBE MANUAL
Section 8. CHARTS, GRAPHS AND CURVES
Section 9. CODES, SYMBOLS AND STANDARDS
Section 10. 50 TESTED CIRCUITS DESIGNED FOR OPTIMUM PERFORMANCE
Section 11. DICTIONARY OF RADIO AND ELECTRONIC TERMS

THE VIDEO HANDBOOK

CONTENTS:

Section 1. Television: Past, Present & Future
Section 2. Fundamentals of electronic Television
Section 3. The Television Station
Section 4. The Television Receiver
Section 5. Television Antenna Systems
Section 6. Creating a Television Show
Section 7. Descriptions of Modern Television Receivers
Section 8. Installing Television Receivers
Section 9. Servicing Television Receivers
Section 10. Television Test Equipment
Section 11. Building a Television Receiver
Section 12. Data Section
Section 13. Television Terms
Section 14. Bibliography

THE RADIO & TELEVISION LIBRARY IN ATTRACTIVE SLIP CASE $9.00 AT YOUR LOCAL RADIO JOBBER

A PRODUCT OF BOLAND & BOYCE INC., PUBLISHERS MONTCLAIR, N. J.

• RADIO DATA BOOK • VIDEO HAND BOOK • RADIO AND TELEVISION LIBRARY • RADIO DISTRIBUTION AND MAINTENANCE • TECHNICAL MANUALS •

Cathode Ray Oscillograph

→ from page 13

negative cathode.

In Fig. 3, the grid is connected to the high negative end of the bleeder which consists of R1, R2, R3, R4, R5, R6, and R7. The cathode, which must be slightly positive with respect to the grid, is connected to a potentiometer, R7, in the bleeder. By varying R7, the potential between grid and cathode is changed, thereby changing the amount of beam current which flows towards the screen. R7 thus serves as the intensity control of the oscillograph. The focusing electrode in a CRT must be operated at a positive potential with respect to the cathode. Voltage for this electrode is obtained from potentiometer R5, which is at a less negative point on the bleeder than the cathode. R5 serves as the focus control of the oscillograph. Both R5 and R7 are found on the front panel of the instrument and are adjusted simultaneously to obtain a bright, sharply focused pattern.

In Figure 3, the output stages of the X and Y axis deflection amplifiers are also shown. The plate potentials of these tubes (which are connected directly to the deflection plates of the CRT) are about 200 volts positive. Therefore the second anode is operated from a +200 volt point on the low-voltage supply bleeder, thus fulfilling the requirements that the deflection plates and the second anode operate at the same potential and be at a low voltage with respect to ground at the same time. The second anode is 1600 volts positive with respect to the cathode (+200 volts and —1400 volts equals a potential difference of 1600 volts).

Intensity Modulation

In some oscillographs provision is made to feed a signal to the grid of the cathode-ray tube in order to intensify or blank the electron beam while it is tracing out a pattern. This makes it possible to superimpose timing markers on the trace and to determine the frequency of an unknown signal. When negative timing signals are applied to the grid, the beam is cut off. A square-wave pattern, with negative timing markers superimposed, is shown in Fig. 4. In this case 60 cycle timing markers were produced from a calibrated pulse generator. Since there are six timing markers for one cycle of the square wave, the square wave frequency is 1/6 the frequency of the timing markers, or 10 cycles per second.

When a signal is coupled to the grid of the cathode-ray tube, it is referred to as Z-axis or intensity modulation. The signal is capacitively connected as shown in Fig. 3. Since 15 volts are needed to fully blank the trace, a Z-axis amplifier is sometimes provided to increase the amplitude of the timing markers if they are derived from a low voltage signal generator.

Servicing Techniques

If the reader has understood the operation of the various sections of the oscillograph, he should have no trouble in using the instrument for servicing f-m and television receivers. Outlined below are techniques which should be observed for best servicing of the basic sections of these receivers. It will be found that no one oscillograph on the market today satisfies all the requirements for servicing.

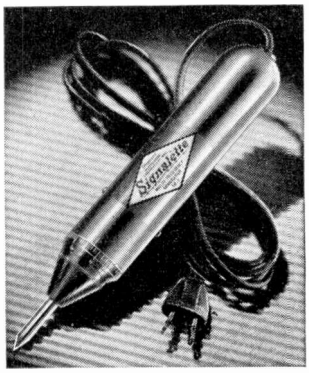
1. Aligning the video amplifier.— Alignment of the video amplifier is done usually with a square wave generator oscillograph. The instruments are connected as shown in Fig. 5. To check the response of the amplifier, the square wave generator is set first at 60 cycles and then at 200 kc. To observe these square wave signals without introducing distortion from the oscillograph amplifiers, the frequency response of the Y-axis amplifier in the oscillograph must be uniform from about five cycles to four megacycles. The Y-axis amplifier should have a sensitivity of about 0.1 rms volts/inch.

2. Aligning video and audio i-f amplifiers and detectors. — The video and audio i-f amplifiers and detectors are aligned with a wobbulator and oscillograph. Since the sweep frequency of most wobbulators is 60 cps, the detected response curve of the i-f amplifiers appears on the oscillograph as a 60 cycle signal. The Y-axis amplifier of the oscillograph should therefore have a low frequency response which is uniform to about five cycles or better in order to observe this 60 cycle signal without distortion. To align the i-f amplifiers, stage by stage, the Y-axis amplifiers of the oscillograph should have a high sensitivity, about 20 rms millivolts/inch.

A detector probe must be used with the oscillograph in order to detect the sweep frequency signals and to observe the response curve (which is the envelope of these signals). Most of the probes designed for use with vacuum tube voltmeters are suitable for use with an oscillograph.

→ to following page

SHOOTS TROUBLE FASTER! MAKES MORE MONEY FOR YOU ON JOB OR AT SERVICE BENCH!



PRICE $9.95 at Distributor or postpaid, direct Sorry, no COD's. Ohioan's add 3% State Sales Tax

Signalette

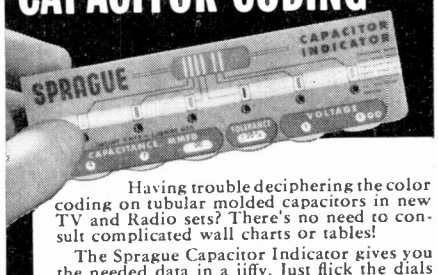
MULTI-FREQUENCY GENERATOR

In radio service work, time means money. Locate trouble faster, handle a much greater volume of work with the SIGNALETTE. As a trouble shooting tool, SIGNALETTE has no equal. Merely plug in any 110 V. AC-DC line, start at speaker end of circuit and trace back, stage by stage, listening in set's speaker. Generates RF, IF and AUDIO Frequencies, 2500 cycles to 20 Megacycles. Also used for checks on Sensitivity, Gain, Peaking, Shielding, Tube testing. Wt. 13 oz. Fits pocket or tool kit. See at your dist. or order direct.

CLIPPARD INSTRUMENT LABORATORY, INC.
Dept. I 1125 Bank Street
Cincinnati 14, Ohio

Qualified Jobbers write, wire for details

QUICK, EASY WAY TO READ TUBULAR CAPACITOR CODING



Having trouble deciphering the color coding on tubular molded capacitors in new TV and Radio sets? There's no need to consult complicated wall charts or tables!

The Sprague Capacitor Indicator gives you the needed data in a jiffy. Just flick the dials to the color bands and read the capacitance, tolerance, and voltage directly.

This slick plastic service help fits your pocket. Always on hand, it saves time and avoids mistakes . . . and it's only 15c. Ask for one at your Sprague distributor today!

SPRAGUE PRODUCTS COMPANY
Distributors' Division of the Sprague Electric Co.
NORTH ADAMS, MASS.

Oscillograph

→ from preceding page

Probes which use crystal rectifiers are preferred because they do not require provision for a heater and bias supply. The circuit of a suitable probe is shown in Fig. 6. The components should be mounted in a shielded tube. A length of coaxial cable should be provided for connecting the probe to the input terminals of the oscillograph.

When aligning an i-f stage, the wobbulator is connected to the grid of the amplifier tube while the probe is connected to the plate. The output of the probe is then fed to the Y-axis of the oscillograph. The probe does not have to be used when the video or sound detector is aligned because the i-f signal is detected in these stages. The oscillograph is merely connected to the output of the detector stage.

3. **Aligning r-f tuners.**—The r-f amplifiers and tuned circuits in the r-f tuner are also aligned with a wobbulator and oscillograph. The probe detector is connected to the output of the mixer stage, while the wobbulator signal is fed to the antenna input terminals. A high gain, good low frequency oscillograph is required.

4. **For signal tracing the vertical sweep circuits,** the oscillograph should have good 60 cycle response and a sensitivity of about 0.1 rms volts/inch.

5. **For signal tracing the horizontal sweep circuits,** the Y-axis amplifier of the oscillograph should have a high frequency response which is uniform to about two megacycles in order to observe the 15,750 kc horizontal sync and sweep signals.

When all the requirements of an oscillograph are considered together, it is found that at least two commercial instruments are needed, one which has high gain amplifiers with good 60 cycle response, and another with low gain amplifiers with extended bandwidth to 4 megacycles.

This concludes the description of the cathode-ray oscillograph and its application to f-m and television servicing problems. In the next article we shall begin the discussion of sweep frequency generators.

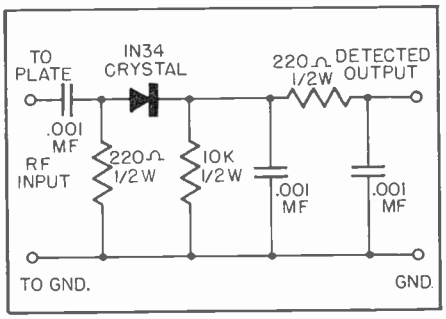


Fig. 6 Circuit of suitable detector probe

Successor to 208-B

→ from page 14

sweep generator is coupled directly to a cathode follower stage. This is necessary since the unattenuated output of the sweep generator would saturate the cathode follower in the input circuit of the horizontal amplifier. Insertion of attenuators would distort the low frequency sweep signals.

The sweep generator in the new instruments may be synchronized by the signal applied to the Y-input terminal, by an external signal, or by an internally supplied voltage of power line frequency. Polarity is not a factor.

The synchronizing voltage is applied to the first half of V7. This is a phase inverter which enables the operator to select varying amounts of synchronizing voltage from either the plate or cathode of the amplifier by the use of a center-tapped potentiometer, R5. The output from this stage is fed into the second half of V7, a second stage of amplification. The positive voltage from this stage is applied to the grid of the thyratron to reduce its firing potential. Thus the applied synchronizing voltage fires the gas-filled triode each time the plate potential rises to a sufficient value, assuring that the sweep recurs at either the frequency of the synchronizing rate or at an integral submultiple.

The type 1N34 germanium diode limits the amplitude of the synchronizing voltage, thus avoiding distortion due to excessive synchronizing signal. This diode also prevents the grid of the thyratron from charging to too high a positive potential at higher sweep frequencies, thus avoiding premature firing of the thyratron.

Driven Sweep

With the X Selector switch in the driven-sweep position, the bias at the cathode of the thyratron is increased by the addition of resistor R6 in Fig. 1. As a result, the thyratron must reach a higher plate potential before it can conduct. The tube V10, connected as a diode, does not permit the thyratron plate to reach the potential necessary for conduction. However, when a positive potential of sufficient amplitude is applied from the sync amplifier to the grid of the thyratron, the firing potential of the tube is reduced sufficiently to start it conducting. The sweep capacitor immediately discharges until the plate voltage of the thyratron drops to the extinction point. Conduction no longer occurs and the capacitor again begins to charge and stands ready to produce another single sweep upon the arrival of another sync pulse. Stabilized synchronization of the pattern is maintained by a sync-limiting circuit, so that sweep length and synchronization are unaffected by variations in signal voltage level.

This sync limiter is important for sync control. It means that no re-setting will be necessary, once the control has been set, though the signal may vary in amplitude.

Extremely slow sweeps are available (10 seconds or more) by the connection of external capacitors between the X-input terminals on the front panel.

Deflection Amplifiers

Unlike its predecessor, the new instrument provides both high gain a-c and d-c amplifiers for the X and Y axes.

The addition of the d-c amplifier makes it possible to observe the actual d-c components, in addition to the a-c components which are made observable through the a-c amplifier. In some circuits it is actually necessary to measure the d-c component; and this is sometimes specified by the manufacturer. The advantage of having a d-c amplifier incorporated in the oscillograph can therefore easily be seen.

The sensitivity of the Y-axis amplifier is 10 millivolts rms per inch, that of the X-axis 50 millivolts rms per inch.

Vertical deflection on these instruments may be expanded to four times full-screen diameter, horizontal deflections to five times full-screen diameter.

Vertical positioning is obtained by moving the arm of R5 in Fig. 2, which varies the d-c level at the

→ to page 34

THE LEADER IN RADIO PUBLICATIONS!

12 BOOKS IN 1

THE

RADIO DATA BOOK

W. F. BOYCE and J. J. ROCHE

THE ONLY RADIO HANDBOOK OF ITS KIND! . . . OVER 900 PAGES . . . 12 SECTIONS, EACH A COMPLETE COVERAGE OF ONE RADIO SUBJECT.

TOGETHER, THE 12 SECTIONS FORM THE MOST COMPLETE, EASY TO READ HANDBOOK MONEY CAN BUY!

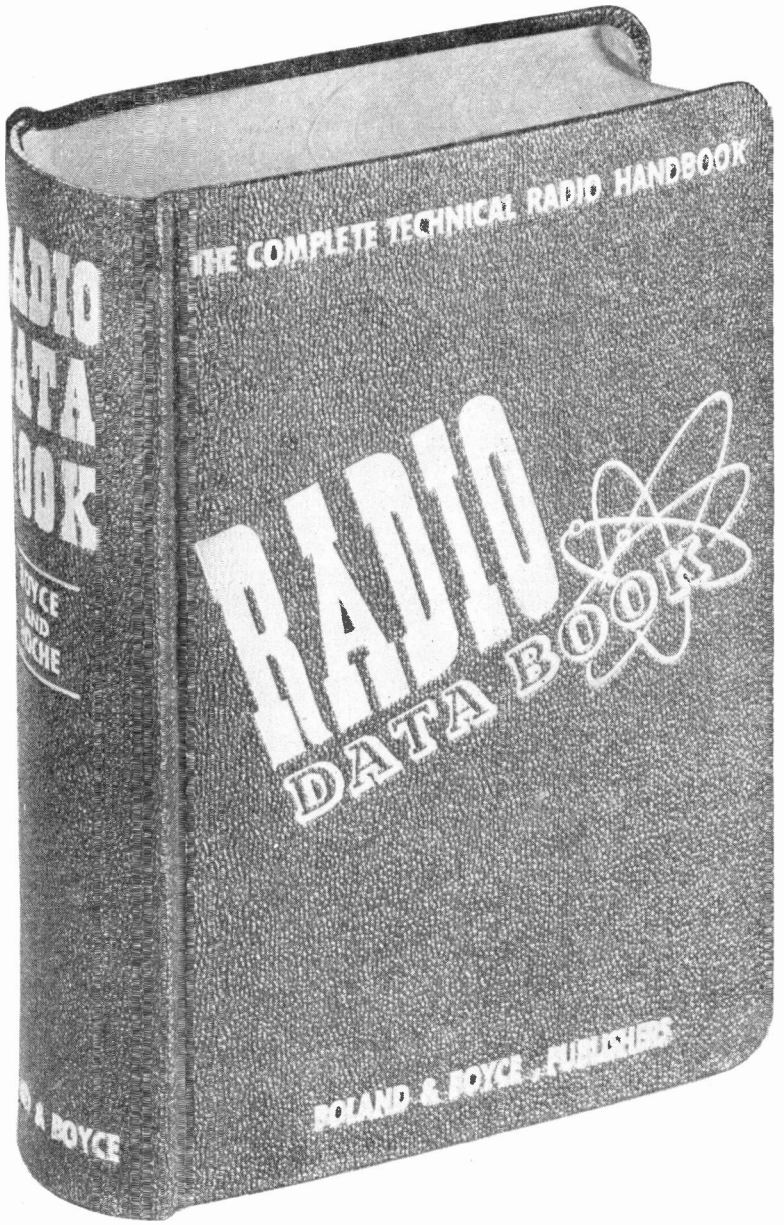
Plan every operation in radio and electronics with the *Radio Data Book*. This new radio bible will be your lifelong tool . . . you will use it every day, on the board, at the bench, in the field! Use it for engineering, construction, troubleshooting and testing. The RADIO DATA BOOK will be your invaluable aid in design, experiment and in layout. It will help make your production better, faster and easier. In any and every operation in radio and electronics, you will use the RADIO DATA BOOK!

The RADIO DATA BOOK is a work of complete authority, prepared by engineers with many years of practical experience. They have been assisted by the Boland & Boyce staff of editors skilled in preparing electronics manuals for the U. S. Signal Corps for many years. These men have worked for several years gathering material for this book . . . all the knowledge of radio principles and operation . . . all the statistics . . . all the newest developments in electronics . . . every possible angle and detail. Eighteen months were spent digesting this material into the most concise, the clearest, and the most readable form. The result is this invaluable manual . . . The RADIO DATA BOOK. Whether you use this book for general reference, for scientific instruction, or for education, one thing is certain—the practical help, the daily usefulness you will derive from it will prove to be worth many, many times its astonishingly low price.

Here's a description of just ONE section—Section 5, Sound Systems:

This section covers the planning, selection of components, and assembly of complete P.A. installations. Every type of unit and material used in a sound system is described and analyzed. Components are classed as to size and type of P.A. installations in which they should be used. Tables and charts are given from which to determine power and ratings. Microphone and speaker construction are described and illustrated in detail . . . placement in auditoriums, etc., for proper acoustical results is explained and illustrated as are the proper methods of wiring up the various units, etc.

The above is just one of the twelve big sections in the RADIO DATA BOOK. We wish we had room here to describe all twelve in detail, but just look over the list of sections, and you will see why this is the best radio handbook money can buy. Send in your order for the RADIO DATA BOOK today!



HANDSOMELY BOUND IN DURABLE DUPONT FABRIKOID . . . TWELVE SECTIONS . . . OVER 900 PAGES . . . COMPLETELY ILLUSTRATED.

CONTENTS:

Section 1. THE 150 BASIC CIRCUITS IN RADIO
Section 2. COMPLETE TEST EQUIPMENT DATA
Section 3. TESTING, MEASURING AND ALIGNMENT
Section 4. ALL ABOUT ANTENNAS
Section 5. SOUND SYSTEMS
Section 6. RECORDING
Section 7. COMPLETE TUBE MANUAL
Section 8. CHARTS, GRAPHS AND CURVES
Section 9. CODES, SYMBOLS AND STANDARDS
Section 10. 50 TESTED CIRCUITS DESIGNED FOR OPTIMUM PERFORMANCE
Section 11. DICTIONARY OF RADIO AND ELECTRONIC TERMS

$5.00 • AT YOUR LOCAL JOBBER

A PRODUCT OF BOLAND & BOYCE INC., PUBLISHERS MONTCLAIR, N. J.

• RADIO DATA BOOK • VIDEO HAND BOOK • RADIO AND TELEVISION LIBRARY • RADIO DISTRIBUTION AND MAINTENANCE • TECHNICAL MANUALS •

Successor to 208-B

→ from page 32

plates of V2. When the arm of this potentiometer is at the center of its traverse, the trace should be at the vertical center of the cathode-ray screen. This condition can be fulfilled by setting R6. This positioning system is designed so that even with a vertical deflection four times full-screen diameter, positioning is available over the entire pattern.

Provision for adjustment of the sensitivity of the vertical amplifier is included in these new instruments. Sensitivity may be controlled by potentiometer R7, which provides a variable shunt between the push-pull plates of V3. Thus the instrument may be adjusted to compensate for any variation in sensitivity which might occur over a period of time, owing, for example, to aging of tubes.

Horizontal expansion is made possible through the high-gain and high voltage capacitance of the horizontal amplifier. Positioning is also available over the entire range.

Other Features

In the type 304, the cathode ray tube is operated at an overall accelerating potential of 1780 volts. In the type 304-H, an additional intensifier power supply increases this potential to 3,000 volts. The higher accelerating potential of the Type 304-H facilitates the use of long-persistence screens so that fullest advantage may be taken of the slow recurrent sweeps, the high-speed driven sweeps, and the d-c amplifier of the instrument.

The intensity of the fluorescent trace may be modulated in these new instruments to obtain reference markers indicating time, angle, distance, or other quantities.

A positive signal to brighten the trace, or negative signal to darken it may be applied to the Z-axis input terminal. This terminal is capacitively connected to the grid of the CRT. No Z-axis amplifier is provided. A negative signal of 15 volts, peak-to-peak, will blank the trace from a normal intensity setting.

And one final feature: In spite of the additional circuits incorporated in the instrument, the overall dimensions are reduced, making it even more portable than the 208-B.

New Circuits

→ from page 16

The operation of this circuit is explained with reference to Fig. 3. The video i-f signal is tapped from the last video i-f stage and fed to the narrow-band sync amplifier. A resonant circuit in the plate circuit of this amplifier is sharply tuned to 26.4 Mc, the video i-f carrier frequency. The band-pass of the circuit is limited to about 100 kc, instead of the 4 Mc required to pass the video signal without distortion. Because of the narrow band-pass, all high frequency components of the video signal as well as the high-frequency noise components are removed. The noise-free, narrow-band i-f signal is then detected by a separate sync detector and fed to the vertical and horizontal sweep circuits. The horizontal sync signals, which are 15,750 cps square waves, are slightly distorted by the 100 Kc wide, narrow-band amplifier.

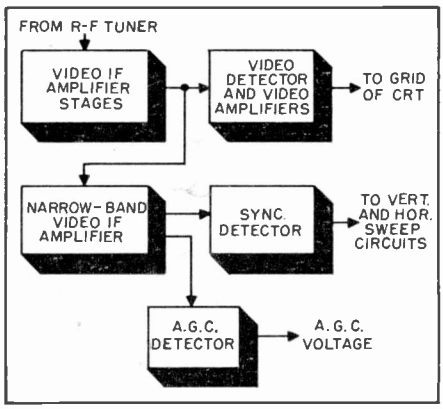


Fig. 3 Block diagram of the "narrow-band" sync circuit. This circuit is found in several DuMont receiver models.

However, a flywheel sync circuit, which depends upon the frequency of the sync pulses rather than their waveshape, is used in the horizontal deflection system. The noise-free distorted horizontal sync pulses thus improve upon the performance of the flywheel sync circuit The 100 kc band-pass is more than sufficient to pass the 60 cps vertical sync signal without distortion. Noise-free, sharp vertical sync pulses are thus obtained and trigger the vertical sweep oscillator at uniform frequency. No noise signals can ride through to the grid of the oscillator and cause the picture to jitter or roll, even in extremely noisy areas.

The narrow-band, noise-free, video i-f signal is also detected by another video detector and then fed to an a-g-c circuit. The a-g-c voltage is therefore free from noise fluctuations and improves the automatic gain control operation of the video circuits.

"Local-Distance" circuits

Of particular advantage in improving the picture contrast in weak signal areas is a "local-distance" circuit which is now used on all DuMont receivers. To appreciate the need for this circuit, one must understand what happens when the contrast control is turned up on a receiver in order to increase the gain. The response of the i-f stages changes slightly when the picture control is varied due to the Miller effect. This effect results in a change in tube input capacitance as the tube's gain is varied by grid bias changes. The change of input capacitance causes a detuning of the i-f coil in the stage. In weak signal areas, the contrast control is usually advanced as far as possible to obtain maximum gain. This greatly detunes the amplifier so that the video i-f carrier, rather than occuring at the 50% point on the i-f response curve (see Fig 4), actually falls lower on the curve. The overall effect is that the gain of the stage is actually reduced when the contrast control is turned up and a weak, unstable picture is obtained. In the "local-distance" circuit, a switch is provided to insert a small capacitor into the grid circuit of the first video i-f stage. This capacitor is switched in only in weak signal areas. It adds to the circuit a sufficient amount of capacitance to retune the i-f stage when the contrast control is far advanced, and thus overcomes the Miller effect. As a result the video i-f carrier always falls at the 50% response point, and stronger, more contrasty pictures are obtained.

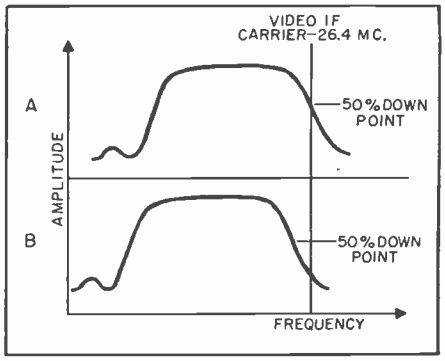


Fig. 4 Response curve of correctly tuned video i-f amplifier (A). Curve (B), video i-f amplifier incorrectly tuned.

THE LEADER IN VIDEO PUBLICATIONS!

THE COMPLETE TELEVISION MANUAL

THE VIDEO HANDBOOK

Morton Scheraga and Joseph J. Roche

How Television Works, Basic . . . through advanced.

How to Design and Engineer Television.

How to Troubleshoot and Repair Television, Safety procedures.

How to Select and Install a Television Antenna.

How to Create a Television Show.

How to Build an Operating Television Receiver, Complete instructions.

How to Select a Television Receiver.

Now in this great one volume book—all the essential knowledge of television! Inside the covers of the VIDEO HANDBOOK is presented complete up-to-the-minute information on television arranged for quick reference—in easy to read, non-mathematical style.

The VIDEO HANDBOOK is designed to give you the practical . . . answers to all your questions on television—the complete, detailed procedures on all phases of television work—step-by-step explanations for everyday problems. This book provides the ready information to make your television education complete.

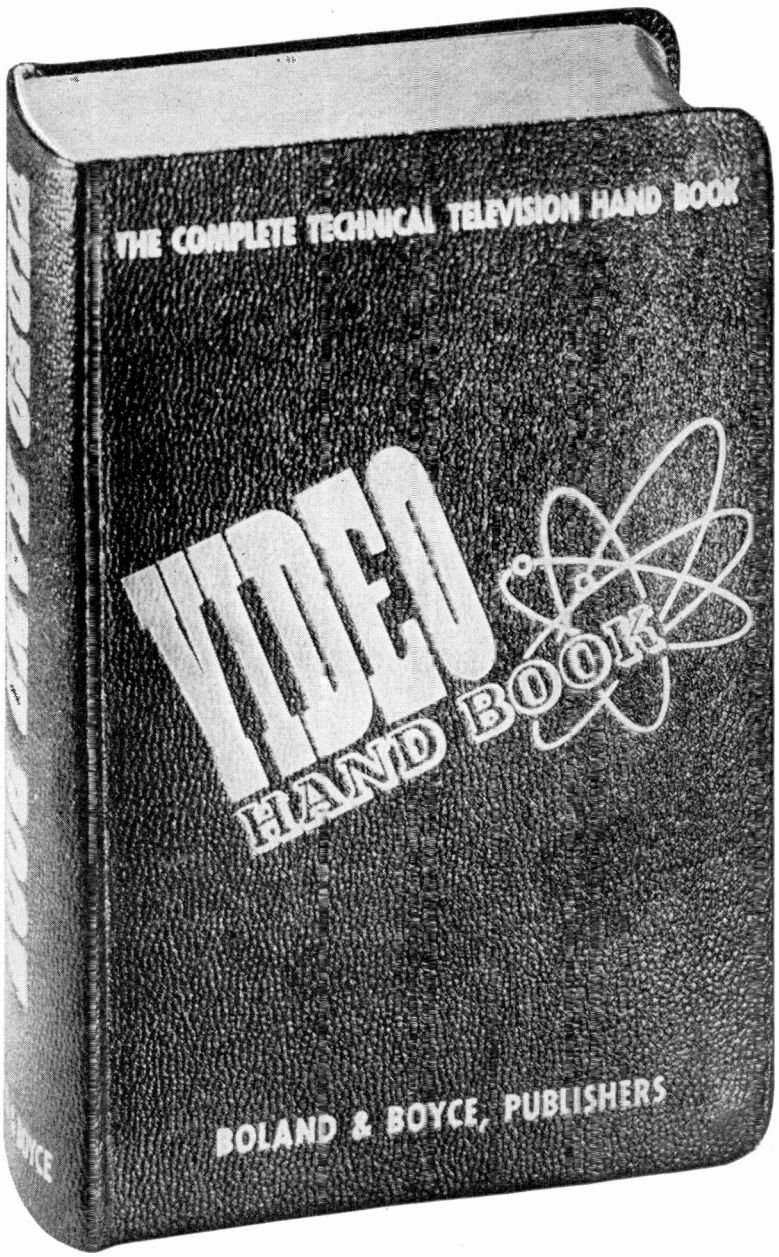
The VIDEO HANDBOOK will save you time — improve your efficiency and make your work easier. It provides the knowledge that means more profit for you. Every page adds to your background for greater prestige and income. Here is the means for everyone in television—employed and executive—to increase his value to his firm.

This book is more than a source of information and interesting reading—it is an investment in your future in television.

READ BY:

Engineers, Designers, Servicemen, Experimenters, Production men, Laboratory technicians, Maintenance men, Program directors, Studio personnel, Broadcast technicians, Manufacturers, Laymen.

The vast amount of information contained in this book can only be briefly outlined here. The VIDEO HANDBOOK contains 900 pages—over 800 illustrations—thousands of vital facts—covering everything you need for working in Television. All this information is designed for easy reading, quick reference—all in non-mathematical language, every point of discussion pictured in diagrams or photographs. The VIDEO HANDBOOK is divided into 14 sections—each a complete, authoritative coverage on its subject—arranged in a practical, easy-to-follow handbook of solutions to every television problem.



Handsomely bound in DuPont Fabrikoid . . . over 900 pages . . . 14 sections . . . over 800 illustrations — photographs, charts, diagrams, schematics.

Section 1. Television: Past, Present & Future.
Section 2. Fundamentals of electronic Television.
Section 3. The Television Station.
Section 4. The Television Receiver.
Section 5. Television Antenna Systems.
Section 6. Creating a Television Show.
Section 7. Descriptions of Modern Television Receivers.
Section 8. Installing Television Receivers.
Section 9. Servicing Television Receivers.
Section 10. Television Test Equipment.
Section 11. Building a Television Receiver.
Section 12. Data Section.
Section 13. Television Terms.
Section 14. Bibliography.

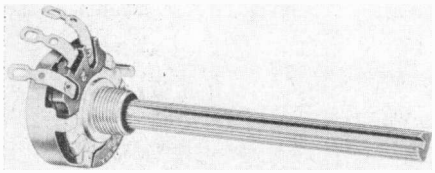
$5.00 • AT YOUR LOCAL RADIO JOBBER

A PRODUCT OF BOLAND & BOYCE INC., PUBLISHERS MONTCLAIR, N. J.

• RADIO DATA BOOK • VIDEO HAND BOOK • RADIO AND TELEVISION LIBRARY • RADIO DISTRIBUTION AND MAINTENANCE • TECHNICAL MANUALS •

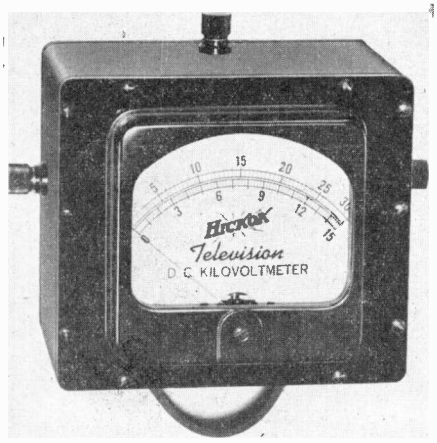
Industry Presents

→ from page 23



NEW CONTROL LINE

A complete line of 59 new, small Q controls has been developed by IRC. The new controls measure only 1 5/16" in diameter. Featured are such innovations as knurled, flatted and slotted shafts which fit at least 90% of the 1/4" shaft knobs, a resilient retainer ring, permitting quick removal of fixed or permanent knob master shaft and replacing it with any of 11 special fixed shafts. This ring also provides smooth, gliding rotation. Operating at 1/2-watt power rating, these controls are available plain or tapped. Free Catalog DC1 is available. Write for it to **International Resistance Company, 401 N. Broad Street, Philadelphia 8, Pa.**

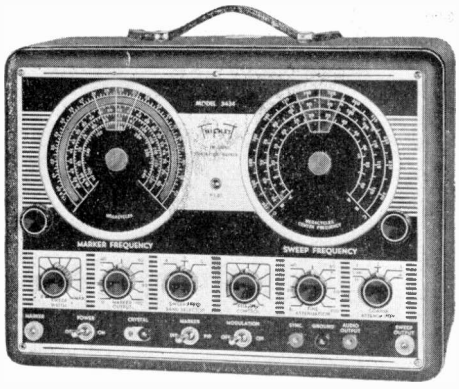


PORTABLE KILOVOLTMETER

A new portable size d-c kilovoltmeter for measuring d-c voltages up to 30,000 volts (as found in TV receivers) is now available. It has a double range of 0-15,000 and 0-30,000 volts d.c., and a sensitivity of 10,000 ohms per volt. For more info on this model S44A, contact **H. D. Johnson, Hickok Electrical Instrument Co., 10634 Dupont Ave., Cleveland 8, Ohio.**

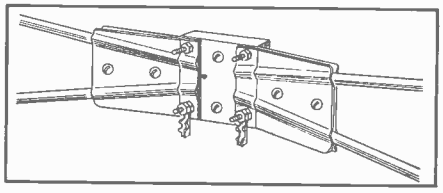
AUTOMATIC CAPACITANCE COMPARATOR

Clippard Instrument Laboratory Inc., has developed an instrument designed as a high-speed accurate aid in selecting, grading, and calibrating of capacitors of any type within an accuracy of 0.2%. The instrument tests all types of capacitors, paper, mica, oil filled, ceramic, and electrolytic. Will be useful for large organizations in checking incoming shipments of capacitors, as well as for work in the lab and on the assembly line. **Clippard Instrument Laboratory, Inc., 1125 Bank Street, Cincinnati, Ohio.**



TV-FM SWEEP GENERATOR

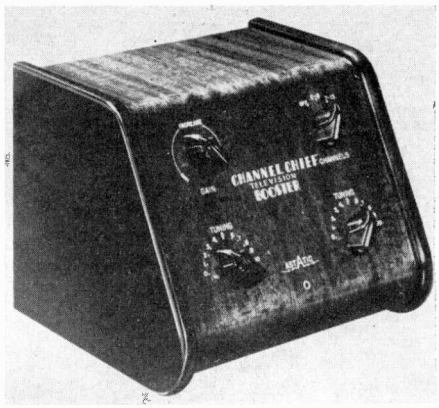
This instrument has continuous ranges to 240 Mc to cover all television carrier and i-f frequencies. Sweep width is 0-12 Mc, continuously variable. Known as Model 3434, the generator has two built-in markers which can be used simultaneously. 19.5-40 Mc marker frequency for i.f., and 57-240 Mc for r.f. and oscillator are available. Marker has both pips and absorption dip control. Stability of instrument is increased by use of ceramic trimmers, zero temperature coefficient capacitors, silver plated coils, critical r-f conductors, and others. For further details, contact **Triplett Electrical Instrument Co., Bluffton, Ohio.**



LOW-COST ANTENNA LINE

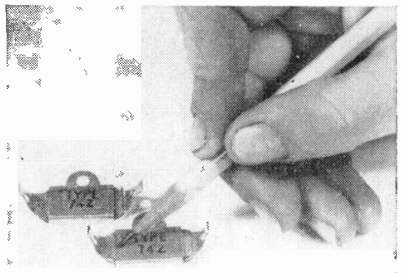
Telrex has announced a new antenna line which retains all the reception ability of the Deluxe Series, but is priced one-third lower than the regular models. It is called the Special Series.

The new economy list prices are made possible by a simplification of the element mounting assemblies. The Telrex Special Element Mounting Assembly is shown in the illustration. Only one Telrex model is not being offered in the new line: the 8X-TV for super hi-gain in weak signal areas. Address inquiries to **Telrex, Inc., 26 Neptune Highway, Asbury Park, N. J.**



TELEVISION BOOSTER

Astatic Corp., till now makers of microphones, phonograph pickups and similar equipment exclusively, have made their entry into the television field with the introduction of the "Channel Chief" Model AT-1 Booster. This booster, they say, is the equivalent of two conventional ones, and is characterized by uniform gain on all twelve channels. The unit is provided with dual tuning controls for separate adjustment of sound and picture definition. Write the company for further details. **Astatic Corporation, Conneaut, Ohio.**



FEED-THROUGH CAPACITORS

A new series of feed-through mica capacitors has been made available by Cornell-Dubilier. Particularly adapted for use in auto radios for radio noise bypass, they are also useful in f-m and television equipment because of their excellent high frequency characteristics. For complete specifications, contact **Cornell-Dubilier Electric Corp., South Plainfield, N. J.**

NEW PICTURE TUBE

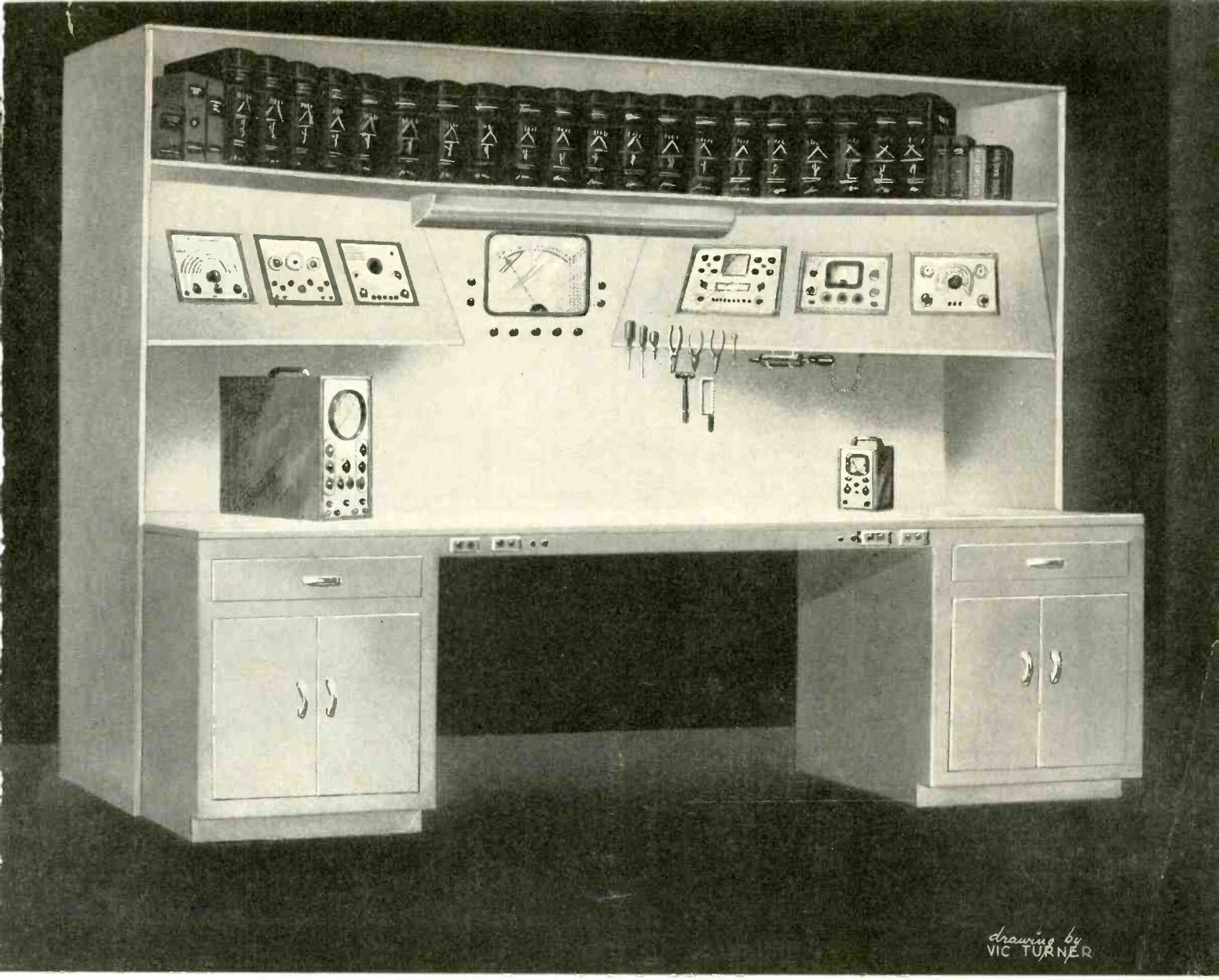
A 16-inch metal television picture tube, 5 1/2 inches shorter than present tubes for 16-inch sets, has just been announced by the Tube Department of RCA. In addition to its reduced length, the tube utilizes, for the first time, RCA's "Filterglass" face plate. Designated 16GP4, the tube will be available in quantity early next year. It is anticipated that this shorter tube will have definite effects on the design of future telesets. **Radio Corporation of America, Camden, N. J.**

INDEX OF ARTICLES

(1948-1949)

INDEX OF ARTICLES

(1948-1949)



BUILD THIS BENCH

Easily, Quickly, and at Low Cost . . . . . .

From complete working drawings, instructions, and illustrations in the JANUARY issue of RADIO & TELEVISION MAINTENANCE.

(NOTE: THE *NEW* TITLE OF THE MAGAZINE BEGINNING JANUARY)

For efficient service work and for added eye-appeal to your service shop this new modern bench design is a must. RADIO & TELEVISION MAINTENANCE magazine has developed this new design after comprehensive research and time-study into the needs of today's television and radio servicing. The result is an ultra-modern service bench incorporating motion saving features—increased production facilities—efficient tool location—replacement part storage—ample portable test equipment stations—built-in permanent test equipment stations—increased space and working facilities for large television chassis—and many other time-and-money saving features.

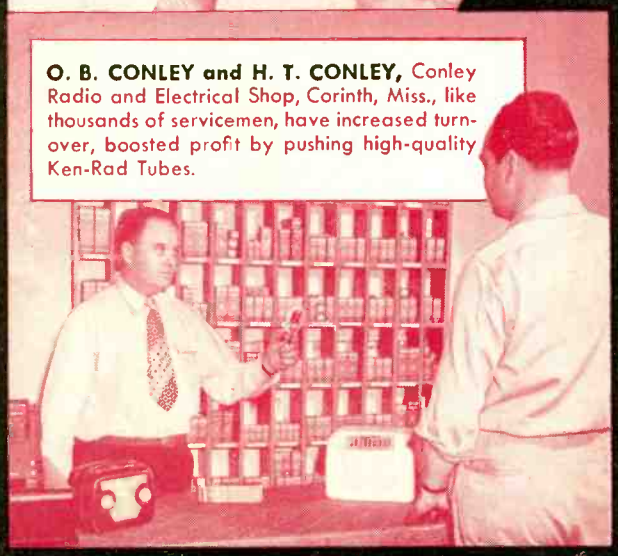
This bench is designed for easy construction at low cost and will be a handsome, durable installation for your shop.

So don't miss the January issue—if your subscription is about to run out, renew it! If you are not a subscriber now—send in your order today (see your jobber for special subscription offer and for single copies).

RADIO & TELEVISION MAINTENANCE . . . . JANUARY ISSUE

MONTCLAIR, N. J. **$3.00 PER YEAR — $5.00 2 YEARS**

"NO BETTER TUBES SOLD THAN KEN-RAD TUBES —SALES PROVE IT!"



O. B. CONLEY and H. T. CONLEY, Conley Radio and Electrical Shop, Corinth, Miss., like thousands of servicemen, have increased turnover, boosted profit by pushing high-quality Ken-Rad Tubes.

"Ken-Rad Tubes have been a steady seller for us ever since we started in business.

"Now, I don't pretend to be a merchandising expert—but when an item satisfies customers and brings them back for more, year after year, the reason is simple.

"It's quality. Quality and value that stand out.

"Ken-Rad Tubes sell fast, stay sold because you can't beat them on either count."

"NO BETTER TUBES MADE THAN KEN-RAD TUBES —TESTS PROVE IT!"

ROBERT E. MOE, Division Engineer, Ken-Rad plants, is one of many experts who help direct the testing of Ken-Rad Tubes. Besides noise and microphonics, these quality tubes are checked for static characteristics, life, shorts, appearance, gas, air and hum.

"I help make Ken-Rad Tubes. And I know—there are no better tubes made!

"Ken-Rad Tubes have to prove their quality over and over again at every stage of production.

"On the right, a Ken-Rad Tube is receiving the microphonic and noise check, with the aid of an amplifier having a known response and a specified gain. The tube is tapped by a motor-driven tapper, and the resulting audio output is checked on a standard VU meter.

"This is only one of the numerous quality tests Ken-Rad Tubes must pass before being shipped to you.

"Good? They've *got* to be good!"

182-HA7

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

THE SERVICEMAN'S TUBE . . . backed by profit-making sales aids which your Ken-Rad distributor will be glad to show you. Phone or write him today!