

RADIO AND

OCTOBER 1949 25c

DISTRIBUTION MAINTENANCE

DEVOTED TO SALES AND SERVICE OF RADIO - VIDEO - AUDIO



Get the "Tune-Up" flier from your Cunningham Distributor for the full story on the new "Tune-Up" campaign.

10 Million Radios Need Repair!

Cunningham's new "Tune-Up" campaign helps you tap this business

NOW... CUNNINGHAM OFFERS YOU an effective way to overcome the public's reluctance to have faulty radios checked... a year-round *personalized* campaign that tells your customers just what they will get for their

money... and you name the price. Here's your chance to cash in on one of the greatest service promotion campaigns ever launched! Get the special flier that gives the whole story from your Cunningham Distributor.



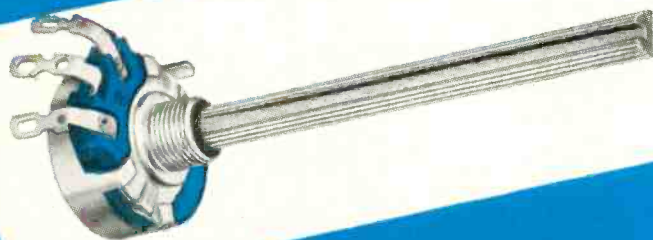
ALWAYS KEEP IN TOUCH WITH YOUR CUNNINGHAM DISTRIBUTOR

**A QUALITY PRODUCT OF THE
RADIO CORPORATION OF AMERICA**

NOW

A SMALL SIZE VOLUME CONTROL

TO MEET THE REQUIREMENTS OF
MODERN AM, FM AND TV SERVICING



COMPACT $1\frac{3}{4}$ " DESIGN and $\frac{1}{4}$ " long bushing permit easy installation in the most crowded chassis. Type Q Controls fit many smaller sets which will not take usual $\frac{3}{4}$ " long bushing, yet are fully capable of handling larger set requirements.

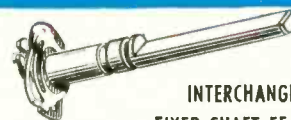


KNOB MASTER FIXED SHAFT
fits 90% of AM, FM and TV $\frac{1}{4}$ " shaft knobs. No alteration except cutting to length. Knurled, flatted and slotted to accommodate knurled push-on knobs, spring-type push-on knobs or set screw knobs. Ends spread for fitting oversize or worn knobs. 3" length meets television requirements. No shaft inserts needed.



**RESILIENT
RETAINER RING**

permits removal of Knob Master Shaft and replacement with any of 11 special fixed shafts, in less than a minute, using only a pocket knife or screwdriver.



**INTERCHANGEABLE
FIXED SHAFT FEATURE**

Gives widest coverage of replacement with nominal stock of controls. Eleven types of shafts let the technician meet many special requirements without expanding control stock. These shafts are sealed in cellophane and individually packaged.



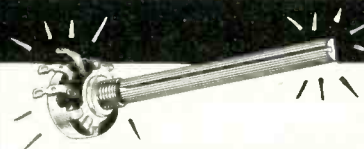
CUSHIONED TURN.

New Resilient Retainer Ring contributes unusually smooth rotation. Your customers will notice the quality "feel" at once. Cushioned Turn does for IRC Q Controls what low-pressure balloon tires do for automobiles.



**NEW TYPE
76 SWITCHES**

designed and manufactured by IRC. Easily and quickly attached to any IRC Q Control.



STURDIER AND MORE BEAUTIFUL.

Rugged, molded control base and switch enclosure are colored distinctive IRC blue. All metal parts are non-ferrous material nickel-plated for lustrous finish and resistance to corrosion. Customers will like the Type Q's rich precision appearance.

IRC now offers Radio Technicians a new volume control carefully engineered to meet the needs of modern television and radio replacement. The new Type Q Control leads the field in practical convenience. It embodies outstanding, constructional, electrical and mechanical features. Absolute uniformity is assured through the elimination of hand operations in manufacture, and by complete production testing.

SEEING IS BELIEVING

In an actual field test, IRC Q Controls and Interchangeable Shafts were demonstrated to a large cross-section of radio and television technicians. All were enthusiastic over the unique features of these revolutionary new controls. Because of their versatility, ease of use, and dependability, we believe they will become the most widely used controls in the industry.

A COMPLETE LINE OF 59 TYPE Q CONTROLS

and 11 Special Shafts

GIVES YOU WIDEST SERVICE COVERAGE

Now, with IRC's versatile Q Control Line and Special Fixed Shafts, you can service virtually every type of small control requirement—in a minimum of time. Ease of installation—even in crowded chassis; one-minute replacement of shafts for specials; shaft and bushing lengths to meet current radio and TV conditions—all mean faster, easier servicing.

PLUS THESE EXTRA CONSTRUCTION ADVANTAGES

Every IRC Q Control, Knob Master Shaft, Interchangeable Fixed Shaft or Switch is simply designed, ruggedly constructed, safeguarded by complete production testing. Control base is precision molded of high strength, low moisture absorption bakelite. Contractor is IRC patented one-piece dual unit of thin high-stress alloy. One-piece collector ring and center terminal are silver-plated brass. And the resistance element is the best IRC ever manufactured!

FREE CATALOG GIVES FULL INFORMATION

For complete details of IRC's revolutionary new Type Q Controls and Interchangeable Fixed Shafts, write us today. IRC Q Controls mean easier AM, FM and TV servicing for you—more convenience for you. Get the full story. Mail coupon for our new Catalog DC-1.

Whenever the Circuit Says ~~~



**INTERNATIONAL
RESISTANCE COMPANY**

401 N. Broad St., Phila. 8, Pa.

In Canada: International Resistance Co., Ltd., Toronto, Licensee



The IRC Type Q Control comes to you in a newly designed blue and yellow carton. There is also a new matching carton for the Interchangeable Fixed Shafts. Complete easy-to-use instructions are included. Look for them at your distributor's.



INTERNATIONAL RESISTANCE CO.

401 N. Broad St., Phila. 8, Pa.

Please send me Catalog DC-1 giving full information on new IRC Type Q Control.

Name _____

Address _____

City _____ Zone _____ State _____

Your Best Buy!

DU MONT Type 16FP4



◆ Fully in keeping with the trend towards larger, direct-viewing tubes originally pioneered by Dr. Allen B. Du Mont—and also the lower price range for higher grade TV offerings.

Type 16FP4 is a 16-inch magnetic focus and deflection television picture tube designed to give high brilliance and sharp definition. Electron gun design utilizes a bent electrode structure to be used with a single external magnet for the elimination of ion spot blemishes. The exclusive Du Mont screen depositing technique assures the longest pleasurable usage.

CHECK LIST OF 16FP4 ADVANTAGES...

- ✓ All glass! No mounting problems.
- ✓ A mass-produced standard TV tube for maximum value at minimum cost.
- ✓ Overall length of only 20 1/4 inches.
- ✓ Deflection angle: 62°.
- ✓ Maximum diameter: 16 1/8 inch \pm 1/8 inch.
- ✓ Bent-gun ion trap requiring but a single magnet.
- ✓ Accelerating potential: Maximum 16 KV; (Design Center Value).
- ✓ New type small shell duodecal 5-pin instead of 7-pin base, for use with economical half-socket.
- ✓ Ideal compromise between large picture size and moderate tube cost.

◆ Detailed Specifications on request. Let us quote on quantity requirements.

© ALLEN B. DU MONT LABORATORIES, INC.

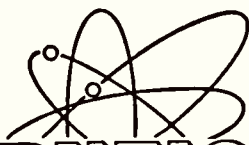
**FIRST WITH THE FINEST
IN TELEVISION TUBES**

DU MONT *Teletrons*

ALLEN B. DU MONT LABORATORIES, INC., TUBE DIVISION, PASSAIC, N. J.

RADIO AND

DISTRIBUTION MAINTENANCE



WILLIAM F. BOYCE
Publisher

VICTOR M. TURNER
Art and Sales

JOSEPH J. ROCHE
Editor

MORTON SCHERAGA
Contributing Editor

ISIDOR I. GROSS
Assistant Editor

FRANK VAN SEETERS
Circulation Manager

Volume 5

October 1949

Number 10

CONTENTS

Newsletter	7
Vertical Deflection Amplifiers in Oscillographs	Morton G. Scheraga 10
Here are the five specifications which will tell you how good an instrument you are buying	
How to Check Audio Amplifiers	Rufus Turner 12
Step-by-step procedures tell how audio amplifiers are serviced, and what instruments are used	
What's New in Picture Tubes	Isidor I. Gross 14
A report on recent developments in picture tube design	
Choosing the Right Antenna is Important	Martin Clifford 16
A summary of the antennas which are available to you to bring in that elusive signal	
Using the Professional Touch	Henry H. Huff 20
The techniques used by one sales and service organization to increase business and profits	
Electronically Speaking	24
Trade Literature	35
Industry Presents	37

ADVERTISING REPRESENTATIVES

Eastern
Herbert J. Olsov
480 Lexington Ave.
New York 17, N. Y.
Plaza 9-0861

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.

For YOU!

from SPRAGUE



New Booklet to BUILD BETTER SERVICE BUSINESS

● Gives customers a new appreciation of your service facilities

● Helps you avoid "cut-throat" price competition

"Your Money's Worth in Good Radio and Television Service" is the title of this new 16-page booklet now made available by the makers of Sprague Capacitors and Koolohm Resistors for distribution to your service customers and prospects *under your own name!*

Profusely illustrated, finely lithographed in two colors, the booklet will help you win customers, justify fair service prices and meet "cut throat" competition that is springing up on all sides. It tells set owners about the complexities of today's radio and television equipment and about the extensive service facilities needed to keep receivers in first class working order.

In short, it is a book designed to win confidence for you by showing customers how complicated the work really is and by proving to them exactly how and why good service work commands a fair price.

**Write for
FREE
SAMPLE**

Dept. RM-109 Sprague Products Co.,
North Adams, Mass.

Please rush free sample of the new booklet "Your Money's Worth in Good Radio and Television Service" and tell me how I can obtain additional copies for distribution to my service customers.

Name _____

Address _____

City, Zone, State _____



with New
Jensen Genuine *Wide Range* Loudspeakers

16 COMPLETELY NEW MODELS

3 15-inch Coaxials, 1 12-inch Coaxial

11 5-inch to 15-inch Single Radiator models

Now music can come to life for everyone — for in the new Jensen Genuine Wide Range loudspeaker series, there is a choice of cost, size and degree-of-performance to meet every requirement for thrilling, realistic reproduction. Whether it be a 5" loudspeaker at \$8 list . . . a 12" Coaxial at \$33.40 list . . . or a 15" Coaxial with the new Jensen Wide-Angle Acoustic Lens listing at \$135 . . . you will find totally new concepts of performance, way ahead of conventional speaker reproduction, brilliantly engineered and painstakingly constructed into these new products.

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

NEW — WIDE ANGLE ACOUSTIC LENS

Typical of Jensen leadership in loudspeaker engineering is the acoustic diverging lens used on the H-510 Coaxial illustrated above. Adopting 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.

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.

GENUINE



Jensen
WIDE RANGE

MADE IN U.S.A.

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

RADIO INDUSTRY

Newsletter

edited by Joseph J. Roche

October 1, 1949

Television Channel allocations continue to be the biggest news in the industry, as the FCC proposals meet opposition from many quarters.

ABDuMont declared that the FCC assignment proposals, if adopted, might result in a one-network monopoly of television. DuMont's T. T. Goldsmith had a solution ready. Main features of his plan...

It would minimize the intermixture of VHF and UHF assignments, and consequently the requirements for converters and other additional equipment.

Most metropolitan districts would have four or more channels.

It would reserve 12 channels for future assignments to small communities, and 9 for non-commercial educational use.

* * * * *

Communications Measurements Laboratory, Inc. also found fault with the FCC proposal. CML proposes that the FCC move all television broadcasting into the UHF band, vacating the VHF band entirely.

The company claimed that use of both bands would complicate future receivers because they would be required to operate over an enormous band of frequencies.

CML pointed to the shift of FM as an example and said that the time to make the change is now.

Such a plan, if adopted, would have the opposite effect of the DuMont plan in that everyone now owning a receiver would need a converter.

The RMA and several others filed statements with the commission.

* * * * *

While all this activity left the average observer slightly bewildered one thing remained clear . . . it will be some time before the Commission can reach decisions which will enable it to lift the TV freeze.

* * * * *

Color Television has been stirring up a great deal of feverish activity in many parts of the industry.

CBS filed the details of its system with the FCC and as it prepared to demonstrate it at the hearings . . .

RCA filed the details of its all electronic system.

* * * * *

Said RCA of its system:—no changes in present black-and-white transmission standards are necessary, performance is equivalent to present black and white, present sets could receive color programs in monochrome without modification, color programs could be received either on special receivers or existing receivers with an adaptor.

Since it would not require changes in standards or cause present receivers to become obsolete, RCA's system seemed to meet all Commission requirements and, from the description released by the company, was superior to the CBS system.

* * * * *

As CBS, RCA, and a third contender, Color Television, Inc. prepared to

demonstrate in Washington, Dr. DuMont requested permission from FCC's Wayne Coy to install commercial black and white receivers alongside the color receivers in order to compare the quality of the various color systems.

In response, Mr. Coy called a meeting to prepare a schedule for comparison tests.

* * * * *

With the possible exception of CBS, the industry agreed that no matter what took place at the hearings, color was years away as far as the public is concerned.

Nevertheless, fear persisted that the public might not see it that way and continue to hold on to its purse strings.

The Industry's efforts to acquaint the public with the facts were looked upon with suspicion in some government quarters.

RMA answered the Industry's critics in its statement to the FCC. Wrote RMA: The industry does not oppose the development of a sound and thoroughly tested system of color television. The industry has not retarded nor opposed the development of color . . . on the contrary, has spent many millions of dollars and years of time in experiments and research.

Members of the Pennsylvania and New York State Federations are staging a "Preventative Radio Maintenance Month" during October. Local distributors, broadcast stations, and manufacturers' reps are cooperating with the State Federations.

Sales of Philco's new teletest line are exceeding expectations, according to the company.

* * * * *

ABDUMont Labs report 87% increase in sales over 1948 for 24-week period ending June 19. This is a good indication of the kind of progress television is making, since this firm is producing almost exclusively for TV.

* * * * *

Motorola August & September teletest deliveries were 103% above same months of last year.

The company hired an additional 1,000 workers in August, bringing the number of its employees to 4,500.

Raytheon, which has been producing and marketing teletests on a small scale for some time, announced that it will enter the market on a national scale.

Samples of its new Belmont Line: a 7" table model at \$129.95; a 16" table model at \$289.95.

* * * * *

G-E announced a price reduction on its TV sets—lowest in their line is \$189.95 ten-inch table model.

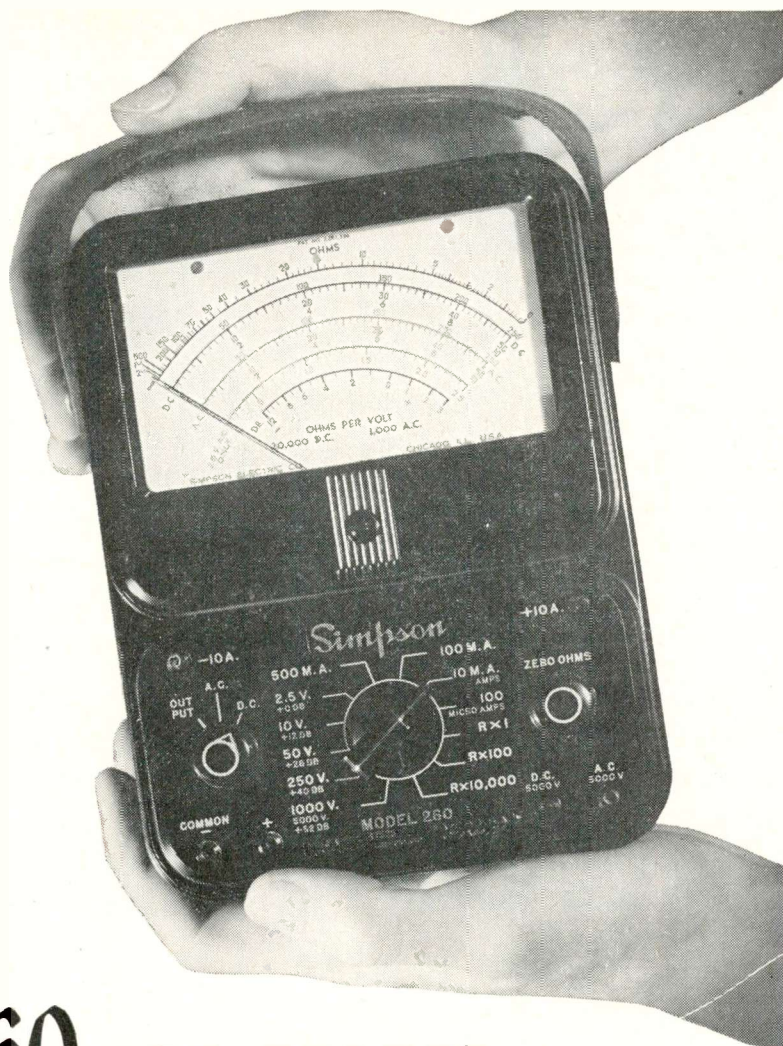
Altec-Lansing, which to date has been producing a TV chassis for custom installation, announced that it will enter the "high end of the high-quality market" with a new line of TV sets.

Capeheart-Farnsworth demonstrated a wired television system for use in industry. The equipment will permit one person to observe activity at several distant points and in places he could not ordinarily see.

Sylvania announced a price protection policy to cover period of August 31 to October 31. It provides for reimbursement to distributors of losses due to price declines within 60 days after receiving tubes shipped during the protection period. According to company, the chief beneficiary will be the radio and TV service industry.

Standard Transformer also announced price protection policy. Will protect distributors against loss for period of 90 days from date of shipment.

Joseph J. Roche, Editor



Here are some of the many reasons why there are more Simpson 260 high sensitivity volt-ohm-milliammeters in use today than all others combined. The Simpson 260 has earned world-wide acceptance because it was the first tester of its kind with all these "Firsts":

Simpson 260 SET TESTER

WORLD FAMOUS FOR ALL THESE "FIRSTS"

- First high sensitivity instrument to use a metal armature frame.
- First to use fully enclosed dust proof rotary switch with all contacts molded in place accurately and firmly.
- First to do away with harness wiring.
- First to provide separate molded recesses for resistors, batteries, etc.
- First to cover all resistors to prevent shorts and accidental damage and to protect against dust and dirt.
- First with a sturdy movement adapted to the rugged requirements of a wide range of service work or laboratory testing.
- First to provide easy means of replacing batteries.
- First to use all bakelite case and panels in volt-ohm-milliammeters.
- First volt-ohm-milliammeter at 20,000 ohms per volt with large $4\frac{1}{2}$ " meter supplied in compact case (size $5\frac{1}{4}$ " x 7" x $3\frac{1}{8}$ ").
- First and only one available with Simpson patented Roll Top Case.
- First to provide convenient compartment for test leads (Roll Top case).
- First to offer choice of colors.



The Model 260 also is available in the famous patented Roll Top safety case with built-in lead compartment. This sturdy, molded, bakelite case with Roll Top provides maximum protection for your 260 when used for servicing in the field or shop.

25,000 volt DC Probe for television servicing, complete, for use with 260, \$12.85

SIMPSON ELECTRIC COMPANY • 5200-18 W. Kinzie St., Chicago 44, Ill. • In Canada: Bach-Simpson, Ltd., London, Ont.

RANGES

20,000 Ohms per Volt DC, 1,000 Ohms per Volt AC

VOLTS: AC & DC—2.5, 10, 50, 250, 1,000, 5,000

OUTPUT: 2.5, 10, 50, 250, 1000

MILLIAMPERES, DC: 10, 100, 500

MICROAMPERES, DC: 100

AMPERES, DC: 10

DECIBELS: (5 ranges)—12 to +55 DB

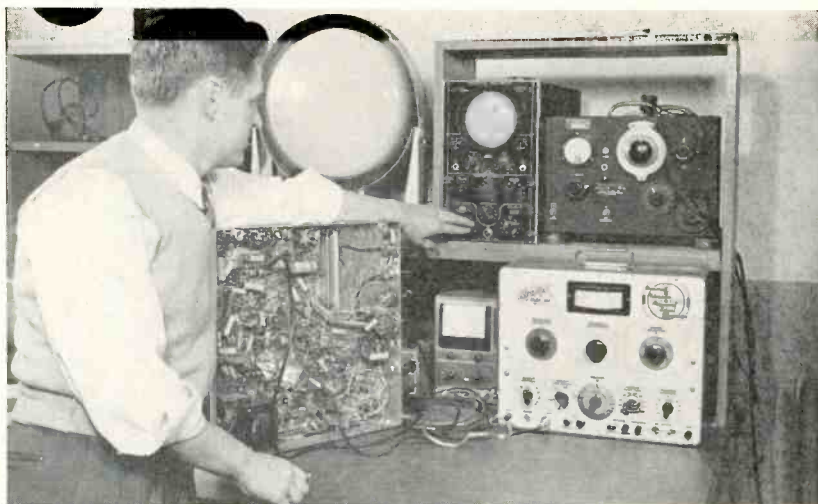
OHMS: 0-2,000 (12 ohms center), 0-200,000 (1200 ohms center), 0-20 megohms (120,000 ohms center).

Prices: \$38.95 dealers net; Roll Top \$45.95 dealers net.

Simpson
INSTRUMENTS THAT STAY ACCURATE

f-m and tv test equipment

*Here are the five
specifications for*



Courtesy Allen B. DuMont Labs.

VERTICAL DEFLECTION AMPLIFIERS *in oscillographs*

by Morton G. Scheraga

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

THE primary function of a cathode-ray oscillograph is to provide a means for plotting a visual curve of an electrical signal on the fluorescent screen of a cathode-ray tube. In the conventional oscillograph, the electrical signal is applied to the vertical deflection plates of the cathode-ray tube. Another signal, generated inside the instrument, is applied to the horizontal deflection plates in order to produce a time base.

Unfortunately, the cathode-ray tube itself is a relatively insensitive device and potentials of the order of several hundred volts must be applied to its deflection plates for full scale deflection. Most oscillographs used for f-m and television servicing involve signals of much lower potential, and an amplifier is therefore necessary.

As pointed out above, the electrical signal is applied to the vertical deflection plates. The amplifier which is interposed between the signal and this set of plates is called the vertical, or Y-axis deflection amplifier. This article deals with the characteristics of

the Y-axis amplifier and how they affect the techniques employed in servicing various sections of the receiver.

Simple Y-axis Amplifier

The Y-axis amplifier in low cost oscillographs has generally a frequency response from 30 cycles to 50 kc. Usually, a single amplifier stage, of the type shown in Fig. 1, is sufficient to cover this range. Certain points in the design of this simple amplifier are of interest.

Since an ordinary resistance-capacitance coupled amplifier stage does not provide sufficient bandwidth, some form of low and high frequency compensation must be employed. High frequency compensation is secured by placing a suitable inductance, L1, in the plate circuit. Its function is identical to similar inductances utilized in the video amplifiers of television receivers. L1 adds a reactance which increases with frequency. Stray capacitances and inter-electrode capacitances of the vacuum tube have the effect of decreasing the plate load impedance as the signal

frequency is increased, therefore attenuating the higher frequencies. For this reason, L1 is employed to increase the load impedance at high frequencies and thus maintain the amplifier gain.

Another method of obtaining high frequency compensation in amplifiers of this type is to use a small cathode bypass condenser, between 0.001 mmf and 0.01 mf. At low frequencies, this capacity is insufficient to give adequate bypassing, and cathode degeneration results. This produces less gain than would be obtained with a fully bypassed cathode resistor. At higher frequencies, where the gain of the stage would start to drop off, the bypassing action becomes more effective. The cathode degeneration is eliminated and the gain of the amplifier is raised to compensate for the loss caused by the stray capacities shunting the plate load resistor, R1.

Low frequency compensation takes the form of resistor R_c and capacitor C_c. These components, and C_g and R_g, are chosen for optimum low frequency response.

Simple, single stage amplifiers, such as shown in Fig. 1, have deflection sensitivities of about 0.5 volts peak/inch when coupled to a cathode-ray tube operating at about 1000 volts accelerating potential. For television servicing, it is desirable to have an oscillograph with a sensitivity at least ten times higher, or 50 millivolts peak/inch, otherwise special techniques, which will be described later, must be employed when using lower gain instruments.

It will be noted in Fig. 1 that the Y-axis amplifier is connected to one deflection plate, while the other plate is grounded. This type of circuit is called a single-ended, or unbalanced deflection amplifier, and is generally confined to the smaller, more inexpensive oscillographs. When a signal is applied to only one plate of a deflection plate pair, it is ordinarily not possible to properly focus the resultant trace across the entire screen. The focus control on the oscillograph may be adjusted in order to focus some particular portion of the trace, but then some other portions will be defocused. This effect is compensated for in more expensive oscillographs which employ push-pull amplifiers to feed both deflection plates.

The properties of an amplifier are such that the higher its gain the narrower is the bandwidth, and visa versa. The gain of an amplifier is determined mainly by the value of the plate load resistor, and is higher for greater values of resistance. On the other hand, the high frequency re-

fier can be built, if one wishes to employ a sufficient number of wideband, low-gain stages.

To increase the gain of the amplifier system shown in Fig. 1, it is necessary only to add another stage or two of similar design. If a wider

→ to page 22

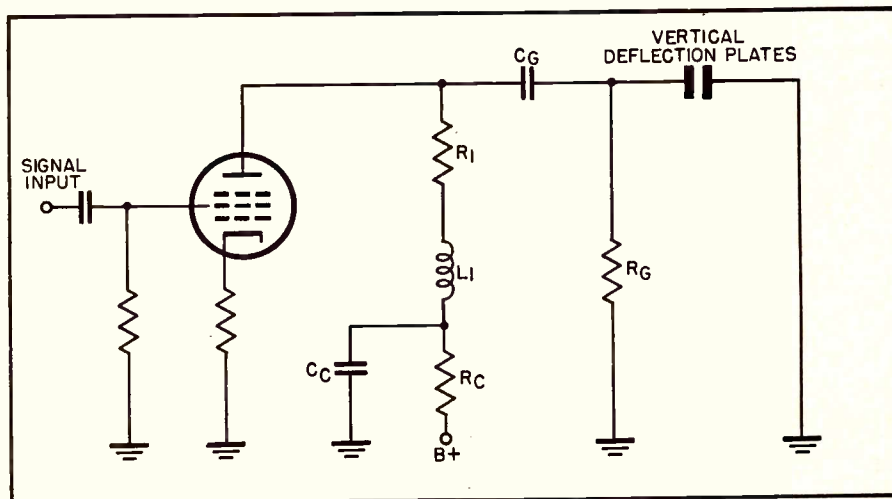


Fig. 1 Schematic diagram of simple vertical deflection amplifier. This is a single-ended deflection amplifier. It is connected to one deflection plate, the other plate is grounded

When buying an oscillograph, check Y-axis amplifiers for these:

- high gain
- good 60-cycle square wave response
- high impedance input, low output capacity
- good high frequency response

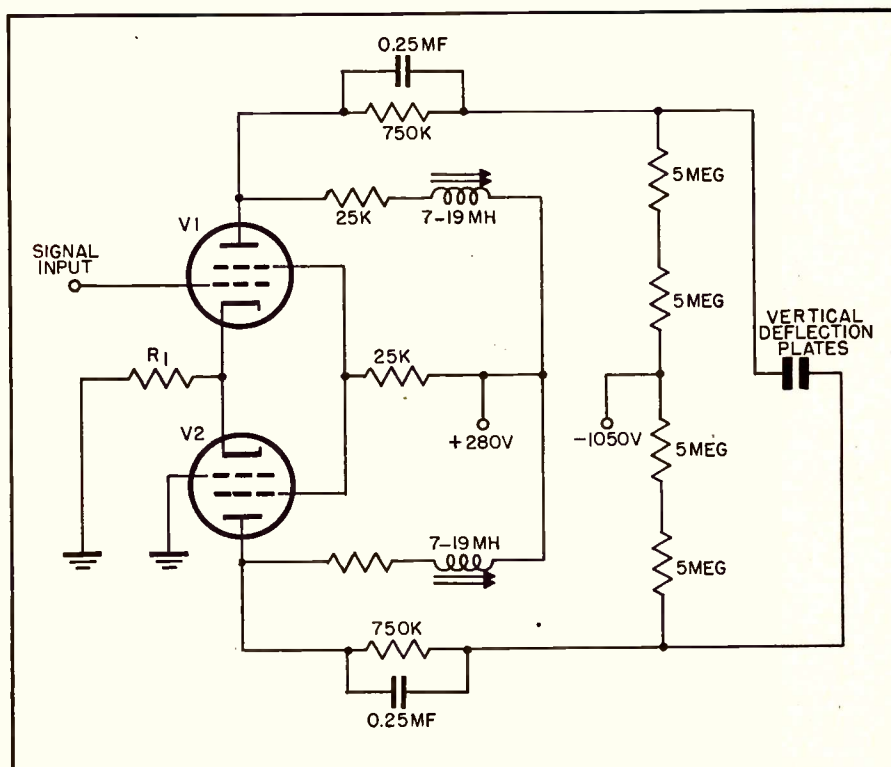


Fig. 2 Balanced amplifiers in vertical deflection system of some oscillographs. This is a typical wide-band amplifier. A cathode-coupled, self-inverting output stage is used

step by step procedure tells

HOW TO CHECK AUDIO AMPLIFIERS

The author details the methods of checking audio amplifiers which he has found most successful

EFFICIENT audio amplifier testing calls for checking of (1) frequency response, (2) gain, (3) distortion, and (4) power output. No overhaul of p-a equipment may be considered complete unless these four performance characteristics have been examined by the technician. Instruments required for complete amplifier testing are (1) sine-and square-wave audio oscillator tuneable from 20 cycles to 20,000 cycles, (2) a.c. vacuum tube voltmeter, (3) electronic switch, and (4) oscilloscope. They are shown in Fig. 1, set up for amplifier checking.

The several test instruments are employed in various ways to check the amplifier characteristics. The connections shown in Fig. 2, 3, and 4, and the simple methods of making the tests will be described in this article. Each of the measurements are

explained separately in the following paragraphs.

Gain Measurement

A sine-wave audio oscillator and a-c vacuum tube voltmeter are required for this test. The apparatus setup is shown in Fig. 2. Connect the output of the oscillator to the input terminals of the amplifier under test. Connect the regular loudspeaker to the amplifier output terminals. If it is desired to keep the test noiseless, replace the speaker voice coil with a resistor (preferably non-inductive) having the same resistance as the voice coil impedance and a wattage rating equal to twice the expected power output of the amplifier. Arrange a double-throw switch, S, so that the voltmeter may be switched back and forth between the input and output terminals of the amplifier.

Either overall gain (that is, for the entire amplifier) or gain per stage may be checked. To measure overall gain:

- (1) Set the amplifier gain control for maximum gain.
- (2) Set the amplifier tone control to its middle (flat-response) position.
- (3) Switch the meter to the input position 1.
- (4) Adjust the oscillator output control to give a small, readable deflection of the meter. Record this voltage as E_1 .
- (5) Switch the meter to output position 2 and record its new reading as E_2 .
- (6) Divide E_2 by E_1 to obtain the overall voltage gain.

If distortion, such as plugging or blocking occurs, it will be necessary to reduce the oscillator output. If the reduced output voltage then is too

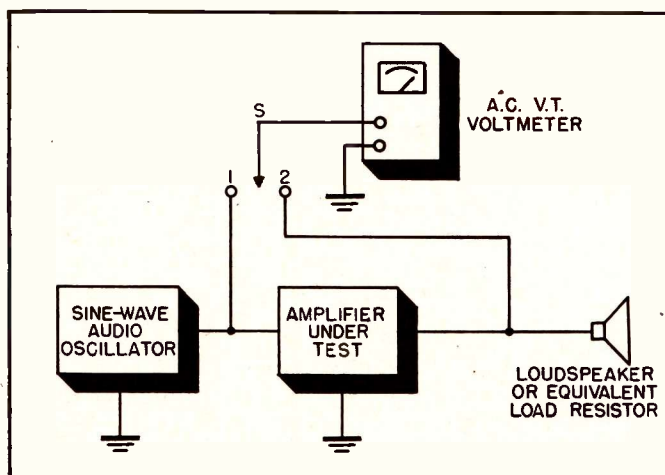


Fig. 2 Above is complete instrument setup for gain measurement. A sine-wave audio oscillator and a-c vtm are required for the test

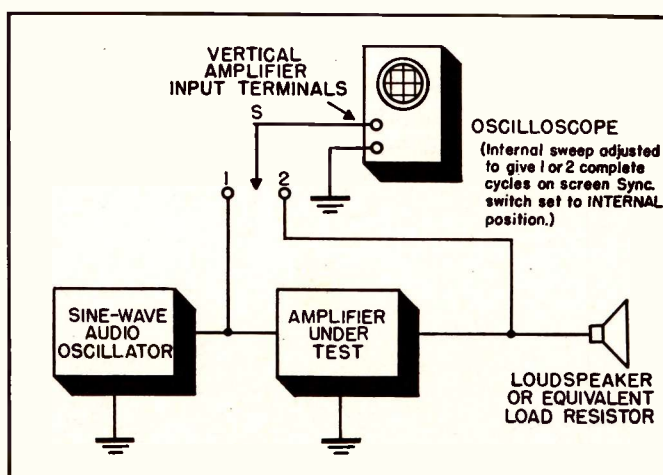
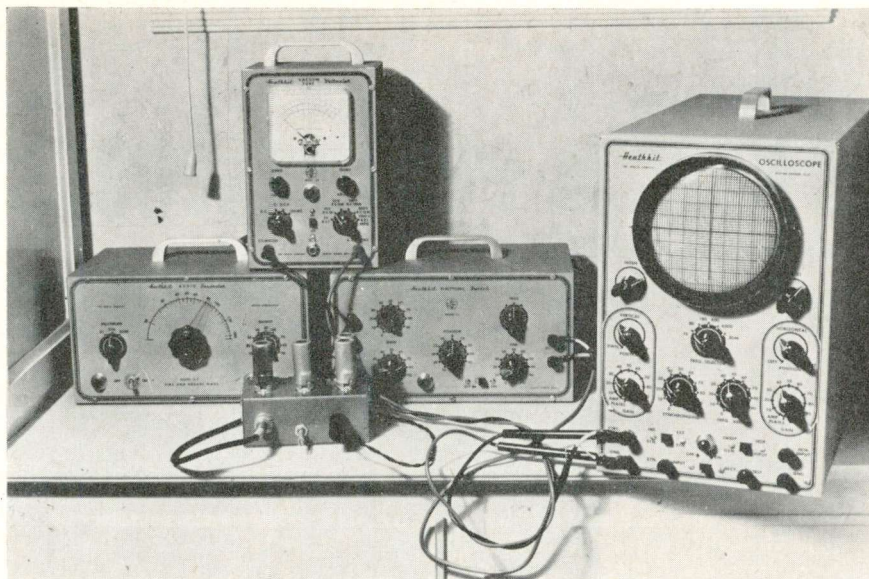


Fig. 3 One apparatus setup for checking distortion in audio amplifiers. Oscillograph is switched permanently to output position 2

by
Rufus Turner

Fig. 1 Setup for audio amplifier checking. A sine-square wave audio generator, electronic switch, a.c. vvm and oscillograph are shown



small to give a readable deflection on the lowest range of the v.t.v.m., install a 10-to-1 or 100-to-1 resistance-type voltage divider between the oscillator output and amplifier input. Connect contact 1 of the switch *S* to the input terminal of the voltage divider. Note the meter reading and divide this value by 10 or 100 (according to the voltage divider ratio) to obtain E_1 . Output voltage E_2 is obtained in the manner described in the preceding paragraph.

Repeat the gain measurement at several oscillator frequencies such as 100, 1000, and 10,000 cycles, and at several selected settings of the amplifier gain control and tone control.

To check separately the voltage gain of any stage in the amplifier apply the oscillator signal voltage to the grid input of the stage under test and check the input voltage (E_1) and

output voltage E_2 (the latter at the plate output terminal of the stage). Divide E_2 by E_1 to obtain the stage gain. When coupling transformers are present, make them a part of the measurement circuit. For example, where both input and output transformers are employed in a single stage, apply the signal to the primary of the input transformer and connect the meter to the secondary of the output transformer. When checking stage gain, an isolating capacitor (0.1 mf, 600-volt tubular) should be connected in the "high" output lead of the oscillator to prevent any d. c. in the circuit under test from entering the oscillator.

If an a. c. vacuum tube voltmeter is not available, an oscillograph may be used in its place, as shown in Fig. 3. The screen of the oscillograph must be calibrated in voltage. In this

way, input voltage (E_1) and output voltage (E_2) may be read by measuring the height of the wave pattern on the 'scope screen.

Still another apparatus setup for gain testing is shown in Fig. 4A. With this arrangement, both the input and output voltage waves appear simultaneously on the oscilloscope screen and the height of each may be measured separately to determine the E_1 and E_2 values. The electronic switch used in this setup is a tube-type instrument which rapidly switches the 'scope input back and forth electronically between the input and output terminals of the amplifier, actually building up both input and output signals in little bits on the screen. However, the action is so rapid that the eye sees only the completed picture rather than the

→ to page 30

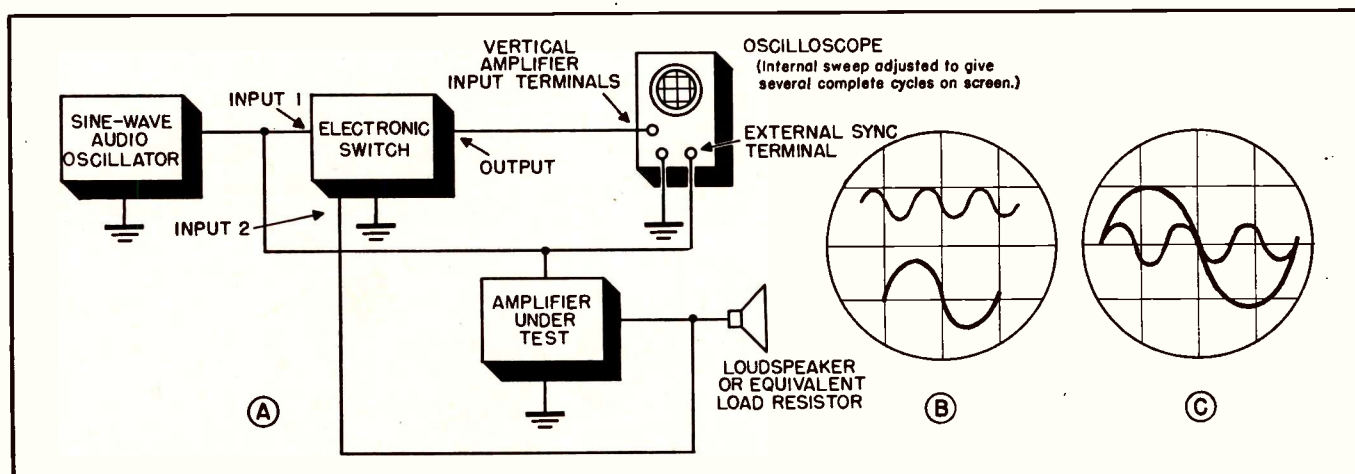


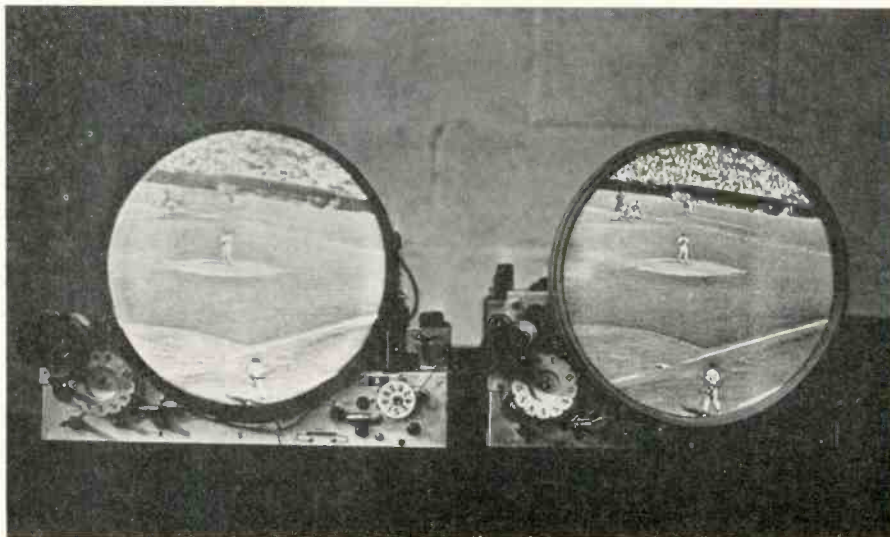
Fig. 4 Shown in A is another setup for checking audio amplifier distortion. The oscillogram in B shows the input and output pat-

terns separated. In C the input and output patterns are superimposed. The technician can choose whichever he prefers

what's **NEW** in PICTURE TUBES?

by Isidor I. Gross

Many manufacturers have announced new developments in picture tube design and material. The more important ones are reviewed in this article



Two identical television receivers with same signal, photographed on same negative at Zenith Labs, illustrate the difference in contrast between the conventional type tube face and Teleglas. Tube to the left has conventional glass, tube at right Teleglas

LAST year, when the shortage of picture tubes was acute, manufacturers had as their slogan: *More Picture Tubes*. Today when supply has caught up with demand, their motto is: *Better Picture Tubes*. Quite a number of improvements in picture tube design have been effected during the past few months, most of them intended to enhance the quality of the picture as it appears on the screen and thereby reduce the incidence of eyestrain. Some of these developments will be discussed here.

New Glass

Two of the problems which face the televiewer are the effect of ambient light (i.e., the external light in a room, for example) on the contrast of the picture, and a phenomenon known as halation (discussed below).

In order to achieve good contrast in the picture, it is necessary that its black areas be really black. The reason for this is the fact that the television picture is composed of black areas, white areas, and different degrees of grey areas in between. It is clear that the greater the difference between the black and the white areas, the greater will be the possible number of shades of grey, and the higher

the contrast. Increasing the blackness of the black areas would therefore be one of the ways to increase contrast. Black areas in television pictures, however, can only be obtained by the absence of light. For this reason, any light falling on the screen would normally change the blacks to a lighter shade, thereby reducing the overall range of contrast. It can thus easily be seen that one of the ways to *increase* contrast would be to keep the amount of external light which might fall on the picture tube to a minimum. But how?

Viewing the screen at night with radically reduced room illumination has been one of the ways the public has found to cope with the problem. But medical and optometrical authorities have agreed that this practice is detrimental to the health of the eyes.

Pittsburgh Plate Glass Co. has now developed a glass for use with metal tubes (called Teleglas) designed to solve this problem. The diagram in Fig. 1 shows how it works. It is a colorless glass which acts as a filter for external light. Illumination striking it is absorbed into it and is not reflected to the viewer or onto other parts of the screen. In effect, it re-

duces the amount of external light hitting the picture tube. The accompanying photograph shows the effect achieved by this new development.

Teleglas also cuts down halation. Normally, light from a bright picture area of the tube striking the exterior tube surface at angles greater than 48° is 100% reflected over into the dark area, thereby diminishing contrast. The design of the glass is such that this reflection is held to a very low level. Fig. 2 shows how this is accomplished.

A company spokesman stated that Teleglas maintains a contrast of the order of 35 to 1 under widely varying conditions of room light. This means that the highlights of the picture would be 35 times brighter than the darkest shade obtainable.

Zenith has already adopted the glass (under the tradename "Glare-Ban"), and other manufacturers with whom we have checked were experimenting with it prior to arriving at a final decision.

Coating

The problem of contrast was attacked from a different angle by American Television, Inc. They started with the observation that the

phosphorescent powder in the screen of the picture tube is of a crystalline nature. Now, when the electron beam hits these crystals, light is scattered uniformly in all directions. For best viewing results, however, light should be traveling only toward the observer. In the conventional tube, that part of the light not traveling toward the viewer goes either back into the tube or toward the surrounding crystals. The net result of this action is that the black areas in the picture seem to be grey and give a washed-out appearance. Fig. 3 shows what happens.

The task which the researchers set themselves was to devise a method whereby side dispersion of the light produced on the screen by the electron beam would be eliminated. They found that manganese dioxide (an opaque powder) combined with sodium metasilicate and mixed with the crystals, would give satisfactory results. The opaque powder acts in such a way as to confine the light emission of each crystal to that crys-

tal alone, as shown in Fig. 4. This action prevents the scattering of light which has heretofore taken place, and as a result increases the contrast of the picture.

Incidentally, American Television Inc. engineers also found that opaque powders of various other chemical composition were equally suitable for this purpose.

This new coating has already been incorporated by Garod is its latest receiver models, and others may follow.

New Tube

Also concerned with the problem of contrast, but going beyond it, DuMont engineers developed the 19-inch 19AP4. They attacked the problem of better pictures via a process which they call "flow-coating." This process involves the more uniform settling of the phosphorescent screen during the coating process, which brings about a reduction in the scattering of light by the phosphorescent crystals.

The tube, however, has some additional and more important features

designed to improve picture quality. A very short neck gives it an overall length of 21½ inches, which makes it 2 inches shorter than the 15-inch tube. The result of the shorter beam throw in this tube is a more clearly defined spot and a sharper focus. The problem to be overcome in this design was one of increased power. Because of the short neck and the large screen diameter, wider deflection angles are required, and these can only be obtained with increased power.

The tube is also equipped with the "bent electron gun," as contrasted with the "slashed field" in conventional tubes. The effect of the bent gun is that the electron beam is bent only once, instead of twice, as in earlier tubes. A single ion trap magnet (rather than the conventional two) is used. Since the electron beam is bent only once, distortion of the spot is considerably reduced. The bent electron gun combined with the shorter beam throw in the tube thus

→ to page 32

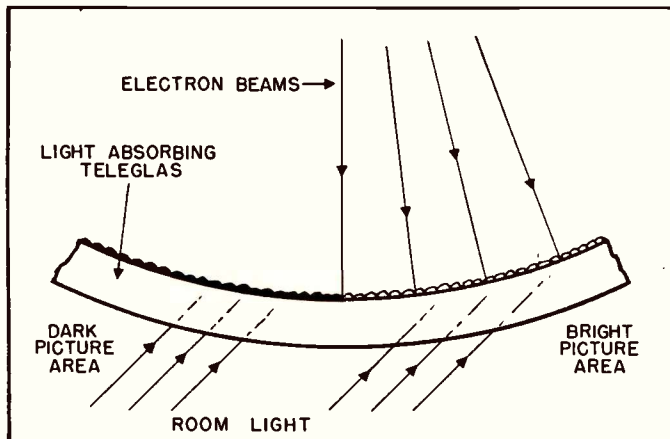


Fig. 1 Diagram showing the effect of room light on television picture. Teleglas absorbs unwanted light, keeps black areas black

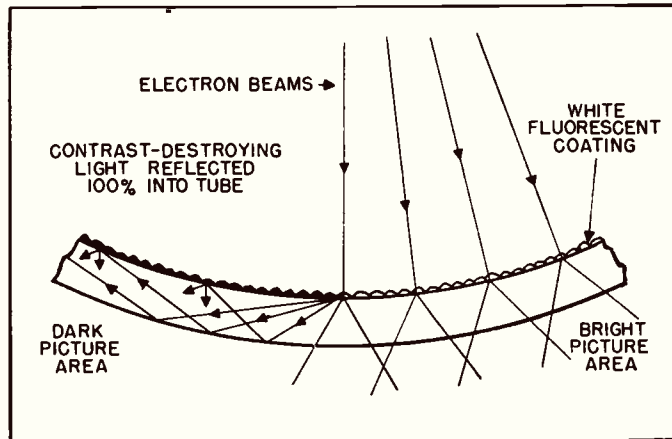


Fig. 2 Illustrating the effect of halation. Some of the light from bright picture area is reflected over into the black portion

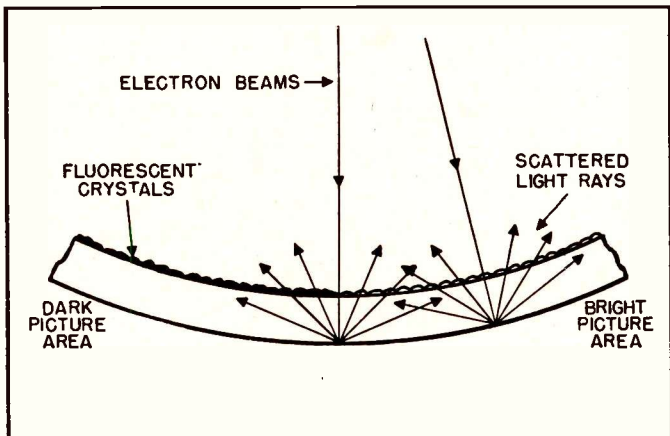


Fig. 3 In the conventional tube, fluorescent crystals in the face coating lower contrast by causing light rays to be scattered

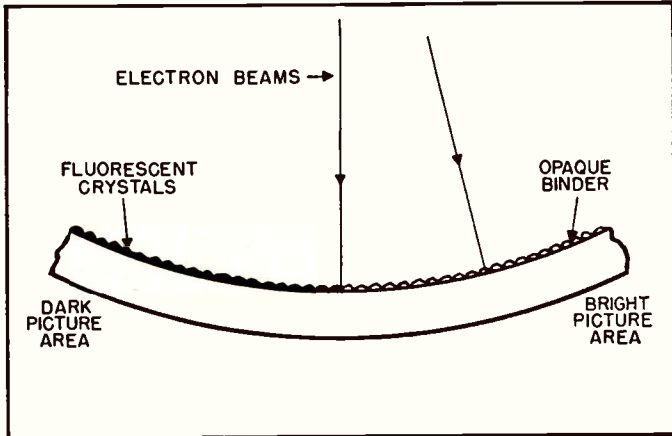


Fig. 4 American Television's method of using opaque binder eliminates scattering of light rays, thereby increasing contrast

choosing the right antenna IS important

by Martin Clifford

TELEVISION technicians have come to realize that the success of an installation depends almost entirely upon the selection of the proper antenna, that it's the antenna which finally determines the performance of the receiver. As a result there has been an increasingly strong interest on the part of the technician in the suitability of the various types of antennas for different installations; and we wish to devote this article to a discussion of some representative examples of practical television antennas which are available to the technician today.

Selection of the antenna is complicated by such factors as location, gain, selectivity, directivity, elimination of unwanted signals, reflections, interference, and finally the ability to receive either a particular station or stations. No wonder that some antenna installations look like—and almost are—engineering construction jobs.

The simplest of all our television antennas is the open dipole. In areas where there is only one station, and where the field strength intensity is good, this antenna has proven to be quite satisfactory. Its performance can be improved for greater signal strength and the reduction of ghosts through the use of a director or a reflector. Additional dipoles can be added if more than one station exists in the area, but the practice today is to have a low and a high frequency dipole in such cases. Both dipoles can be made to have a sufficiently low Q —and therefore broader bandwidth—for the frequency range to cover several stations.

Variations

All television stations radiate waves which are best received by antennas which are horizontal to the earth, because television transmitters radiate horizontally polarized waves. If buildings, trees, or other obstructions exist between the station and the receiver, particularly near the receiving antenna, the radio wave may be so altered that it may be necessary to change the antenna angle.

It also happens occasionally that a "direct" and a "reflected" signal combine at the receiving antenna. Where an ordinary horizontal type dipole antenna is used, this combination of signals produces a minimum of desired signal since one signal tends to cancel the other. In such instances we can use an adjustable V dipole antenna.

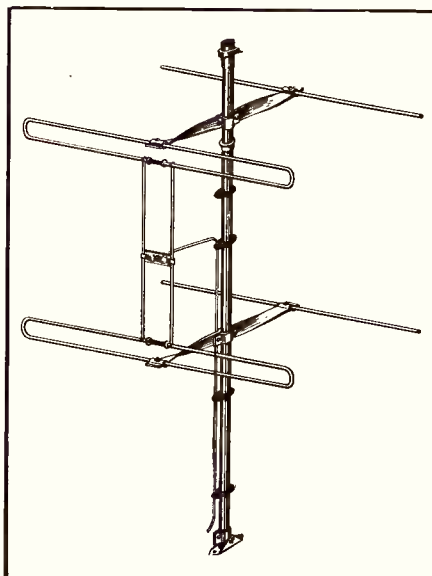


Fig. 2 Ward TVS48. This antenna is designed for high band reception in those areas where low signal intensity obtains

This antenna is simply a dipole whose arms may be moved up and down. In this manner it is possible to make the two signals combine in phase, thereby increasing the signal. The arms of the antenna are moved up or down until best overall reception is secured. Some adjustable V-antennas, particularly of the indoor type, have, in addition, a telescoping arrangement with which its arms can be made longer or shorter, thus physically tuning the antenna to a station.

The folded dipole is a variation of the open dipole. It has a broader bandwidth and a higher input impedance than the open dipole. This antenna is designed for use in areas of medium to high signal strength, or in cases where bi-directional sensitivity is desired. Where elimination of ghosts is necessary, a reflector may be added. The reflector, not electrically connected in any way to the dipole or the receiver, is placed behind the dipole, that is, on the side farthest away from the station. Low and high frequency dipoles, and their reflectors, may be combined into one antenna to serve those areas having television stations in both the upper and lower channels.

It's customary to see the high frequency dipole placed above or below the low frequency dipole, each oriented separately for best reception. However, in areas where both the high and the low frequency stations are located in approximately the same direction from the receiver, both the low and high frequency dipoles may be placed in the same plane, that is, in line with each other. Having both dipoles in the same plane makes it

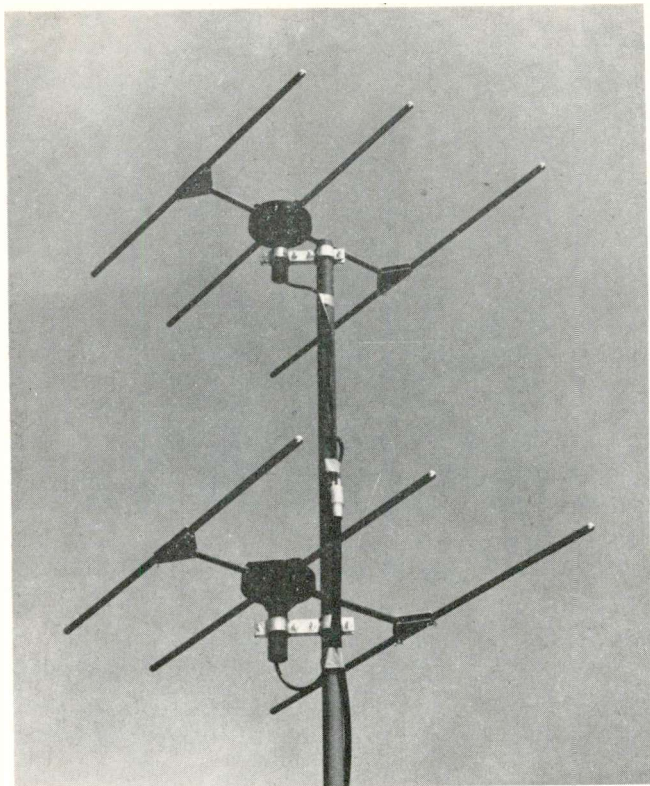


Fig. 1 Workshop Associates Series 2A multiple stacked array. Such antennas are often needed in fringe areas to bring in picture

Troubled by ghosts or snow? Out in the fringe area and no picture? Proper antenna choice may correct these troubles

possible to have one reflector serve both.

The Array

In addition to reflectors, television antennas also use directors to increase directivity and gain. The director, like the reflector, is not electrically connected to the antenna. It is about 4% shorter than the antenna, and is placed between it and the television station. When an antenna is used with a reflector or a director, or a combination of both, it is called an array. Such arrays are used within the normal range of the television station, where it is necessary to discriminate against reflected or interfering signals within this normal service range. Combinations of two or more of these three-element arrays can be mounted on a single mast so that signals on separate channels can be received from different directions.

Where "line-of-sight", or clear optical paths do not exist between station and receiver, the technician must use more elaborate means to furnish the receiver with signals strong enough to give acceptable pictures. Particularly in fringe areas, multiple stacked arrays, such as that shown in Fig. 1 may have to be used. Four,

and sometimes even six element arrays are used. For more severe requirements, a twelve-element array could be assembled, consisting of stacked six-element arrays. The six-element array shown in Fig. 1 consists of two basic three-element antennas aligned in the same direction, connected together by a special cable harness, and spaced one-half wave-

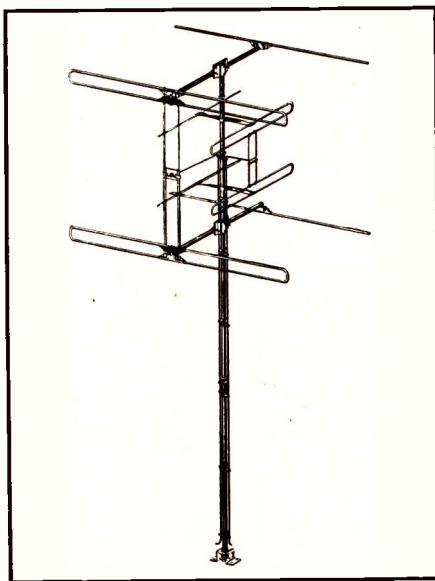


Fig. 3 This Ward antenna, TVS47, is designed for fringe areas where both the low and high band signals are to be received

length apart. The array is commonly referred to as a broadside array, and is capable of furnishing high gain and sharp directional pattern to bring weak television signals up out of the "snow" and discourage ghosting. While it is essentially single channel in terms of optimum reception, the stacked array shown in the illustration will accept adjacent channel signals with a slight loss of gain (about 2 db). Any interfering signal approaching from the rear will be reduced as much as 98%. Multiple array systems should, in some instances, employ guy wires, depending on the method of support.

The forward gain of such a multiple array is much greater than the conventional half-wave dipole and will produce a signal approximately six times as strong in power. The sharp directional pattern, combined with the advantages of shielded coaxial transmission line, means that the signal-to-noise ratio is greater.

Stacked arrays can be designed for reception of a limited number of television stations, whether in the low or in the high frequency range. In Fig. 2 we have a four-element high-frequency band stacked array consisting of two folded dipoles and reflectors. This antenna is designed to be used in areas of low signal intensity where only high band reception is desired. For all-channel work, a dual stacked array consisting of one low-band four-element array and one high-band four-element stacked array can be used. This antenna is designed for use in areas of low signal intensity (fringe areas) where reception of both low and high band stations is desired, as illustrated in

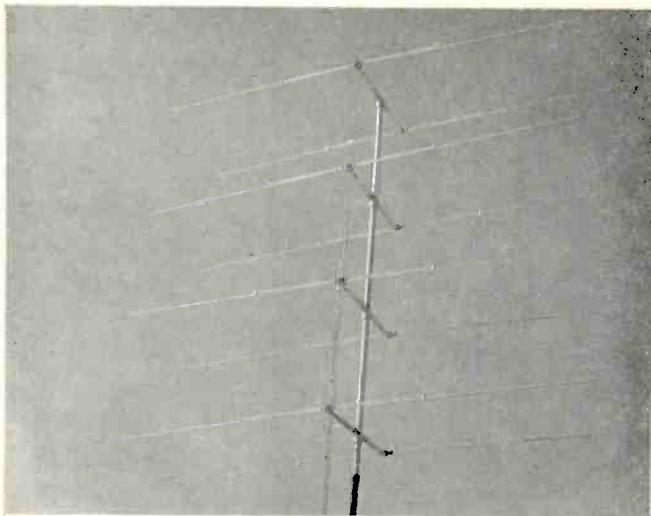


Fig. 4 Four-bay, sixteen-element stacked array, Vee-D-X type RD-13. This antenna features a convenient matching section



Fig. 5 Here is a simpler four-element array, the Vee-D-X type JR-13. Antenna has 72-ohm impedance and provides Q section

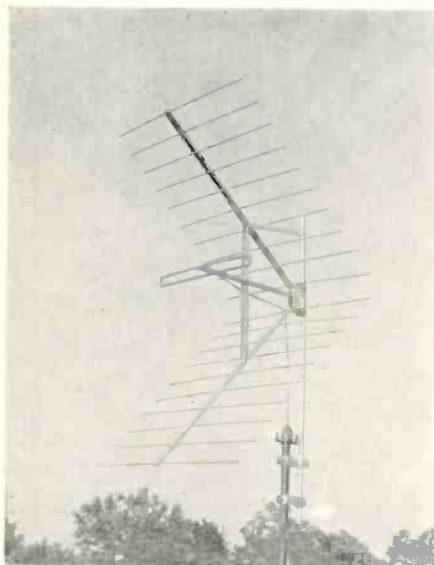


Fig. 6 Called the "Channel Chief", this antenna kit utilizes radar principles to bring in pictures on all high channels

Fig. 3. Individual transmission lines are suggested for use with this dual antenna to minimize inter-connector losses.

Matching Section

In Fig. 4 we have another of the antennas characterized by high forward gain, giving maximum pick-up in one direction, while affording minimum pick-up from the sides and rear, thus helping in the elimination of interference.

A unique feature of this antenna is a "Q" or matching section which affords a convenient and accurate method for matching impedances of the transmission line (which may be from 60 to 600 ohms) to that of the antenna, resulting in the elimination of ghosts and other undesirable char-

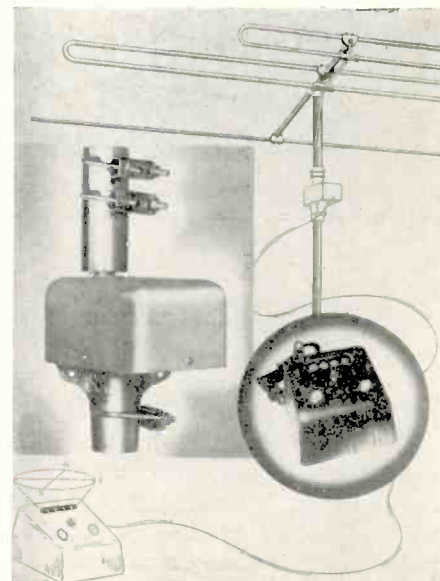


Fig. 7 The Radiant Tele-Rotor shown here provides a practical means of securing peak performance from a given antenna

→ to page 28

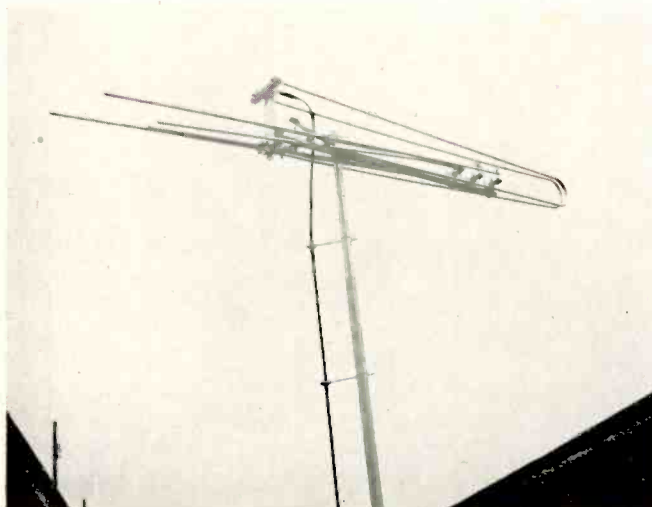


Fig. 8 The "Duoband" antenna shown here is of the collapsible type. This is the way it appears before it is actually installed

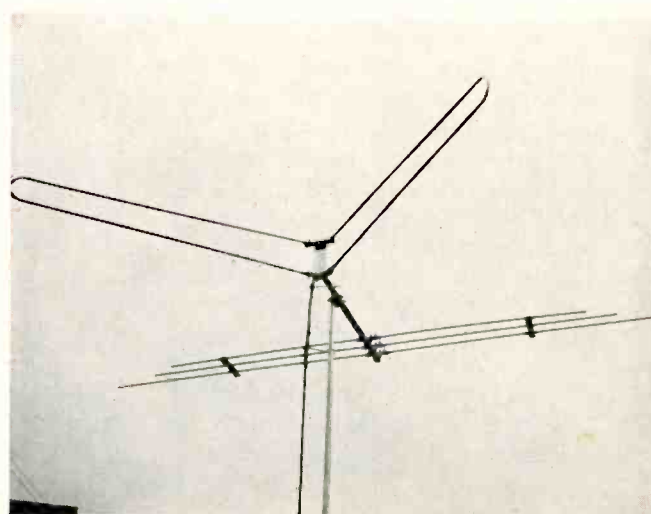


Fig. 9 The same "Duoband" antenna installed for operation. Total assembly time for this type antenna is about 2 minutes

Sound Advice From One Serviceman To Another!

MAC'S Radio REPAIR

Choteau, Montana

PHONE 74

John F. Rider Publisher, Inc.
480 Canal Street
New York 13, N. Y.

Rumors are running around financial circles to the effect that a good many ex G.I. radiomen who have gone into business for themselves are practically starving to death. I can well believe such rumors since I am an ex G.I., and after a year and a half I am just beginning to pull away from the deep part of that red ink pool. I think Dun & Bradstreet, Inc. still list me as a good cash-on-the-line customer. Since the above-mentioned rumors are probably true, I would like to take the advantage of your advertising department to pass on some tips to ex G.I.'s who are now in or who contemplate entering the radio repair business.

A man entering radio repair must have some working capital, a good working knowledge of radio, adequate test equipment, and a GOOD REFERENCE LIBRARY. That good reference library cannot be stressed too much, because the big jobs, the mean jobs, and the tough jobs are dependent on that library.

Unfortunately there are quite a few radio wreckers operating, and the only complete key that I have found for setting those radios right is the use of Rider's manuals. If the manufacturer has made changes in the set, those changes are included in Rider's. In most cases all other changes should be discarded and the radio re-assembled according to schematic.

The SPEED with which repair work is completed has much to do with income. In the interest of speedy repair I recommend Rider's. A customer who is PLEASED with the work done on his radio doesn't mind paying a good price for it. Rider's manuals give you the information on nearly every radio made and if used will mean pleased customers. REPEAT BUSINESS and word-of-mouth advertising means extra money in your pocket. By doing conscientious work that proves satisfactory you will get both repeat business and good advertising.

There are many shops operating without Rider manuals, and that is especially true of newcomers to the business. I am sure that many of the newcomers will find that an investment in a complete set of Rider's manuals will mean the difference between success and failure in their business.

I have written this with the hope that it will help some of the boys who are busy pulling out what little hair is left in their heads, and also with the hope that it will serve to help a lot of men improve their work and thus give a better name to our business.

Yours truly,

A. E. McCorkle

A. E. McCORKLE



"HIWYNI"

This is not a code. It is simply an abbreviation of a very important condition in the operating life of a service shop. H WYMI means HAVE IT WHEN YOU NEED IT. It applies to many things, but especially to RIDER MANUALS. Make sure that you have a complete library of RIDER MANUALS on hand at all times.

These RIDER books are the result of twenty years of specialized publishing for the Radio Servicing Industry

Television Manual, Volume 2 (Plus "How It Works" and Index).....	\$18.00	Automatic Frequency Control Systems, 144 pages.....	\$1.75	Inside the Vacuum Tube, 424 pages, illustrated.....	\$4.50
Television Manual, Volume 1 (Plus "How It Works" and Index).....	\$18.00	Servicing Superheterodynes, 208 pages, illustrated.....	\$2.00	Cathode-Ray Tube At Work, 338 pages, illustrated.....	\$4.00
PA Equipment Manual, Volume 1.....	\$18.00	An Hour-A-Day with Rider Series: "Alternating Currents in Radio Receivers", "D.C. Voltage Distribution", "Resonance and Alignment", "Automatic Volume Control", 96 pages each.....	each \$1.25	Servicing by Signal Tracing, 350 pages, illustrated.....	\$4.00
Volume XIX.....	\$19.80	Servicing Receivers By Means of Resistance Measurements, 203 pages.....	\$2.00	Servicing by Signal Tracing, (Spanish Edition), 404 pages, illustrated.....	\$4.30
Volume XVII.....	\$16.50	Aligning Philco Receivers, Two Volumes, Vol. 1, 1929 to 1936, 176 pages, Vol. II, 1937 to 1941, 208 pages, Each Volume.....	\$2.00	Understanding Vectors and Phase, 160 pages, paper binding, 03e cloth.....	\$1.80
Volume XVI.....	\$8.40	Radar—What It Is, 72 pages.....	\$1.00	Vacuum Tube Voltmeters, 180 pages, illustrated.....	\$2.50
Volume XV.....	\$19.80	FM Transmission and Reception, by John F. Rider and Seymour D. Usian, 416 pages, illustrated.....	\$3.60	Understanding Microwaves, 385 pages, illustrated.....	\$6.00
Volumes XIV to VII (each volume).....	\$16.50	Broadcast Operator's Handbook, by Harold E. Ennes, 288 pages, illustrated.....	\$3.30	A. C. Calculation Charts, 160 pages, 9 1/2" x 12".....	\$7.50
Volume VI.....	\$12.50			High Frequency Measuring Techniques Using Transmission Lines, 64 pages, illustrated.....	\$1.50
Abridged Manuals I to V (one volume).....	\$19.80			The Meter at Work, 152 pages, illustrated.....	\$2.00
Record Changers and Recorders.....	\$9.00			The Radio Amateur's Beam Pointer Guide, 32 pages.....	\$1.00
Master Index, Covering Manuals, Vols. I to XV.....	\$1.50				
TV, How It Works, 203 pages.....	\$2.70				
TV Picture Projection and Enlargement.....	\$3.30				
Installation and Servicing of Low-Power PA Systems, 208 pages.....	\$1.00				
The Oscillator At Work, 250 pages, illustrated.....	\$2.50				

JOHN F. RIDER PUBLISHER, INC. • 480 Canal Street, New York 13, N. Y.
Export Agent: Rocks International Corp., 13 East 40th Street, New York City • Cables: ARLAB

NOTE: Are you receiving your copy of "Successful Servicing"? It's Rider's own publication of interest to every serviceman. In it you will find all of the circuit changes in sets... as soon as they are released. It's FREE!

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

RIDER MANUALS mean Successful Servicing!

MURDER!

The front page is full of it! Turn the page quickly to these ads of ours. At least they won't depress you—and, who knows, you may become one of our happy customers!

"RADIO REBUILT" DIVISION

Wm. A. Holmin & Co.

Radio and Electronic Laboratories

Dial 4-5313

1010 Elm Street

USING THE

by Henry H. Huff

THE terms "repair" and "fixing" are never used by William A. Holmin & Co., Radio & Electronics Laboratories, Rockford, Ill. In its promotion work, as well as in its dealings with customers, the organization speaks only of "radio reconditioning."

"When people call us they expect to pay more money than the so-called 'radio repair shop' would charge," says Mr. Holmin. "Through our advertising and contacts with customers we have educated people to expect a professional job from us, not just the replacement of a tube or minor repairs. We sell them on the idea that a radio that has been in use a long time requires a thorough going-over, as well as replacement of worn or defective parts. It should be made to duplicate its original performance."

"To the customer, a radio is just a box with knobs which he turns to make it talk, sing, or play music. When the radio goes dead or loses volume, about ninety-five percent of the people think the trouble is simply a bad tube. If the radio service technician replaces a tube or repairs the part that is causing trouble, and does not give the entire receiver a thorough checkup, the customer is likely to get mad and blame the service man if the radio goes bad again. After the customer has paid once for having it fixed, he feels that it is the serviceman's responsibility to keep it in repair if more trouble should occur a short time later. The later trouble, of course, may have nothing to do with the original breakdown. That is the reason our company re-

The Atomic Bomb

has nothing on us when it comes to making things "radio active!"

"RADIO REBUILT" DIVISION Wm. A. Holmin & Co.

Radio and Electronic Laboratories

Dial 4-5313

1010 Elm Street

BOOSTER BAIT!

We sort of like to cater to people who are fed up with ordinary radio service and come to us with a "chip on their shoulder," as they put it. They always become our best boosters!

"RADIO REBUILT" DIVISION

Wm. A. Holmin & Co.

Radio and Electronic Laboratories

Dial 4-5313

1010 Elm Street

PROFESSIONAL TOUCH

gives the customer confidence in your sales and service, and increases his respect for the radio service industry. Here's the story of a firm that tried it and found it worked

fuses to take 'repair' jobs. We insist on a thorough reconditioning."

The Holmin radio service includes everything required to put a receiver into an electrical condition equal to or better than it was originally. Not only defective parts are replaced, but the fatigued ones as well. If a by-pass condenser is a bit leaky, all by-pass condensers are replaced. In addition, new filter condensers and controls, etc. are provided. When the set comes in for reconditioning, it is inspected as thoroughly and as conscientiously as though it were Mr. Holmin's own personal radio.

The Professional Touch

A radio technician cannot build a reputation around a "fix-it" shop. "We Fix Radios" is a sign which implies that minor adjustments are all that is required to put a radio in working order. The customer feels that a tube replacement or simple adjustment will usually do the trick and expects to pay only a small fee for the work. As a result, the repair man just fixes what is immediately causing trouble, although something else may develop after the radio has been back in the home a few days. By making a profession of radio reconditioning, one can assure the customer of continuous and satisfactory service from the set. When this is explained to him, he usually agrees that it is better to pay a sufficient amount for lasting service than smaller amounts repeatedly as various defects show up.

Mr. Holmin believes that it is a function of the trade to elevate the ideas of the public about radio serv-

icing. From experience with radio shops, it is the impression of many people that minor adjustments will usually start a radio working again. Once they have become educated to the fact that a radio is a complicated machine which requires professional knowledge, they are not inclined to think of reconditioning as a minor matter. They are willing to pay higher prices for such work when they understand what it involves to do a first-class job.

About Giving Estimates

William A. Holmin & Co. never give customers estimates on the cost of reconditioning a radio. People like to know in advance what the job will cost, so an exact price is quoted. This avoids quibbling over the price when the work is finished. The firm is prepared to state the cost of a job over the telephone, even without seeing the set. This is accomplished by inquiry as to the make of radio and the model. They have an established price for reconditioning any set, the only exception being that the set must have had normal care and use. The price would not apply if the radio has parts missing or has been in a fire or accident.

When a type of radio is encountered on which the firm has had no previous reconditioning experience, reference is made to the standard manuals describing the make and model number of the radio and its construction. Records of previous jobs reveal what any set is likely to require to put it in "like new" order. When the reconditioning job is completed, the customer gets a list of

parts used, but parts and labor are not individually itemized. This has a psychological effect on the customer, inspiring confidence. Because people become accustomed to the inferior reception of a set that has lost its efficiency, they frequently assert that an instrument which has been reconditioned in the Holmin shop sounds "better than new."

Advertising Campaigns

By imparting to its newspaper advertising a "professional" appearance, the company leads its customers to expect really first-class work. It attracts the better type of customers. As the firm also manufactures custom-built radios, it identifies its reconditioning service as the "Radio Rebuilt" division. Their newspaper ads have ample white space and a catchy heading to intrigue readers. Some of the headings in recent ads are: "The Man Said . . .," "Booster Bait!" "The Atomic Bomb," all of which arouse curiosity and induce people to read further. A light face, dignified type is used in the ads.

Bill Holmin has virtually grown up in the radio business. At the age of 12 years, he constructed crystal sets. Upon his return from military service, he started his present business. "After all, people think of you what you think of yourself," he says, "By treating radio reconditioning business as a profession, they are willing to pay the prices that professional work justifies." The growth of Wm. A. Holmin & Co. is proof that people like good work and are willing to pay what it costs. This firm's success may offer inspiration for others in the trade. ✓ ✓ ✓

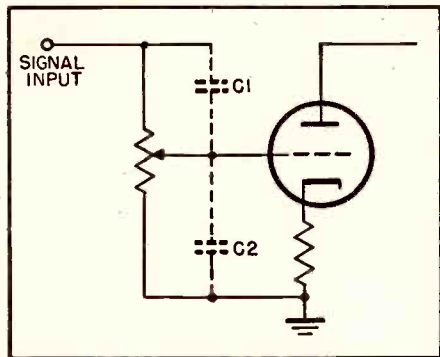


Fig. 3 Typical high-resistance gain control circuit found in some low-cost oscillographs

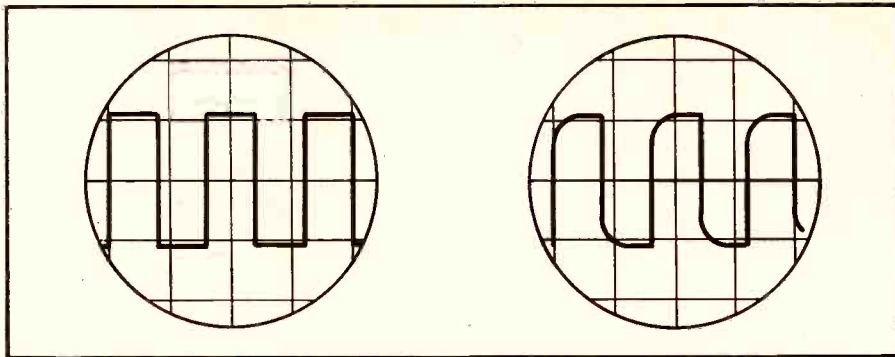


Fig. 4 Oscillogram of square wave response, high-resistance gain control set at maximum (left). Distorted square wave response, gain control set at intermediate position (right)

Vertical Deflection Amplifiers

→ from page 11

band amplifier is desired, then the plate load resistor must be reduced in order to obtain a better high frequency response. A typical wide-band amplifier is shown in Fig. 2. Because of the low value plate resistors employed, it is difficult to obtain sufficient voltage to deflect the cathode-ray tube with single-ended deflection. Therefore, push-pull output stages are employed. Many of the phase inverting circuits used at audio frequencies are not suitable at video frequencies, and almost all oscillographs having push-pull amplifiers use the cathode-coupled, self inverting output stage shown in Fig. 2. In this circuit, the signal applied to the grid of V1, produces across the common cathode resistor, R1, a voltage wave of the same shape and polarity, but of approximately half the amplitude, as the input. This voltage is used to drive V2. Since it is a degenerative voltage for V1, the effective voltage between grid and cathode of this tube is approximately half of the input voltage. Thus the input voltages of the two tubes are of nearly equal, but opposite polarity with respect to the grids. Thus, the outputs of the circuit are

two voltages of approximately the same amplitude and opposite polarity. The plates of the two amplifiers are directly coupled to the deflection plates of the cathode-ray tube to prevent attenuation of the low-frequency signals. This type of push-pull arrangement is employed in higher priced oscillographs.

Gain Controls

It is necessary to provide the Y-axis amplifier with some type of gain control in order to adjust the size of the pattern on the screen. The simplest method of obtaining a gain control is to put a high resistance potentiometer in front of the amplifier, as shown in Fig. 3. This is the method employed in low cost oscillographs. The use of such an attenuator has certain disadvantages, particularly extreme high frequency discrimination at intermediate settings of its movable arm. As shown in Fig. 3, the distributed capacitances, C1 and C2, produce a voltage division at the higher frequencies. This voltage division is essentially constant and independent of the setting of the potentiometer arm. Thus, as the position of the potentiometer arm is changed, the relative voltage division across the sections of the potentiometer and the fixed, stray capacitances

will differ, producing serious frequency discrimination. Although this frequency discrimination could be reduced by using a low-resistance gain control, the loading upon the circuit under test would be excessive.

The oscillograms of Fig. 4 illustrate what may happen if a square wave signal is applied to an oscillograph which has an amplifier with a high resistance gain control. The response in 4A is obtained when the gain control is at maximum position, while that in 4B is obtained with the control at an intermediate position. It shows distortion produced by the narrower bandwidth characteristic of the gain control. If this oscillograph were used for square wave testing the video amplifier of a television receiver, it would be impossible to tell whether the high frequency distortion of the square wave is caused by the received amplifier or the oscillograph amplifier.

A solution to this difficulty is to provide an input attenuator with fixed steps and adjustable capacitance elements, as illustrated in Fig. 5. This scheme will permit individual adjustment for each attenuation ratio, maintaining uniform voltage division over a wide frequency range. Obviously, this cannot be used as

→ to page 33

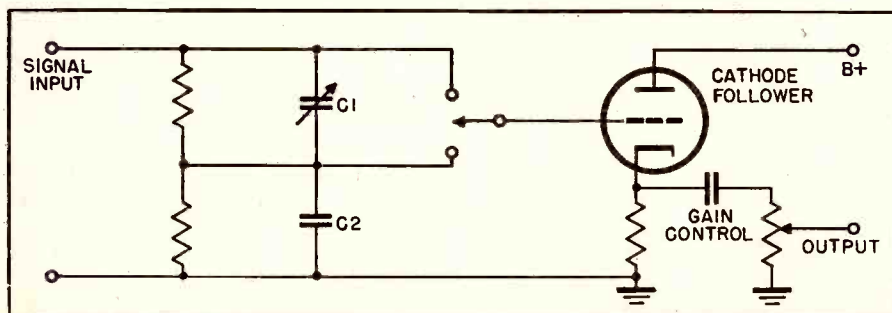


Fig. 5 Stepped attenuator and cathode follower circuit. This circuit is employed to overcome the difficulties produced by the use of a high-resistance gain control (see Fig. 4)

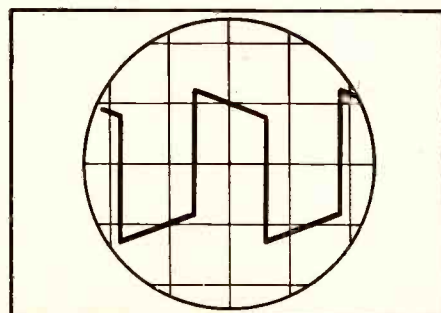
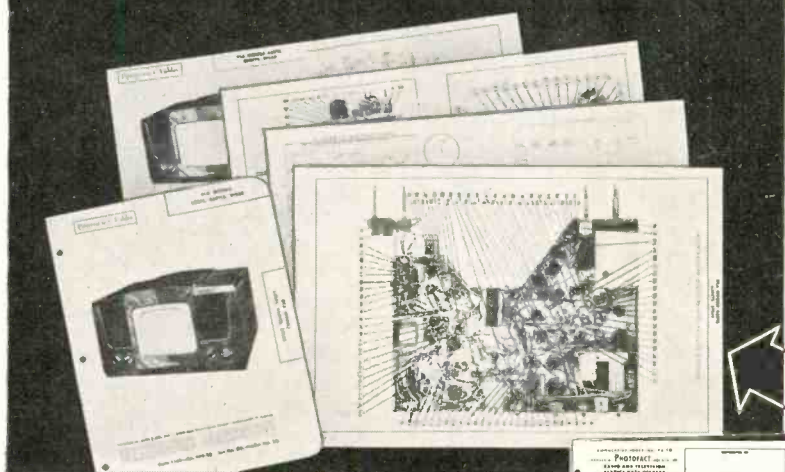


Fig. 6 60-cycle wave distorted by amplifier with poor low-frequency response

The Offer Still Stands!



Only \$18.73 Down Puts the Complete Photofact Library in Your Shop Today...

NOW—the new “Pay-as-you-Profit” Plan brings the famous PHOTOFACT Library within the reach of every Serviceman! Now you can easily own the world’s finest radio service data—seven complete volumes, *plus* continuous PHOTOFACT Folder Set service—full coverage of *all* post-war AM, FM and TV models! Everything you’ll ever need for quicker, more profitable servicing! You pay only \$18.73 down—the remainder in small monthly payments. *Absolutely no carrying charges and no interest!* Make the down payment—and you get the complete Library immediately. Your Jobber has all the details of this amazing new purchase plan. See him today, or write us direct for full information.

Get the Easy-Pay Details Now!

FREE PHOTOFACT Cumulative Index

Select your FREE PHOTOFACT Folder (covering any AM, FM or TV model) from the PHOTOFACT Cumulative Index. Get the FREE Index today. Covers all post-war receivers right up to the present. Helps you find the Folders you want in a jiffy—Folders that make your work quicker, easier, more profitable. Get this FREE Index at your Jobber or write direct for it now.

SERVICEMEN: We'll Prove You'll Save Time, and Earn More with PHOTOFACT!

We'll Send You Absolutely

FREE

Any PHOTOFACT Folder Listed in the PHOTOFACT Cumulative Index!

NOW—learn for yourself—at our expense—how PHOTOFACT will make your service work quicker, easier, more profitable! Examine an actual PHOTOFACT Folder. Use it. You'll learn first-hand why this indispensable service data is used daily by over 25,000 successful service technicians. You'll discover quickly that no other service gives you PHOTOFACT'S outstanding advantages: *completeness, accuracy, uniformity and ease-of-use.* PHOTOFACT *alone*, is the *only* radio service data prepared from laboratory analysis of the actual equipment. Nothing in the field equals PHOTOFACT. Know the facts—get your FREE Folder now. Examine it—use it—compare it—and you will understand why no modern service shop can afford to be without PHOTOFACT.

NOTE: This FREE offer is limited to Service Technicians. Attach coupon below to your letterhead and mention the name of your jobber. If you have no letterhead, send coupon to your jobber. Experimenters and others may obtain the Photofact Folder by remitting 50c.



CURRENT PHOTOFACT BEST-SELLERS

The Recording and Reproduction of SOUND, by Oliver Read. The complete, authoritative treatment of the entire subject of Sound, written by the editor of *Radio & Television News*. **\$5.00**

Photofact Television Course. The book used by thousands; gives you a clear understanding of TV principles, operation and practice. **\$3.00**

Television Antennas. Shows you how to select and install the proper antenna, and how to overcome antenna problems. **\$1.25**

1948 Record Changer Manual. Covers 45 models made in 1948, including new LP and dual-speed changers, plus leading wire recorders. Based on actual analysis of the equipment. **\$6.75**

Auto Radio Manual. Complete Photofact service data on more than 100 post-war auto radio models—a time-and-money-saver. . . **\$4.95**

HOWARD W. SAMS & CO., INC. INDIANAPOLIS 1, IND.

HOWARD W. SAMS & CO., INC.
955 N. Rural St., Indianapolis 1, Ind.

- ☐ Send FREE Photofact Cumulative Index
- ☐ Send Full Easy-Pay Details

I am a Service Technician:

- ☐ Send FREE Photofact Folder for set model . . .

I am an Experimenter:

- ☐ Send Photofact Folder for set model (50c enclosed)

Name

Address

City Zone State

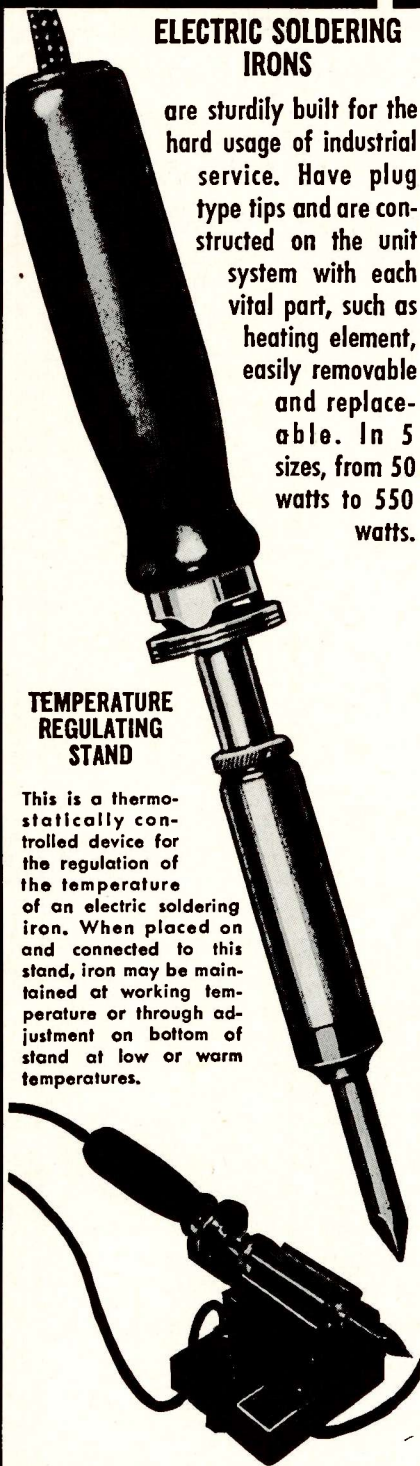
American Beauty

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.

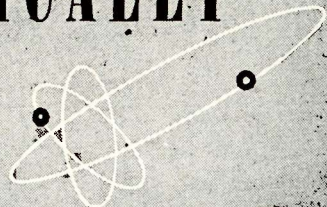


For descriptive literature write

110-2

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

ELECTRONICALLY SPEAKING



by Isidor I. Gross

Getting Clipped. We're indebted to reader B. McGehee for sending in an item from the Tampa Morning Tribune concerning the experiences of a Florida barber. How do barbers get into a radio magazine you ask? Read on.

Seems they have a law in Fla. requiring the licensing of barbers. One day, a tonsorial artist from Elmira, N. Y., came to settle in that state, and discovered that he was required to take a license examination before being permitted to practice his trade. He didn't object to that, but was a little surprised when he found it would cost him \$27 just to be allowed to take the exam. His surprise grew considerably when he heard broad hints that it would cost him another \$500 to pass the test; in fact he got pretty mad.

He reported the matter to the police who, with the aid of some marked bills, arrested two members of the licensing board on charges of bribery.

Now if you will substitute the words "radio technician" for the word "barber," the point of the story becomes obvious. Says reader McGehee: "This sort of thing happens all the time where there is a 'licensing board' to pass on the applicant's qualifications, and it is only once in a lifetime that it comes out."

Oh, incidentally, in all the excitement, the barber never got around to taking his examination.

In the Heart of Texas. Speaking of licensing, here is a letter we received from the Galveston Master Radio Technicians Associations.

"This organization is planning to ask our city commission to introduce an ordinance that will establish a license for radio and television servicemen. If you can help us with copies of any such license ordinances that exist in other cities, we will be

most grateful. Also, we would like to know of any cities that have laws controlling the erection of television antennae."

We're passing this letter on without our comments. What are yours?

Do You Remember? The other day we were looking over some estimates on 1949 automobile radio production, and were impressed by the fact that output was expected to top the four-million mark and possibly to outstrip the number of a-m home receivers manufactured this year. This got us to thinking back to the early days of auto receivers and we began to wonder just what progress had been made over the years. Unfortunately, we found our memory much hazier than we would care to admit; so, to satisfy our curiosity, we sent our man Rollo over to the library to get all the info he could on the subject and report back to us.

Here are the notes he brought back: "Arrived at library 10 a.m., doors just opened. Went to librarian and stated errand (very cooperative lady). Found seat, got old magazines and started reading (very dusty here).

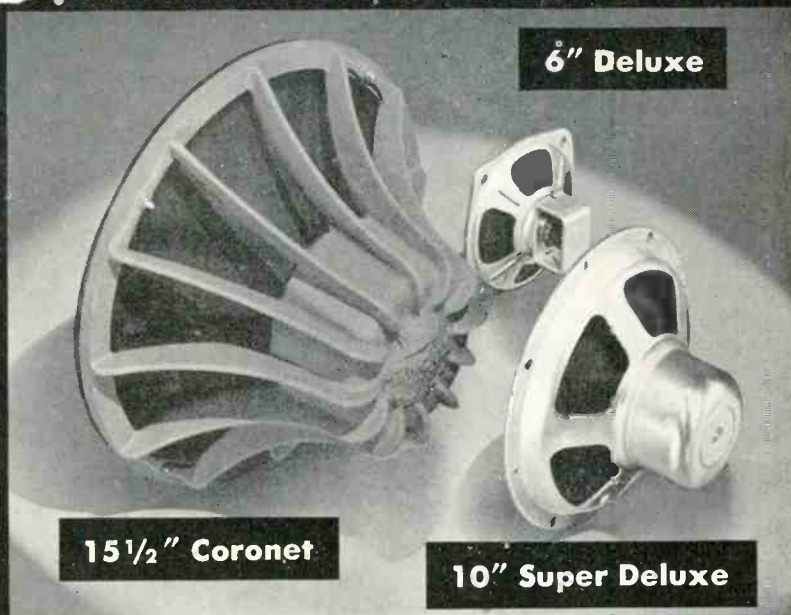
"First experimental auto receiver in 1922, but nothing commercial till 1930 when Transitone (later merged with Philco) came out with first. No production figures available before 1935. That year output 700,000, grew to 3,500,000 in 1948. Nobody very interested in it at first, 25% of dealers in '30 saw no future in it. Very expensive proposition, cost car owner up to \$200, took one to three days to install.

"First car radio came in six parts: radio chassis in steel box, tuning control, volume control, B batteries, loudspeaker, suppressor. Tubes powered by car storage battery. Was a t-r-f (first superheterodyne was RCA's

— to page 26

announcing :
The Greatest Advent in Speaker Development!

The New
PERMOFLUX
High-Fidelity
SPEAKERS



6" Deluxe

15 1/2" Coronet

10" Super Deluxe

A Special Treatment in Design that Eliminates Distortion!

These outstanding, new, deluxe high-fidelity speakers make PERMOFLUX, the most complete speaker line in the world!

SERVICEMEN — DEALERS

- Insist on the best!
- Buy PERMOFLUX Speakers!
- See your jobber today!

PERMOFLUX speakers will outperform, model for model, any speaker on the market.

PERMOFLUX HIGH-FIDELITY SPEAKERS

Deluxe High Fidelity Models—Heavy Magnets—No Pot Covers

SIZE	MODEL NO. OR CODE	MAGNET DATA FLUX GAUSS	VOICE DIA-METER	COIL IMPE-DANCE	WATTS
6"	6L-1	10000	3/4"	3.2	5
8"	8T-8-1	10000	1"	8.0	8
10"	10T-8-1	10000	1"	8.0	9
12"	12T-8-1	10000	1"	8.0	10

Super Deluxe High Fidelity Models — Extra Heavy Magnets — With Pot Covers

8"	8WP-8-1	10000	1 1/4"	8.0	10
10"	10WP-8-1	10000	1 1/4"	8.0	11
12"	12WP-8-1	10000	1 1/4"	8.0	12
15"	15WP-8-1	10000	1 1/4"	8.0	15

"Coronet" Supreme High Fidelity

12 1/2"	125Z-16	15000	2"	16 ohms	20
15 1/2"	155Z-16	15000	2"	16 ohms	35

NEW catalog available upon request. Write for your FREE copy!

TRADE MARK
PERM-FLUX

PERMOFLUX CORPORATION

Two Factories to Serve You

Chicago 39, Illinois 4900 West Grand Avenue
Glendale 5, California 236 South Verdugo Road

NOW *Astatic Research* AIDS TELEVISION PROGRESS WITH THE

Channel Chief

MODEL AT-1

TELEVISION BOOSTER



LIST PRICE
\$49⁵⁰

New Astatic Booster Has Gain
Equivalent to Two Ordinary Boosters

... Covers All 12 Channels with

Very Uniform Gain ... Eliminates Sacrifice
of Good Sound for Good Picture, or Vice
Versa, with Dual-Tuning.

ADDITIONAL IMPORTANT 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 (8½" wide x 6½" high x 7¾" deep) to complement fine home furnishings.
5. Simple to install and operate—complete instructions with each unit.

ASTATIC RESEARCH—which has led the march of progress in various sound reproduction fields since the company first pioneered in crystal microphones, phonograph pickups, cartridges, parts and accessories—now brings major new advantages in reception and tuning to the television field. The new Astatic device which makes it all possible is the Channel Chief, Model AT-1, a radically improved type of television booster. The common failing of many boosters—showing a "peak" on some channels and "fall-off" on others—has been eliminated. The Channel Chief provides extremely high gain—equivalent of two conventional boosters—uniform on all 12 television channels. Its dual controls allow separate tuning of picture and sound, with no sacrifice of one for the other. Or, if one signal is weak and the other adequate, both controls may be adjusted to the weaker to bring it in strong. 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 from adjacent channels, amateur and commercial fundamentals and harmonics in the receiver's I.F. range, FM stations and oscillators of nearby FM, TV and short wave receivers. No other booster can do so much ... for your installation and service business, for the television receiver owner. Write for added details.

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

Electronically Speaking

→ from page 24

Radiola Super in 1923, but superhet patents not released by RCA till late 1930). Early sets headache all around. Problem was where to put all the components of receiver. One guy cut hole in floorboard, suspended B battery from it. Another, with a small sedan, also found the underside of his car a likely place, put a speaker there. Saw picture of one car with equipment (plus wires) hanging all over. Interference from ignition sys-

tem fierce, had special suppressors to cut it out. Some of suppressors used, suppressed motor instead of static. No whip antennas; instead, capacitor plates under the car or in roof. Reception very poor. Don't see why anybody bothered with these radios. Took til about '35 for all units of the radio to be combined into one. Started placing the entire assembly under dash-board.

"Safety officials worried about effect of radio on drivers, feared they'll be detracted. Also worried about pedestrians being disturbed by blaring receivers. M. Metcalf, then Pres. of

RMA eased their mind, said that no one expects car radios to be played in crowded traffic, suburban travel, at noontime. One of main purposes, he said, was to make waiting in parked car pleasure. Guess motorists didn't pay too much attention to him.

"Craze for DX (long distance reception) hit just about the same time. Some adventurous spirits tried to get DX via car radio. Had to park car, rig up antenna. Should have stayed home.

"The whole business a far cry from today.

"Left library 1 p.m. for lunch. Found I had left radio on in car. Battery dead. Making trip to garage."

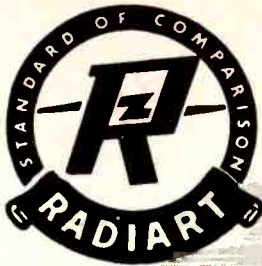
Rollo

The Eyes Have It. Last month we reported here the findings of our physicians with regard to health and TV. Now the optometrists have made a study of their own, published their findings in the Journal of the New York State Optometric Association. After viewing images of varying sizes from several different receivers, they found that projection television offers pronounced advantages to the viewer from the standpoint of visual health.

We're waiting for word from our dentists.

Latest on Licensing. Seems we were a little premature last month in reporting that sales and service contracts by independent service organizations would be considered illegal under New York State Insurance law. Word has just reached us that the N. Y. State Insurance Department has made a ruling on the question (last month's report was based on an opinion by the N. Y. State Attorney General), and has interpreted the opinion of the Attorney General as follows: Television manufacturers, including wholly owned subsidiary corporations, as well as dealers who sell television sets may enter into yearly sales and service contract agreements. These contracts must be limited to keeping the telesets in proper operating conditions because of failure arising from normal use. No manufacturer or his subsidiary or a dealer is allowed to renew such an agreement. A service organization which is not the dealer or the manufacturer of a television receiver may *not* enter into such agreements.

This, we believe is the final word on the matter.



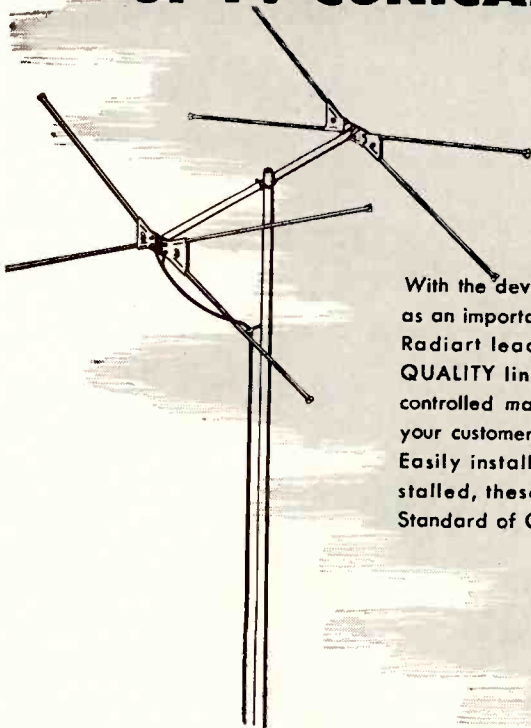
Radiart
features

THE Lowest Priced *Quality* Line

OF TV CONICAL ANTENNAS



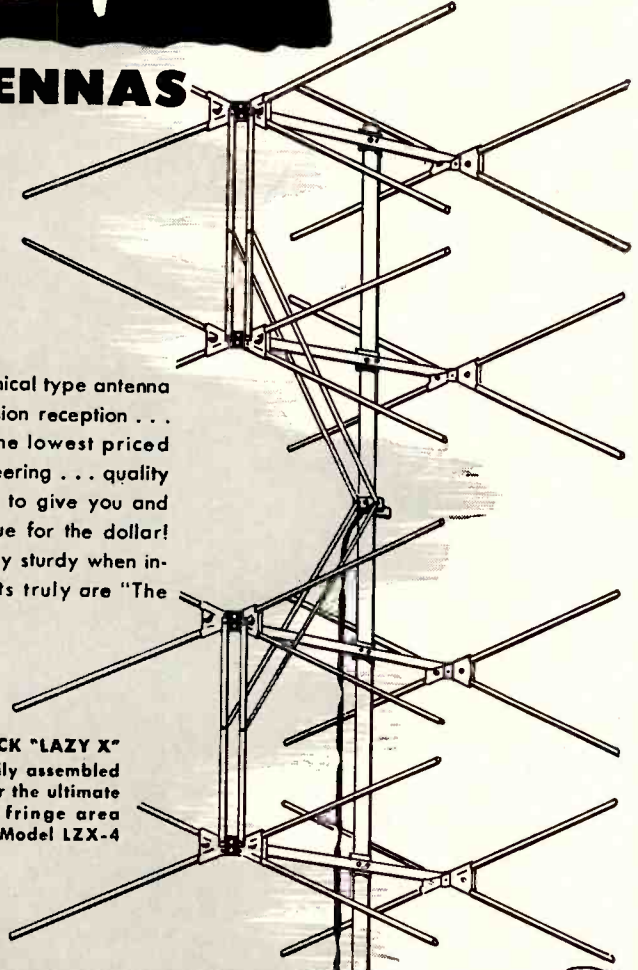
THE DOUBLE STACKED
"LAZY X" ARRAY . . .
for improved gain in low
signal strength areas —
also where a higher
signal-to-noise ratio is
desired . . . Model LZX-2



THE SINGLE BAY "LAZY X"
... for primary service areas
..... Model LZX

With the development of the conical type antenna
as an important factor in television reception . . .
Radiart leads the way with the lowest priced
QUALITY line. Precision engineering . . . quality
controlled manufacture combine to give you and
your customers the greatest value for the dollar!
Easily installed . . . and rigidly sturdy when in-
stalled, these Radiart products truly are "The
Standard of Comparison."

The QUAD-STACK "LAZY X"
Array . . . easily assembled
and installed for the ultimate
in all channel fringe area
reception Model LZX-4



IT'S RIGHT WHEN IT'S RADIART!

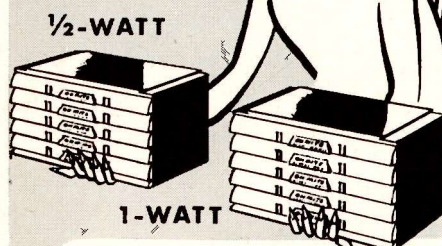
THE RADIART CORPORATION
CLEVELAND 2, OHIO

Manufacturers of the Famous Red Seal Vibrators



YOU'LL WANT BOTH OHMITE

**RESISTOR
ASSORTMENTS**



PACKED IN RUGGED

ALL-PLASTIC CABINETS

1/2-Watt Little Devil Assortment, Tolerance $\pm 10\%$. Stock No. CAB-1, \$12.50

1-Watt Little Devil Assortment, Tolerance $\pm 10\%$. Stock No. CAB-2, \$18.75

NO CHARGE FOR CABINETS

It's easy to find the *right* resistor... *fast*... in these handy, handsome, all-plastic OHMITE cabinets. Compact—only 9" x 5 1/4" x 4 3/4"—each one has 40 compartments factory packed with a carefully selected serviceman's assortment of 125 individually marked "Little Devil" resistors, either 1/2 watt or 1 watt, in the 40 values from 10 ohms to 10 megohms most frequently used. And, you pay only the regular price of the resistors... *nothing extra* for cabinets.

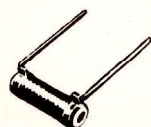


**LITTLE
DEVIL**
Composition
Resistors

See Your Distributor

BROWN DEVIL

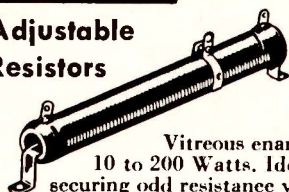
Vitreous Enameled Resistors



A favorite with servicemen. Easily mounted by its tinned wire leads. In sizes 5, 10, and 20 watts. Tol. $\pm 10\%$.

DIVIDOHM

**Adjustable
Resistors**



Vitreous enameled. 10 to 200 Watts. Ideal for securing odd resistance values.

OHMITE MANUFACTURING CO.
4912 Flournoy Street • Chicago 44, Ill.

Be Right with
OHMITE

Reg. U.S. Pat. Off.

RHEOSTATS • RESISTORS • TAP SWITCHES

Antennas → from page 18

acteristics caused by mis-matching. The matching section provides maximum signal transfer with minimum losses. The antenna is a four-bay, sixteen-element stacked array, cut and stacked for maximum performance on any specific high channel, although it performs well on other channels.

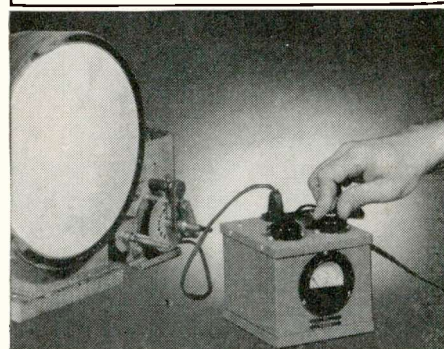
A simpler job is the four-element array shown in Fig. 5. Since this antenna (like that of Fig. 4) has an impedance of 72 ohms, a matching section is provided so that connection may be made, without loss of signal strength to different types of transmission line.

An interesting array designed for single channel performance is the well-known Vee-D-X Yagi array. The four-element beam is cut especially for each particular channel. The antenna has high forward gain and is sharply directional. High front-to-back ratio helps reject unwanted signals. The stepped-up driven element (the element to which the lead-in is connected) is a modified folded dipole and matches a 300-ohm line. For multi-channel reception, several arrays may be mounted on the same mast and directed to different transmitters.

Of course, the stacked array is not a cure-all, particularly in metropolitan areas in which multiple reflections exist. Sometimes a single reflection can be picked out and utilized to greater advantage than the direct picture. To overcome the problem of multiple reflection, a radar type antenna has been developed, known as the "Channel Chief" and shown in Fig. 6. This antenna, offered in kit form for assembly by service technicians, provides a method of obtaining long distance pictures on any high band television channel. The antenna is designed to take advantage of radar techniques. The unit employs a square corner reflector type curtain, mounted in back of a broadband folded dipole. The curtain functions as a mirror, catching and reflecting back to the antenna, many times the amount of signal that would normally be present if the antenna alone were used.

Being precision tuned to any one television band, this antenna has a gain of 8 to 10 db over a conventional dipole. The folded dipole and associated curtain reflector provide

ISOLATION BENCH TRANSFORMER



**REGULATE YOUR LINE VOLTAGE
TO FIT YOUR REQUIREMENTS**

**N-303 VARI-VOLT JUNIOR
\$15.00 DEALER NET**

A voltage regulating isolation transformer to make your bench test voltage exactly what you want...on 117V line, variable from 95 to 145 volts...if line drops to 90, variable from 75 to 115V....output adjustable in 1 1/2 volt steps...metered output voltage...capacity up to 250 Watts intermittent, 50-60 cycles...for radio and television receiver testing at under or over voltage...to isolate "hash" and live ground from AC-DC equipment...controled voltage for meter calibration...speed up or retard heating of light soldering iron...and for many other similar uses.

See your local Halldorson distributor for complete line of replacement transformers...exact duplicates television and auto Vibrator transformer replacements, or write direct to us for complete information. **THE HALLDORSON COMPANY**, 4500 Ravenswood Avenue, Chicago 40, Ill.

Halldorson
Vacuum Sealed Transformers

**In the November issue of
Radio Distribution & Maintenance**

You will find articles on

TVI

**IF ALIGNMENT
ADVERTISING
PA SERVICING**

and other timely topics

Don't miss it

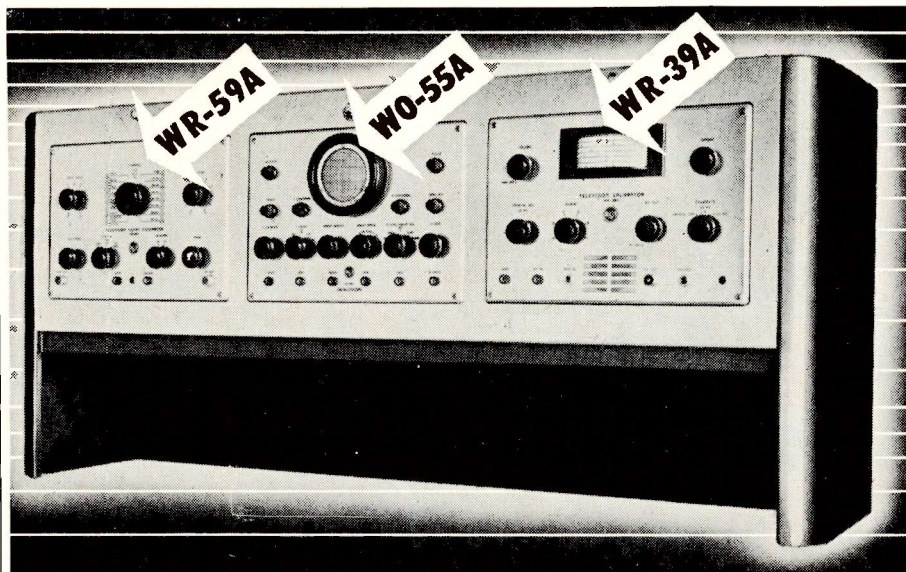
stagger tuned response in order to cover the video and sound channel width requirements. Large diameter tubing, combined with folding of the dipole, provides low Q response, thus aiding full frequency coverage. In addition to the high gain feature of the curtain design, the directional response pattern is sharp. This means freedom from interfering signals, reflected responses and ground noise. Ghost patterns, ignition noises, f-m signals, are virtually eliminated. Because the signal is in effect amplified by the antenna without boosting noise, longer distance reception is practical, since the amount of snow in the picture is greatly reduced. Signal-boosters used at the set become even more effective, since the signal-to-noise ratio is greatly improved by antenna gain before amplification. Accurate matching to 300-ohm twin lead is provided by proper spacing between the antenna and the curtain.

Rotators

For satisfactory reception of television, a highly directional beam antenna can be used to advantage. To obtain maximum signal strength, the beam must be properly directed. The antenna rotating device shown in Fig. 7 provides a practical means of securing peak performance from a given antenna system by allowing the user to turn his antenna in any direction. The system consists of an electrically powered rotator unit which is mounted on the antenna mast and is connected to a control box located at the receiving set. This control box, plugged into the 110-volt 60-cycle house line, provides power for the rotator, which slowly turns at 1 r.p.m. The point of optimum reception is found by watching the screen of the television receiver for the clearest picture.

Some antennas, such as the "Duo-band" feature flexibility in installation or permit adjustment after installation. In Fig. 8 this antenna is shown collapsed, prior to installation. In Fig. 9 we see the same antenna set up for proper reception.

No matter where the installation—whether close to the station or out in the fringe area—problems will arise. Making a station come in where none came in before, getting rid of multiple images, eliminating interference, these are logical sources of service and profit. ✓ ✓ ✓



The WR-39A and WR-59A combined with the WO-55A Oscilloscope in RCA's new WS-17A Rack, provide a modern, self-contained set-up for the efficient and profitable alignment of television receivers.

YOUR ANSWER to accurate television alignment

- ✓ The RCA WR-59A Television Sweep Generator
- ✓ The RCA WO-55A Oscilloscope
- ✓ The RCA WR-39A Television Calibrator

● Designed by RCA engineers at "television headquarters"—these companion units furnish *all basic signals* necessary for the rapid, accurate alignment of television receivers. Flexibility, dependability, and accuracy are outstanding characteristics of these instruments.

For alignment, the WR-59A Television Sweep Generator and WR-39A Television Calibrator can be used with the RCA WO-55A General Purpose Oscilloscope matching unit—as illustrated—or with any good oscilloscope.

The WR-59A Television Sweep Generator covers all television frequencies. All ranges develop 0.1 volt rms or more on *fundamentals* and can be quickly selected by means of a band switch. Excellent shielding plus a piston attenuator allow the output to be re-

duced to the noise level. Unusually flat output is provided with amplitude variation on all ranges of less than 1 db. Phasing and retrace-blanking controls are incorporated.

The RCA WR-39A Television Calibrator is a variable-frequency oscillator, dual-crystal frequency standard, and heterodyne detector with audio amplifier and speaker. The VFO puts markers of fundamental frequency and crystal accuracy on TV-FM traces from 19 to 110 Mc and 170 to 240 Mc. Dual-crystal standard is used to calibrate VFO or other signal generators with 250-kc and 0.25-Mc check points from 250-kc to 240 Mc.

See your RCA Test Equipment Distributor today for further technical details or write RCA, Commercial Engineering, Section 51JX, Harrison, N. J.

**For test equipment you can trust
always keep in touch with your RCA Distributor**



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

FOR
DEMONSTRATING
& TESTING AUTO RADIOS
from AC LINES

ATR

"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.



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.



AMERICAN TELEVISION & RADIO CO.
Quality Products Since 1951
SAINT PAUL 1, MINNESOTA-U.S.A.

How to Check Audio Amplifiers → from page 13

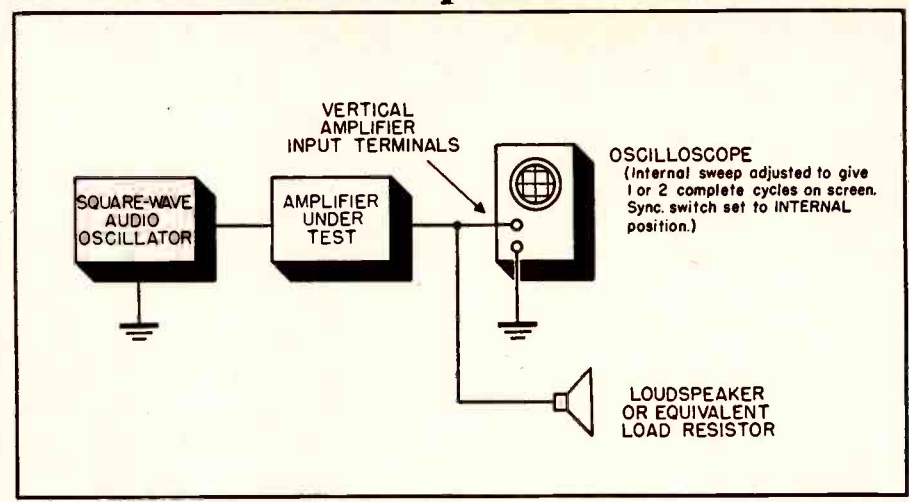


Fig. 5 Another method of checking amplifier distortion. Here square-wave audio oscillator supplies test signal to amplifier, output waveform is observed on oscilloscope screen

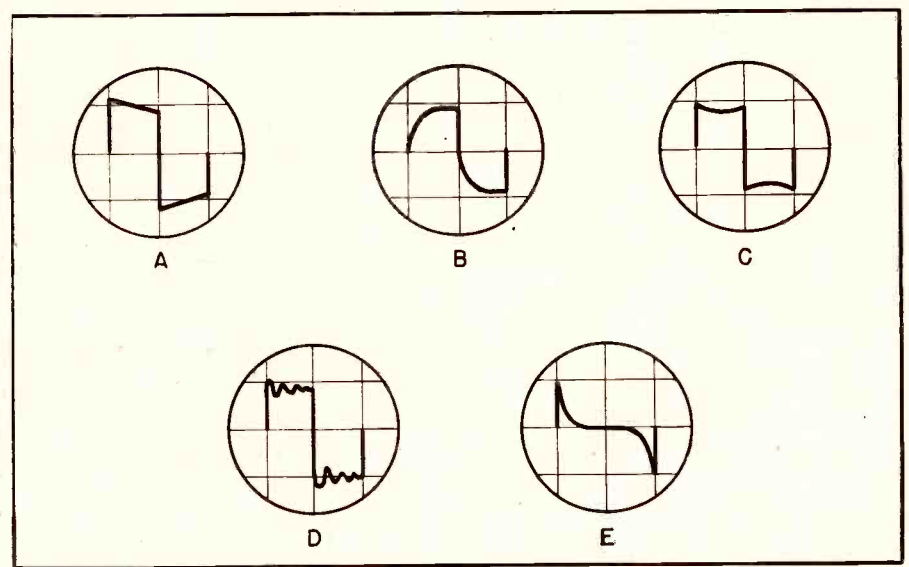


Fig. 6 Some distorted square waves. A—poor low-frequency response, B—poor high frequency response, C—resonant attenuation (dip) in amplifier, D—oscillation in amplifier, E—presence of output-to-input capacitance (found in some low-grade transformers)

small pieces by means of which the pattern is constructed.

By adjusting the "position" control of the electronic switch, either the two separated input and output patterns (Fig. 4B) or the superimposed patterns (Fig. 4C) may be obtained. The technician may use whichever of the two he prefers, ease of height measurement being the determining factor.

Frequency Response

To check frequency response, the sine-wave audio oscillator frequency is varied gradually throughout the audio spectrum, starting at 20 cycles and progressing to 20,000 cycles. The oscillator output voltage is held constant, while variations in the amplifier output voltage are read and re-

corded. If the amplifier has a perfectly flat frequency response (an ideal situation seldom, if ever, realized in practice), the output voltage will not change one way or the other as the input frequency is shifted. If the output voltage variations are plotted on graph paper against frequency steps, the result will be an informative frequency response curve.

The apparatus setups for checking frequency response are shown in Fig. 2 and 3. If an a-c v.t.v.m. is available for this measurement, the technician undoubtedly will prefer the arrangement shown in Fig. 2.

The test should proceed as follows:

- (1) Set the amplifier gain control to maximum.

(2) Set the amplifier tone control to its center (flat-response) position.

(3) Apply a low-voltage 20-cycle signal from the oscillator to the amplifier input terminals. Switch the voltmeter to input position 1. If the input signal is too low to be read accurately on the lowest-voltage scale of the meter, employ an input voltage divider as explained above.

(4) Switch the meter to output position 2.

(5) Record the output voltage for 20 cycles.

(6) Increase the oscillator frequency to 50 cycles, switch the voltmeter back to input position 1, and reset the oscillator output (if necessary) to give the same reference voltage as that used in the preceding 20-cycle measurement.

(7) Switch the voltmeter to output position 2 and record the 50-cycle output voltage.

(8) Repeat at as many frequencies as practicable.

(9) Repeat at various selected settings of the amplifier gain control and tone control.

(10) The numerous output voltages obtained in this test may be plotted against frequency settings on graph paper, to give a family of highly-informative frequency-response curves.

Distortion Checking

A distorting amplifier changes the wave shape of the signal it amplifies. The oscilloscope is a convenient instrument for examining waveforms for distortion.

If we use the apparatus setup shown in Fig. 3 (with the oscilloscope switched permanently to output position 2) or that of Fig. 4A, we will be in a position to observe whether the amplifier output is sine-wave (as was the input signal from the oscillator) or if it has been distorted. Separate tests should be made at several frequencies and at several settings of the amplifier gain and tone controls. Pronounced harmonics in the amplifier output cause severe mis-shaping of the output waveform and are readily observed. However, small percentages of distortion are rather difficult to detect and evaluate by means of this method.

Another convenient method is illustrated in Fig. 5. Here, a square-

→ to following page

NOW DU MONT OFFERS THE TYPE 274-A

CATHODE-RAY OSCILLOGRAPH FOR

**RADIO and
TELEVISION
Servicing**



AT REDUCED COST

Remember . . .

**DOUBLED BAND WIDTH
TRIPLE SENSITIVITY**

● Some time ago Du Mont announced a new oscillograph—Type 274-A—featuring several notable improvements over Type 274. Since then the 274-A's popularity has been unparalleled by any other low-priced oscillograph in the fields of radio and television servicing. Here's why:

The 274-A has an improved vertical amplifier with a sensitivity better than 0.2 rms volts/in., and a range (within 30%) of 20 cps to 100 kc in frequency response.

In your servicing of both radio and television receivers, you can look at

more parts of more circuits with still greater accuracy and therefore better results. For example, you can see lower level signals and you can handle more sections of the detector and i-f circuits. You can minimize "hum" troubles more easily, and you can do a better job on sync circuits as well as on other circuits in TV sets.

All in all, with the 274-A you can't miss doing an all-around, bang-up, more satisfactory and therefore more profitable job. You enjoy all the benefits of the big 5-inch cathode-ray tube (either medium - persistence Type 5BP1-A or short-persistence Type 5BP11-A).

CAT. NO. 1420-A with 5BP1-A tube \$124.50

CAT. NO. 1422-A with 5BP11-A tube \$124.50

DU MONT *for Oscillography*

ALLEN B. DU MONT LABORATORIES, INC., PASSAIC, N. J.
CABLE ADDRESS: ALBEEDU, NEW YORK, N. Y., U. S. A.

NOT SINCE "BEFORE THE WAR" ... ART RADIO TUBES

SUCH TUBE VALUES AS THESE!

Brought to you by ART RADIO CO.—an old and trusted name. All tubes listed here are available immediately from our huge stock. No waiting. Your order comes in—merchandise goes out—without delay. Stock up now at these terrific prices. All tubes individually boxed and backed by standard 90-day RMA guarantee.

1L4	6AQ5	6X4	35B5
1R5	6AT6	12AT6	35C5
1S5	6AU6	12AT7	50B5
1T4	6BA6	12AU6	117Z3
1U4	6BA7	12AU7	9001
1U5	6BE6	12AX7	9002
3A4	6BF6	12BA6	9003
3Q4	6BH6	12BA7	954
3S4	6BJ6	12BE6	955
3V4	6C4	12BF6	956
6AG5	6T8	19T8	

ANY ABOVE
TUBE 33c each

\$2795 PER 100
Assorted

Please do not order types not shown on this list.

CATHODE RAY TUBES

First Quality—Fully Guaranteed

Type	Size	Your Cost	Type	Size	Your Cost
7JP4	7"	\$15.95	12LP4	12 1/2"	\$29.95
10BP4	10"	19.95	All-Glass 15" or 16"		44.95

ALL-CHANNEL TV ANTENNA



High and low folded dipoles, with reflectors, complete with mast, specially priced **\$545**

TREMENDOUS SPEAKER BUYS!

3", 4" or 5" PM, less output, Alnico #5, each	98c
In cartons of 30, each	86c
6" x 9" Oval PM, Alnico #5, 3.16 oz. magnet, each	\$2.49
In cartons of 24, each	\$2.29

3" DYNAMIC, 3000-ohm field, each	49c
7 1/2" PM Replacement Auto Speaker less output, each	\$2.19

Minimum order is \$10.00. Orders below \$10.00 cannot be accepted at these amazing prices

ART RADIO CO.

115 Liberty St., New York 6, N. Y.

Phone: COrtlandt 7-2918

Specify SPECIAL OFFER when ordering from this ad.

10% deposit with all COD orders. All Prices F.O.B., N.Y.C.

How to Check Audio Amplifiers

→ from preceding page

wave audio oscillator supplies a test signal to the amplifier, and the output waveform is observed on the oscilloscope screen. If no distortion is present in the amplifier, the output wave will be square. Variations of the output waveform from squareness indicates various faults within the amplifier. A few representative distorted square waves are identified in Fig. 6. It is a rule-of-the-thumb among amplifier technicians that a rise or fall of the horizontal portion of an output "square" wave indicates low-frequency deficiency in the amplifier under test, while a sloping of the vertical sides of the pattern with a rounding off of the corners indicates poor high-frequency response.

Distortion checks should be made in the low, medium, and high-frequency portions of the audio spectrum (for example, at 20, 1000, and 10,000 cycles) and at several settings of the amplifier gain and tone controls. These tests may be applied to a single amplifier stage, as well as to the complete amplifier.

Power Output

For power output measurement, use the apparatus setup shown in Fig. 2, with the v.t.v.m. permanently connected across the speaker voice coil or, better still, across a load resistor (preferably non-inductive) having the same resistance value as the voice coil impedance and having a wattage rating equal to twice the expected power output of the amplifier.

Set the amplifier tone control to its center (flat-response) position and the gain control to maximum. Set the oscillator output control to give maximum *undistorted* output of the amplifier. At this point, record the voltmeter reading as E. Calculate the amplifier power output by dividing E^2 by R, where R is the ohmic value of the load resistance (or the voice coil impedance).

Repeat the power output measurement at several frequencies and at several settings of the amplifier gain control. If desired for comparison, the measurements may also be made at each extreme setting of the amplifier tone control.

Picture Tube News

→ from page 15

act to improve the resolution of the picture.

Some of these developments have been incorporated in other DuMont tubes; and we have been informed that further improvements are in the mill there now (specific information on what these were, however, could not be obtained).

Tilting

Still another attempt to cope with external and internal light reflections has been made by Philco. In its "No-

Glare" system, the picture tube is tilted back so that the viewer looks slightly downward at the screen, approximating his normal line of vision; and a glass plate has been tilted forward in front of the tube, so that distracting reflections from external light sources are reflected to the floor, rather than the eye. To reduce reflections further, the picture mask area has been covered with a green lacquer which has been used during the war for camouflage purposes.

This basically mechanical system has been incorporated in the 1950 Philco Receiver line. ✓ ✓ ✓

Deflection Amplifier

→ from page 22

the only attenuator, since a large number of steps would be required to cover a wide voltage range and still maintain useful attenuation ratios. Consequently, an additional method of attenuation is employed for fine adjustment of gain. Such a method is the use of a cathode follower stage, providing a low impedance cathode output suitable for use with a continuous attenuator. Although this stage has a gain of less than unity, the low output impedance permits it to work into a low-impedance potentiometer (500 to 5000 ohms). Even with the capacity of the next stage which exists between the arm of the potentiometer and ground, the response of this type of gain control is flat to 10 Mc or more.

Amplifier Specifications

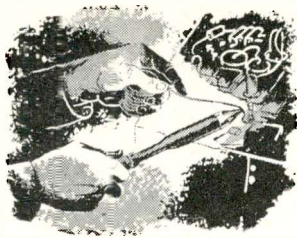
The foregoing discussion of the design of the vertical amplifier system of an oscillograph will enable the reader to appreciate the important specifications to look for when choosing an oscillograph. The following specifications apply only to the vertical amplifier system. Additional factors on other sections of the oscillograph will be discussed in later articles.

1. High Gain — The deflection sensitivity of the Y-axis of the oscillograph should be 0.05 volts per inch. This high gain is required when aligning a single r-f or i-f amplifier stage, using a sweep frequency generator. If the oscillograph does not have this high gain, it is necessary to increase the output signal from the sweep generator in order to produce a sufficiently large pattern on the oscillograph screen. Increasing the sweep generator output to more than a few millivolts is not recommended, because it may overload the stage that is being aligned.

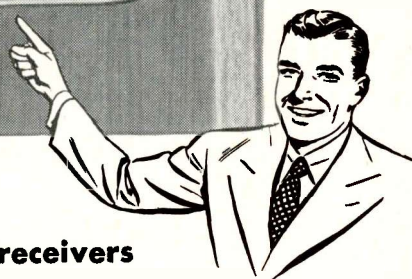
Although it is often desirable to do a stage-by-stage alignment with a high gain oscillograph, the next best thing to do, if only a low gain oscillograph is available, is to connect the instrument to the output of the second video detector. An overall alignment of each stage may then be accomplished, because the gain of each amplifier in the receiver makes up for the low sensitivity of the oscillograph.

2. Good 60-cycle square wave response—For aligning the r-f and

→ to following page



Kester Cored Solder—1st in the Television Field



Use Kester Solder for fast, efficient soldering on all TV receivers



In the television and radio fields, where good work is important and economy in present high labor costs is essential, Kester Solders of the Rosin-Core type fit right into the picture. Made to the highest standards possible, Kester Flux-Core Solders have always been and still are the standard in the industry.

The Finest Solder Made For Fast, Efficient Maintenance

Insist upon Kester Plastic Rosin-Core Solder from your jobber. Use Kester Flux-Core Solder exclusively and be assured of satisfied customers and repeat business.

KESTER SOLDER COMPANY

4201 Wrightwood Avenue, Chicago 39, Illinois

Factories Also At


Newark, New Jersey • Brantford, Canada




**KESTER
SOLDER**

Build YOUR OWN

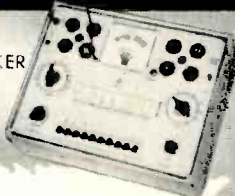
Heathkit TEST EQUIPMENT




Heathkit AUDIO GEN KIT
\$34.50




Heathkit TUBE CHECKER KIT
\$29.50



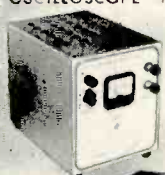
Heathkit 5" OSCILLOSCOPE KIT
\$39.50




Heathkit TELEVISION GENERATOR 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




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

Heathkits are beautiful factory engineered quality service instruments supplied un assembled. 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 HandiTester), all tubes, fully assembled and calibrated, panel already printed, chassis all punched, ferreted 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. The basic three instruments—an Oscilloscope, Vacuum Tube Voltmeter and Signal Generator can be purchased in Heathkits for \$83.50, about the cost of a factory built VVM alone. Write for complete catalog.

HEATH COMPANY

BENTON HARBOR, 10
MICHIGAN

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

Vertical Deflection Amplifiers

→ from preceding page

i-f amplifiers with a sweep generator, the Y-axis of the oscillograph should have good 60-cycle square wave response, because the sweep generator has a sweep frequency of 60 cps which, when detected, approximates a square wave. If the oscillograph does not have good 60-cycle square wave response, the curve which appears on the screen will be distorted. Good low frequency response is also required when square wave testing the low frequency response of a video amplifier. Fig. 6 shows the distortion of a 60-cycle square wave that is introduced by an oscillograph having poor low frequency response. To avoid such distortion, the oscillograph should either have a direct coupled amplifier, or an a-c amplifier whose response is down only 10% at 2 cps.

3. High Impedance Input and Low Input Capacity—To prevent loading of the circuits in the receiver, the oscillograph should have an input impedance of at least 2 megohms. The shunting capacity should be 30 mmf or less. To prevent frequency distortion in the input gain control, the oscillograph should have a high-frequency compensated, stepped attenuator, followed by cathode-follower and low-impedance gain control.

4. Good High Frequency Response—A vertical amplifier response extending to 100 kc is adequate for alignment work with a sweep generator and for observing the 60-cycle sync and sawtooth signals in the vertical sweep circuit of a TV receiver. If the oscillograph is used for examining horizontal sweep signals, and for checking video amplifiers by means of a high-frequency square wave, the response should extend to better than 30% down at 2 Mc, and preferably to 30% down at 4 Mc.

Now that we know what is required of an oscillograph with regard to the Y-axis deflection system, we shall consider next the X-axis circuits and sawtooth generators which provide the time base. These will be discussed in the next issue.

(The article scheduled for that time will cover essentially the same ground as Mr. Roche's proposed discussion on sawtooth generators, which is therefore cancelled) ~ ~ ~

HALF AS LARGE... TWICE AS GOOD!

DUAL & TRIPLE DANDEES

with the NEW INSULATED-STUD TERMINALS

- Smaller — better. That's why the new Aerovox dual and triple midget-can electrolytics are a smash hit with servicemen.
- Stud terminals replace usual riveted terminals. Reduce tubular diameter 40%. Advanced electrolytic capacitor art further reduces bulk. Note comparison between usual dual and new Dual Dandee.



To top it all, insulated wire leads in place of bare wires! Also insulating sleeves over stud terminals. No danger of "shorts" even in tight spots.

GO AEROVOX!

For faster, easier, more-money servicing, ask your Aerovox jobber for these Dandees. Ask for latest Aerovox catalog—or write us.



FOR RADIO-ELECTRONIC AND INDUSTRIAL APPLICATIONS

AEROVOX CORPORATION, NEW BEDFORD, MASS., U. S. A.

SALES OFFICES IN ALL PRINCIPAL CITIES • Export: 13 E. 40th St., NEW YORK 16, N. Y.

Cable: 'ARLAB' • In Canada: AEROVOX CANADA LTD., HAMILTON, ONT.

TRADE LITERATURE

★ ★ ★ ★ ★

How to Service Radio with an Oscilloscope,
(Sylvania Electric Products, 72 pages,
\$1.00)

This little book is intended for the radio technician or student who has been doing a-m and f-m work without the aid of a scope. It tells him briefly how the instrument operates, and shows him a number of applications. Included in the booklet is a technical discussion of the two oscilloscope models (131 and 132) produced by Sylvania.

Here are a few of the oscillograph uses which are discussed: a-m receiver alignment using a-m signal generator, f-m receiver alignment, checking frequency response, and superhets, testing audio amplifiers, checking frequency response, and many more.

The presentation of the material is excellent. The instructions which are given for the various tests are written in great detail, and provide step-by-step procedures. Connections are clearly indicated, and 'scope patterns are shown for various types of fault.

Selected for inclusion in the book have been those applications which were considered by the publishers to be of greatest interest to the service technician. Many others have necessarily been left out. But as far as it goes, the book is recommended.

Radio-Television Questions and Answers,
(Editors and Engineers, Ltd., \$.85
each)

As a study aid to those planning to take the commercial operators' license examination, Editors & Engineers, Ltd., has published six booklets, each dealing with a different subject. The booklets are made up of questions taken from the Government publication "Study Guide and Reference Material for Commercial Radio Operator Examination," and are representative of the scope of the questions for that examination. Immediately following each question, the authors supply fairly detailed answers. For example, what is the purpose of a 'shunt' as used with an ammeter? Answer: The purpose of

INTRODUCING NEW **IRC** PRECISTORS

Here is the precision resistor you've been hunting. IRC's new Deposited Carbon PRECISTOR combines accuracy, stability and economy!

PRECISTORS are principally designed for uses where carbon compositions are unsuited and wire wound precisions too expensive. They are excellent in television, voltmeter multiplier, and high frequency circuits. PRECISTORS are supplied in 2 sizes: Type DCF—200 ohms to 5 megohms and Type DCH—500 ohms to 20 megohms.

Your IRC Distributor has new PRECISTORS packaged in sturdy plastic cases. Fully protected against scratches and jars. Characteristics are printed on the case, and range, type and tolerance are given on the resistor. Ask to see new IRC PRECISTORS when you visit your Distributor!

IRC also manufactures a complete range of Wire Wound Precision Resistors. 1% accuracy is standard, but closer tolerances to 1/10 of 1% are available at slightly higher prices. Highest quality materials combined with skillful winding technique make IRC Precision Wire Wounds the choice of leading instrument makers. International Resistance Co., 401 N. Broad St., Phila. 8, Pa. In Canada: International Resistance Co., Ltd., Toronto, Licensee.

INTERNATIONAL RESISTANCE CO.

Wherever the Circuit Says ~~~~



**GUARANTEED
ACCURACY
1%**

PLUS

**STABILITY
OVER LONG
PERIODS**

PLUS

**LOW
COST**

PLUS

**WIDE RANGE
OF
VALUES**

PLUS

**PRECISION
PACKAGING
in tubular
plastic case**

the shunt is to permit use of the meter for measurement of currents greater than the full scale reading of the basic instrument.

At the present time, only three booklets are available: Element 2: Basic Theory and Practice; Element 3: Radiotelephony, and Element 4: Advanced Radiotelephony. Other elements are awaiting expected FCC revision of questions.

Catalogs and Pamphlets

Capacitor Catalog. A 6-page supple-

mentary folder lists Duranite molded paper tubulars, several types of electrolytics, oil-filled tubulars, mica capacitors, interference filters, and auto radio suppressors. Copy of the condensed catalog (Form SC-549) is available from Aerovox jobbers or Aerovox Corporation, New Bedford, Mass.

Switchcraft Catalog S49 has a complete listing of jacks, plugs, and switches carried by the firm. Gives specification data. 1328-30 N. Halsted St., Chicago 22, Ill.

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.

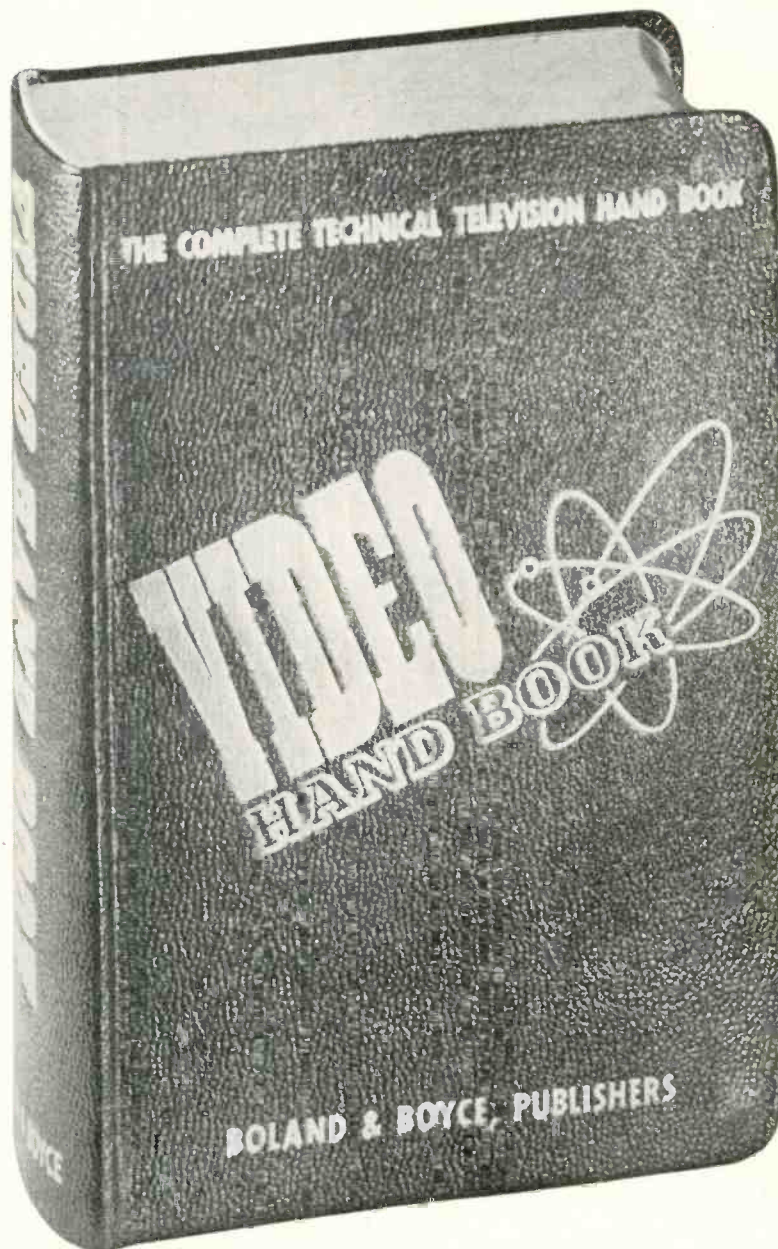
The VIDEO HANDBOOK will save you time—improve your efficiency and make your work easier. It provides the knowledge that means more profit for you. Every page adds to your background for greater prestige and income. Here is the means for everyone in television—employed and executive—to increase his value 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 7. Descriptions of Modern Television Receivers. |
| Section 2. Fundamentals of electronic Television. | Section 8. Installing Television Receivers. |
| Section 3. The Television Station. | Section 9. Servicing Television Receivers. |
| Section 4. The Television Receiver. | Section 10. Television Test Equipment. |
| Section 5. Television Antenna Systems. | Section 11. Building a Television Receiver. |
| Section 6. Creating a Television Show. | Section 12. Data Section. |
| | Section 13. Television Terms. |
| | Section 14. Bibliography. |

\$5.00 • AT YOUR LOCAL RADIO JOBBER

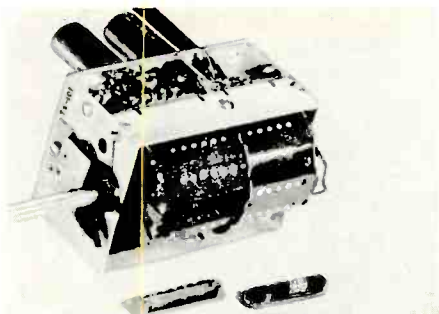
A PRODUCT OF

BOLAND & BOYCE INC., PUBLISHERS

MONTCLAIR, N. J.

INDUSTRY PRESENTS

★ ★ ★ ★ ★



REPLACEMENT TUNER

The "Standard Tuner", until recently available only to teletest manufacturers for factory installation in TV receivers, can now be had by the technician for his replacement needs. The tuner, similar to a type described in the January '49 issue of this magazine, features interchangeability of channel inductors, individual oscillator adjustment screw for each channel, one control shaft for fine tuning and channel selection, and covers all 12 channels.

The tuner is available through local jobbers or by writing directly to the company, Standard Coil Products Co., Inc., 2329 N. Pulaski Rd., Chicago 39, Ill.; or 2901 E. Slauson Ave., Huntington Park, Calif.



AUTO RADIO TOOL

Here we have the third tool to come out from the Hytron Contest of last year. This one is an auto tool for tuning, adjusting volume and tone, realigning dial, etc. after cables of universal auto radio have been detached. It has a square tip which fits splines. Another feature is the slotted V-shaped tip for different thicknesses of spade and similar key fittings. 24c at Hytron jobbers.

SCREWDRIVER

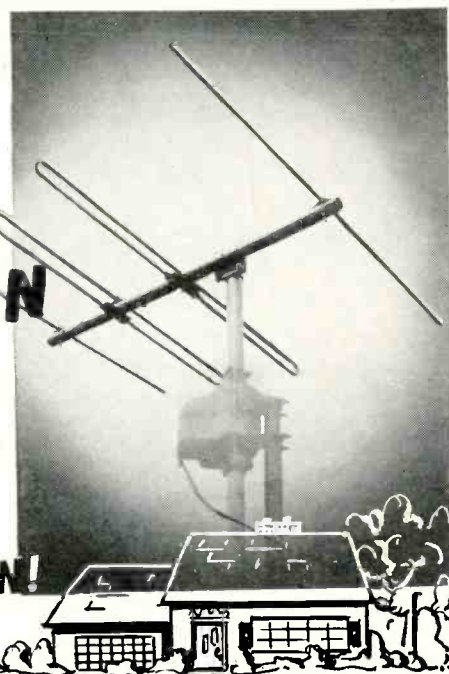
You may be interested in this screwdriver for work in dark places. It has a built-in battery and bulb that focuses light on your work. It's called the Flashdriver, has shockproof handle and comes with interchangeable blades. Town-Talk Products, 308 Hoffman Building, Detroit 1, Mich.

COMPARE RESULTS
NOT CLAIMS, FOR RESULTS
IT'S THE NEW —

TACO TWIN-DRIVEN YAGI

BOOSTS SIGNAL!
LOWERS COSTS!
PINPOINT DIRECTION!

• WRITE FOR FREE BULLETIN ON TACO YAGIS.



RADIO & ELECTRONIC
EQUIPMENT
TECHNICAL APPLIANCE CORP.
SHERBURNE, N. Y.

IN CANADA: STROMBERG-CARLSON CO., LTD., TORONTO 4, ONT.

SHOOTS TROUBLE FASTER!

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



PRICE
\$9.95 at
Distribu-
tor or
postpaid,
direct
Sorry, no
COD's.
Ohioans
add 3%
State
Sales Tax

Signaletto

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. M 1125 Bank Street
Cincinnati 14, Ohio
Qualified Jobbers write, wire for details

FREE! Send for it NOW!

ALLIED'S NEW 1950 CATALOG!

196 PAGES—
Everything in
Radio and
Electronics



GET RADIO'S LEADING BUYING GUIDE

Service Technicians and Engineers: ALLIED'S 1950 Buying Guide brings you all the new releases and money-saving values—from the world's largest stocks of test instruments, amplifiers, P.A. systems and equipment, tubes, parts, tools, books and accessories—ready for instant expert shipment. Send today for your FREE new 196-page ALLIED Catalog.

ALLIED RADIO CORP., DEPT. 27-K-9
833 W. Jackson Blvd., Chicago 7, Ill.

☐ Send FREE New ALLIED Catalog.

FREE

Name.....
Address.....

ALLIED RADIO

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:

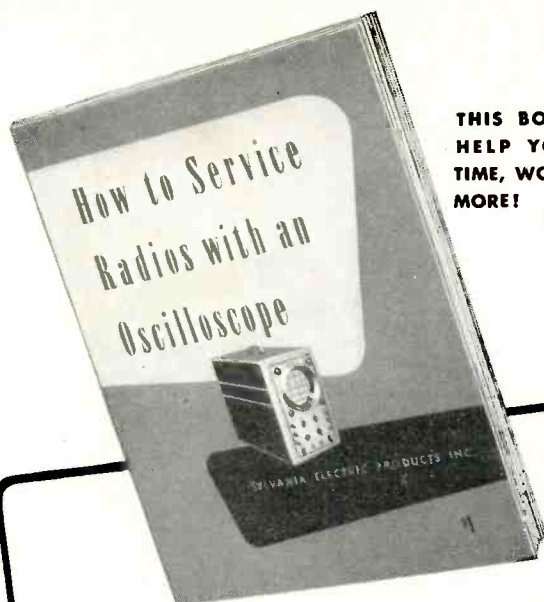
- Section 1. Television: Past, Present & Future
- Section 2. Fundamentals of electronic Television
- Section 3. The Television Station
- Section 4. The Television Receiver
- Section 5. Television Antenna Systems
- Section 6. Creating a Television Show
- Section 7. Descriptions of Modern Television Receivers
- 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

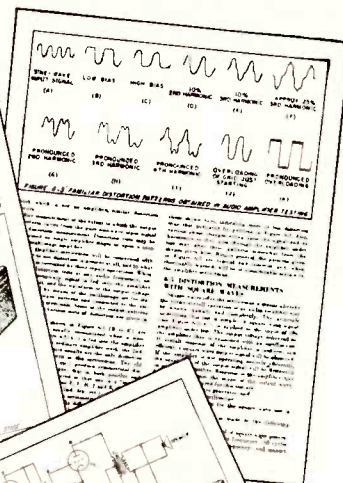
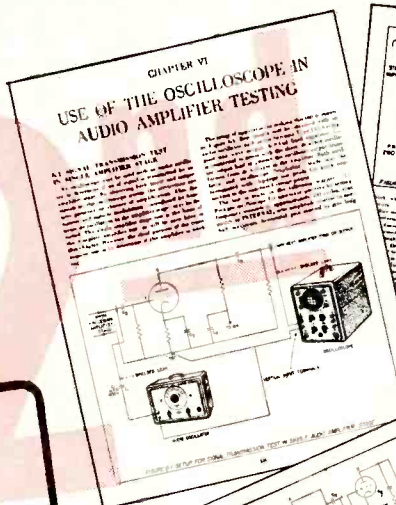
A PRODUCT OF

BOLAND & BOYCE INC., PUBLISHERS

MONTCLAIR, N. J.



**THIS BOOK WILL
HELP YOU SAVE
TIME, WORK, EARN
MORE!**



SYLVANIA SHOWS YOU

"HOW TO SERVICE RADIOS WITH AN OSCILLOSCOPE"

Here's a big, complete book that gives you step-by-step instructions for using the oscilloscope in testing and servicing radio receivers, audio amplifiers and transmitters.

The more than 90 illustrations of circuits, 'scope patterns, and set-up arrangements for circuit testing explain over 50 separate oscilloscope applications.

**Only
\$1.00**

**EXPLAINS THESE AND
MANY MORE**

1. AM and FM receiver alignment
2. Locating hum
3. Signal tracing and trouble shooting
4. Finding receiver faults from oscilloscope patterns
5. Checking AVC action
6. Voltage gain measurement
7. Auto radio vibrator tests
8. Checking peak current in rectifiers
9. Impedance measurement
10. Checking filter capacitors — and many others!

SYLVANIA ELECTRIC

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

★ **Get this big 72-page book!**

★ **More than 90 pictures and diagrams!**

★ **Written in easy-to-follow servicemen's language!**

Sylvania Electric Products Inc.
Advertising Dept. R-2010
Emporium, Pa.

Gentlemen:

Send me "How To Service Radios with an
Oscilloscope." Enclosed is \$1.00.

Name

Address

City.....Zone.....

State.....

"MY SALES PROVE KEN-RAD TUBES HAVE WHAT IT TAKES!"

"I tell you, businesses aren't built on promises. They're built on performance—performance that brings customers back for more.

"And it takes good quality to guarantee good performance!

"Take Ken-Rad tubes. Why, they've been the quality leader for years—backed by one of the country's biggest, finest companies with plenty of engineering know-how.

"Result is, Ken-Rad tubes have paid me a steady dividend of increased business. For turnover and profit, they have what it takes!"



HOWARD L. BOLIN,
Omaha, Nebraska,
with thousands of dealers
like him, sells the tubes
that sell fast and stay
sold—Ken-Rad tubes.



RALPH L. CLARK, Foreman, Miniature Mounting Section, is one of the many experts who carefully supervise the manufacture of Ken-Rad tubes. These men build quality into the tubes at the very beginning; test out trouble at every stage of production.



"MY TESTS PROVE KEN-RAD TUBES HAVE WHAT IT TAKES!"

"Here at the plant we put Ken-Rad tubes through one test after another to prove their quality is unsurpassed.

"The 'short' test, shown on the left, is given tubes before the characteristics test. It enables us to spot tubes that are not up to Ken-Rad standards.

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

"We don't guess. The Ken-Rad tubes we make and ship have proved themselves over and over again!"



KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

THE SERVICEMEN'S TUBE
... backed by profit-
making sales aids which
your Ken-Rad distribu-
tor gladly will show you.
Phone or write him!