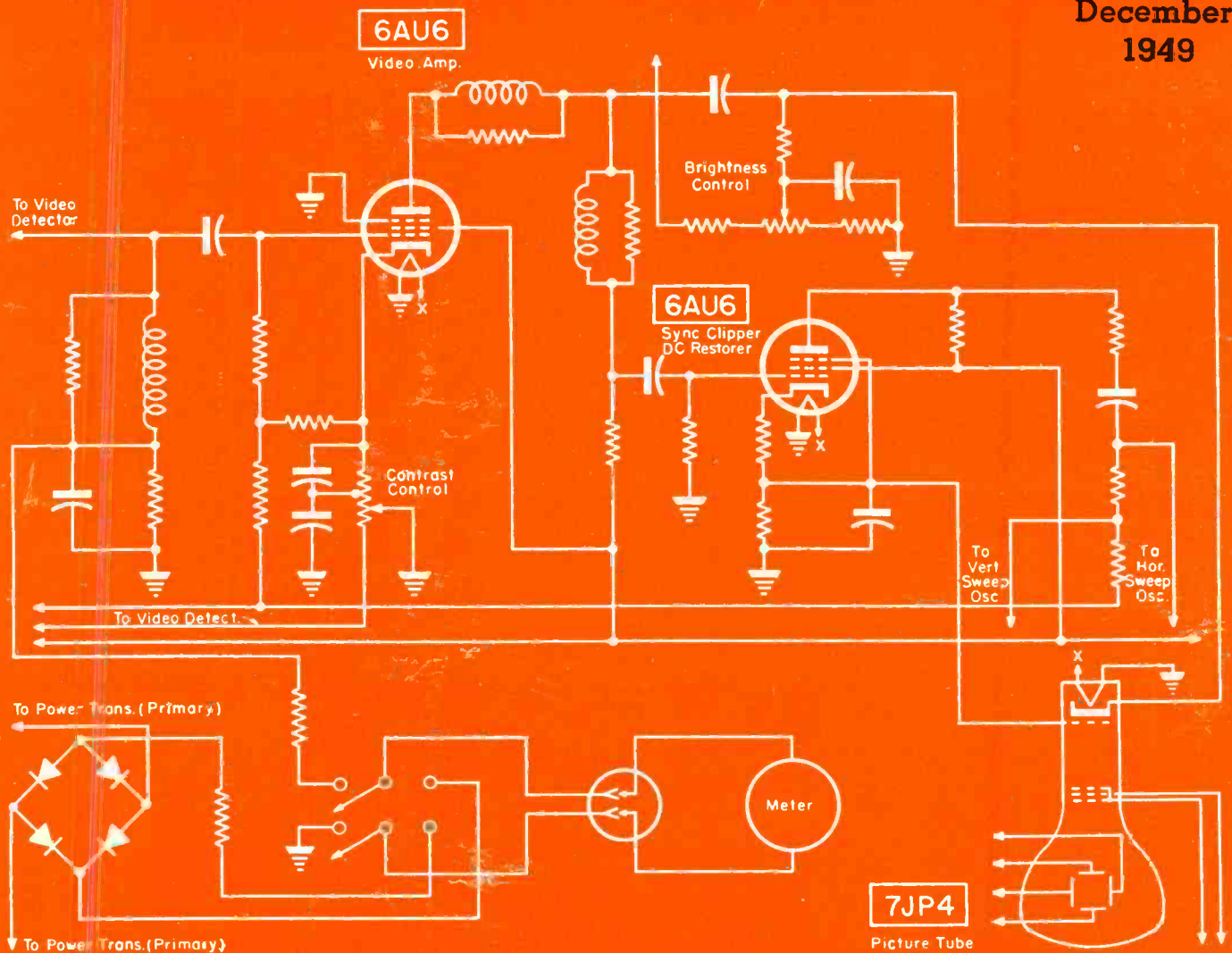


# SERVICE

December  
1949

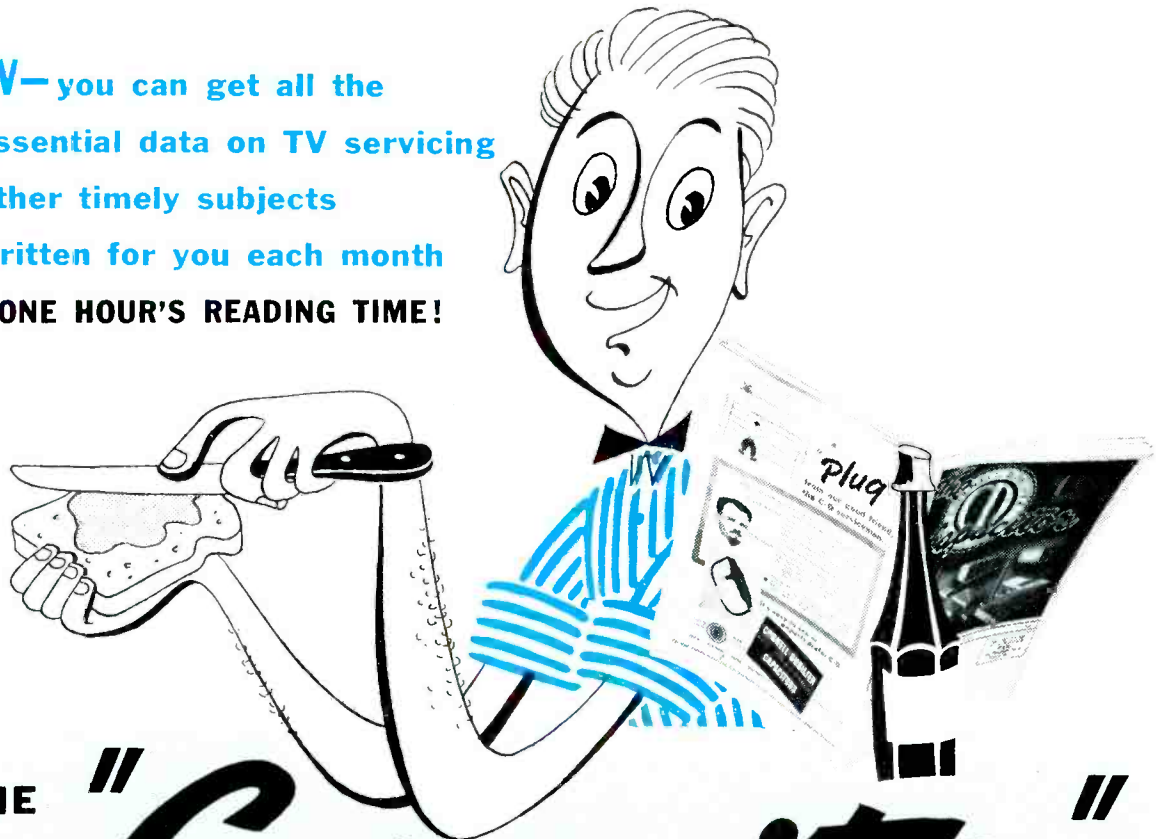


TV Signal-Strength Indicating Circuit Featured in a  
21-Tube Model.

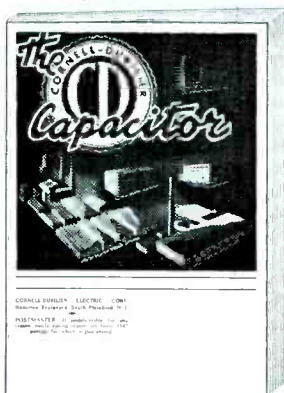
[See page 2]

THE TECHNICAL JOURNAL OF THE RADIO TRADE

**NOW**—you can get all the  
 essential data on TV servicing  
 and other timely subjects  
 written for you each month  
**INTO ONE HOUR'S READING TIME!**



IN THE " **Capacitor** "



**C-D's FREE MONTHLY MAGAZINE OF NEW SERVICE HINTS!**

Want to know how you can keep up with all the "down-to-earth" facts on TV servicing without having to cut your lunch hours in half? Just clip that coupon at the bottom of the page and mail it in to us pronto. Every month for a year we'll shoot you a copy of The Capacitor — a one-hour "package" of time-saving, money-making TV servicing hints and short cuts written for your specific day to day needs. Here's material written in response to the thousands of requests we get every month. Just glance at a few of the articles that have appeared in recent months:

- "Television Video Detectors"
- "TV Picture-Tube Voltage and Signal Systems"
- "Record Changer Speed Faults"
- "F-M Antennas"
- "Auto Receiver Servicing"
- "TV Interference . . . Causes and Remedies"

You get all this FREE for a year, just by sending in the coupon on a penny postcard. Do it now!

*Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey. Other plants in New Bedford, Brookline and Worcester, Mass.; Providence, R. I.; Indianapolis, Ind., and Cleveland, Ohio.*

**YOURS, FREE 1-YEAR SUBSCRIPTION TO THE C-D CAPACITOR**

**CLIP COUPON AND MAIL TODAY!**

CORNELL-DUBILIER ELECTRIC CORP., DEPT. S129,  
 SOUTH PLAINFIELD, N. J.

**GENTLEMEN:**  
*You're on! Send me The Capacitor for the next twelve months, so that I can keep "my nose to the grindstone".*

NAME .....

ADDRESS .....

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

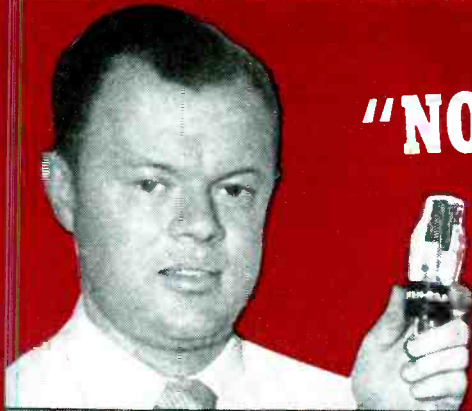
**CORNELL-DUBILIER**  
 CONSISTENTLY DEPENDABLE

- ★ CAPACITORS
- ★ VIBRATORS
- ★ ANTENNAS
- ★ CONVERTERS

1910-1949  
 Reg. U. S. Pat. Off.

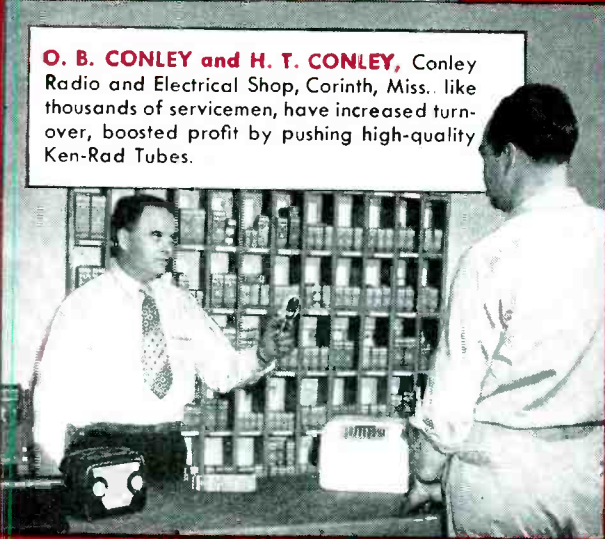
world's  
 largest manufacturer  
 of Capacitors





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

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



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

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

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

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

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



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

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

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

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

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

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



## KEN-RAD Radio Tubes

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

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



RADIO · TELEVISION · ELECTRONIC  
**SERVICE**

**LEWIS WINNER**  
Editorial Director

**F. WALEN**  
Assistant Editor

**ALFRED A. GHIRARDI**  
Advisory Editor

	Page
Annual Index to <b>SERVICE</b> , 1949	26
Association News	24
Performance Diagnosis of Vacuum Tube Circuits. By Edward M. Noll	20
Phono Installation and Servicing (Stylus Factors . . . Frequency Rating Systems . . . Dual Speed Changers). By Kenneth Stewart	14
Ser-Cuits (G. E. 12" Tube TV Models)	12
Servicing Helps. By M. A. Marwell	23
Signal-Strength TV Test Set (Cover)	30
Ten Years Ago in Associations	24
Tube News (Sweep-Circuit TV Tubes). By L. M. Allen	19
TV Receiver Line-Voltage Control-Checker. By Carl S. Cummings	16
TV Receiver Production Changes. By Donald Phillips	22
News and Views. By Lewis Winner	11
 <b>CIRCUITS</b>	
G. E. 817 and 821 TV Models (T and S Versions)	13
G. E. Discriminator Circuit	22
Horizontal Sweep System	19
Horizontal Deflection and Pulse Operated HV Supply for 10BP4 and 12LP4	23
Magnetic Deflecting Yoke Circuit	23
National Videometer (Cover)	30
6BQ6GT/25BQ6GT TV Circuit	19
TV Receiver Line-Voltage Control-Checker	16
 <b>COVER</b>	
Signal-Strength TV Test Set (National Videometer)	30
 <b>SERVICING HELPS</b>	
Deflecting Yoke Applications	23
External Connection of Antennas to BC Sets	23
Horizontal Deflection Output and HV Transformer Application Notes	23
 <b>TV RECEIVER PRODUCTION CHANGES</b>	
Damping Tube Replacements	22
Discriminator Performance in G. E. Horizontal Sweep Generator and AFC System	22
Westinghouse Vertical Hold Improvements	22
 <b>Index to Advertisers</b>	 48
 <b>Manufacturers</b>	
Jots and Flashes	48
News	45
New Parts . . . Accessories	43
TV Antennas . . . Accessories	40

*Entire contents Copyright 1949, Bryan Davis Publishing Co., Inc.*



**Published monthly by Bryan Davis Publishing Co., Inc.**  
52 Vanderbilt Avenue, New York 17, N. Y. Telephone MURray Hill 4-0170



Bryan S. Davis, President      Paul S. Weil, Vice-Pres., Gen. Mgr.      F. Walen, Secretary      A. Goebel, Circulation Manager

East-Central Representative: James C. Munn, 2253 Delaware Dr., Cleveland 6, Ohio. Telephone: ERIEview 1726  
Pacific Coast Representative: Brand & Brand, 1052 W. Sixth St., Los Angeles 14, Calif. Telephone: MICHigan 1732  
Suite 1204, Russ Building, San Francisco 4, Calif. Telephone: SUTter 1-2251

Entered as second-class matter June 14, 1932, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Subscription price: \$2.00 per year in the United States of America and Canada; 25 cents per copy. \$3.00 per year in foreign countries; 35 cents per copy.



# Put This Proved Money-Making Service Data Library to Work ... in your shop *NOW!*

NOW YOU CAN OWN

## PHOTOFACT

*this Amazing*  
**EASY-PAY WAY!**

**Pay as you Profit**  
**Earn with it Now**



**100% Service Coverage!**  
AM, FM, TV Receivers,  
Record Changers, Tuners,  
Amplifiers, Ham Radios

Everything  
You Need to Know  
for Profitable  
Servicing

**NO CARRYING CHARGES**  
**NO INTEREST**

ONLY  
**\$18<sup>39</sup>**  
DOWN

*Gets You Started!*

Includes your membership in the Howard W. Sams Institute.  
Entitles you to valuable service help at no cost to you.

NOW—you can afford to own the Service Data Library that is earning *extra profits* every day for more than 25,000 successful Service Technicians! NOW—for the first time—the famous PHOTOFACT Library can be yours with this new “Pay-as-You-Profit” Plan! Here’s all you have to do: See your parts jobber. Order 4 or more PHOTOFACT Volumes. Pay only \$18.39 down. You get your Library *immediately*. You use it *now*. It *earns* for you—and you pay as you profit! If you’re not already a money-making PHOTOFACT user, here’s your easy-pay chance to own the most productive radio service data in the world. If you’re already using PHOTOFACT, here’s your chance to complete your library by filling in those missing volumes. Now that you can afford PHOTOFACT, don’t be without its time-saving, money-making advantages a single day longer. See your parts jobber today!

### HAVE COMPLETE, ACCURATE DATA ON ALL POST-WAR SETS YOU SERVICE!

With the Easy-Pay Plan, you can boost your earnings *now*, using proved superior PHOTOFACT. Have complete, accurate, uniform data on all post-war receivers—own the *only* Radio and TV service data based on actual laboratory analysis of the equipment. Here’s why PHOTOFACT is better in every way. You get: 1. Exclusive TV coverage in easy-to-use individual envelopes. 2. Exclusive Standard Notation Schematics. 3. Exclusive oscilloscope wave forms. 4. Photos of all chassis views with each part identified. 5. Full alignment instructions, plus circuit voltage and resistance analysis. 6. Complete parts lists and proper replacements. 7. Dial cord stringing diagrams. 8. Disassembly instructions. 9. Record Changer service data. 10. Exclusive keyed data system—all values right on the schematic. There’s nothing like PHOTOFACT! It pays for itself in saved time, bigger work output and *greater profits*. To protect your future in Radio-TV servicing, *act now*—own the PHOTOFACT Library the Easy-Pay Way!

**SEE YOUR PARTS JOBBER OR WRITE DIRECT TODAY**

*Get the EASY-PAY Details*



### 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 full Easy-Pay Details
- Send FREE PHOTOFACT Cumulative Index
- Send PHOTOFACT Folder for Set Model. . . . .  
(FREE to Service Technicians writing in on letter-head; 50c charge to Experimenters)

Name . . . . .

Address . . . . .

City . . . . . Zone . . . . . State . . . . .



# Problem solved when you use G-E SPEAKERS

...WITH MOUNTING BRACKETS AT NO EXTRA COST!

HERE'S the answer to a serviceman's prayer! Time-saving mounting brackets that solve dozens of awkward replacement problems are now available at no extra cost with

every General Electric small-size speaker you get from your distributor or jobber! Adjustable up, down, or sideways, these brackets save your time and simplify tough jobs.

ALL POST-WAR SERVICE  
HAVE COMPLETE DATA ON

With the Easy-Pay Plan, you can start your earnings now, using your prior Plan. Have complete data on all post-war service. Includes your membership card. Includes you to valuable service. Includes you to valuable service.

How To Build Customer Goodwill  
Your customer gains confidence in you when you replace with components of the best quality. When you install a G-E speaker in his set, tell him about its advantages—

- ★ Aluminum Base Voice Coil—a famous G-E resource! High humidity won't warp it. Extremes of temperature won't affect it.
- ★ Much higher power handling capacity. Tough, all-weld construction. G-E Alnico 5 Magnet, securely and efficiently mounted.
- ★ Power, sensitivity, fidelity! More of everything for his money!



Bracket can be adjusted up or down to fit the cabinet problem. This G-E 5" Round speaker is especially designed for service replacement.

Lateral mounting feature of bracket saves fingers, time and temper. Screws hold bracket arms and speaker securely and permanently in place.

Call your G-E distributor or jobber today!

Mail coupon for  
Free Sample Bracket!

This offer open only to radio and TV servicemen!

General Electric Company, Bldg. 1, Room 1S  
Electronics Park, Syracuse, New York

Send me free sample bracket and all the facts on G-E Small-Size Speakers.

NAME \_\_\_\_\_

FIRM \_\_\_\_\_

ADDRESS \_\_\_\_\_

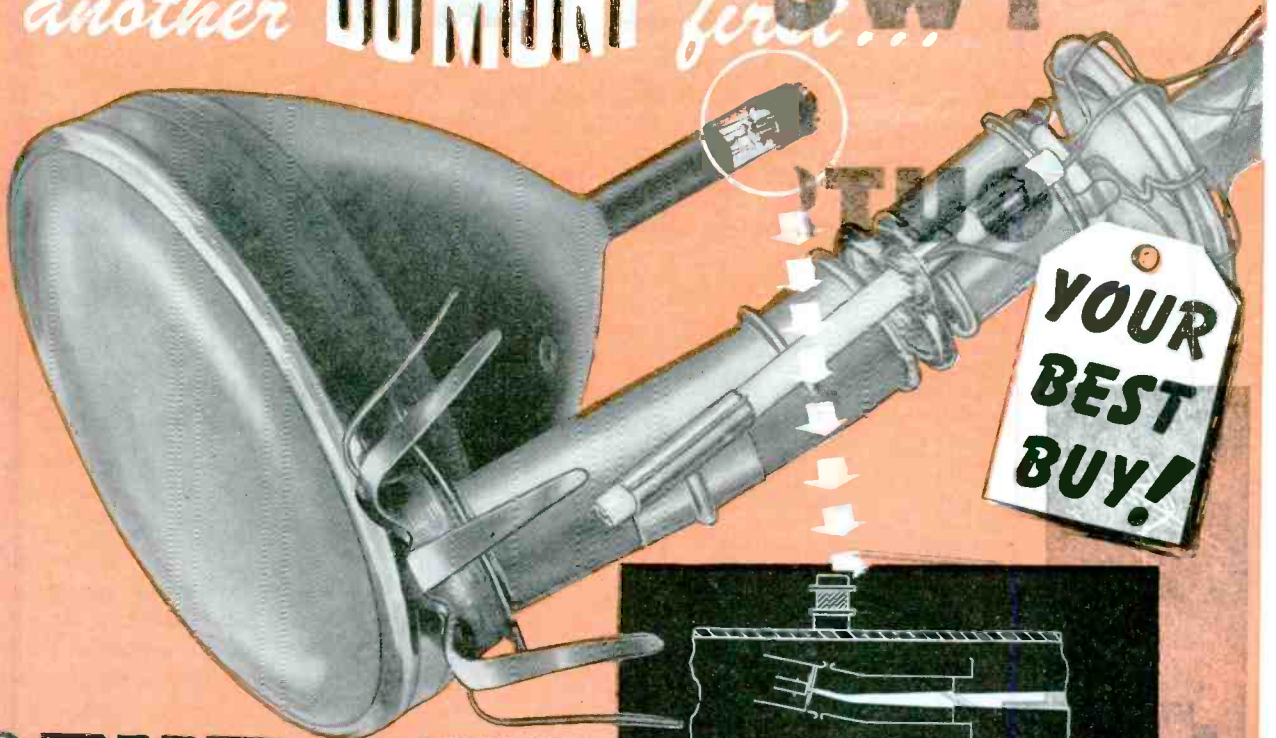
CITY \_\_\_\_\_ STATE \_\_\_\_\_

You can put your confidence in

**GENERAL ELECTRIC**



another **DU MONT** first... **DWT**

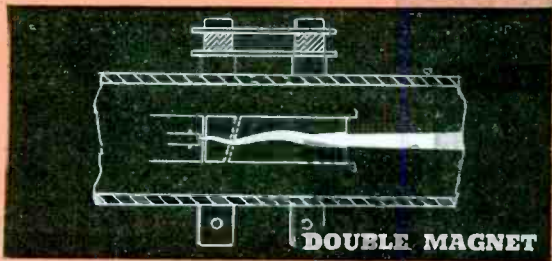
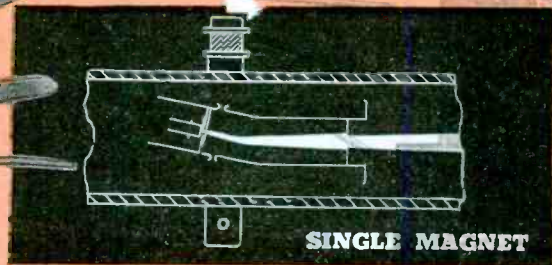


# BENT-GUN

*Teletrons\**

The new Du Mont Types 12RP4 and 15DP4 (replacing respectively Types 12JP4 and 15AP4) feature the exclusive Du Mont bent-gun. This ion-trap design eliminates ion-spot blemishes while maintaining an undistorted spot for maximum pictorial resolution. Meanwhile, lead-free glass reduces tube weight considerably. Five-pin duodecal base permits using the new half-socket for a significant saving, although old-type full-socket also accommodates these new tubes without modification.

Definitely "Your best buy!" For initial-equipment or replacement purposes — for superlative performance and longest service — insist on Du Mont Teletrons!



Above: Du Mont bent-gun principle, utilizing single ion-trap magnet. Space saved by eliminating double beam-bending magnet results in shorter neck length. Focussed-spot distortion eliminated by use of electrode parts designed to form symmetrical electrostatic fields in G<sub>2</sub> space. Lower-cost magnet.

Below: Conventional straight-gun design. Ion and electron beam is twisted by slanting electrostatic field between second grid and anode, requiring TWO bending magnetic fields. More costly beam-head. Longer neck. Focussed-spot distortion.

Write for latest literature.

© ALLEN B. DU MONT LABORATORIES, INC.

\*TRADE MARK

**DU MONT**

FIRST WITH THE FINEST IN T-V TUBES

*Teletrons*

ALLEN B. DU MONT LABORATORIES, INC. • TUBE DIVISION • PASSAIC, NEW JERSEY

SERVICE, DECEMBER, 1949 • 5



# TWO STANDOUTS from the OUTSTANDING LINE

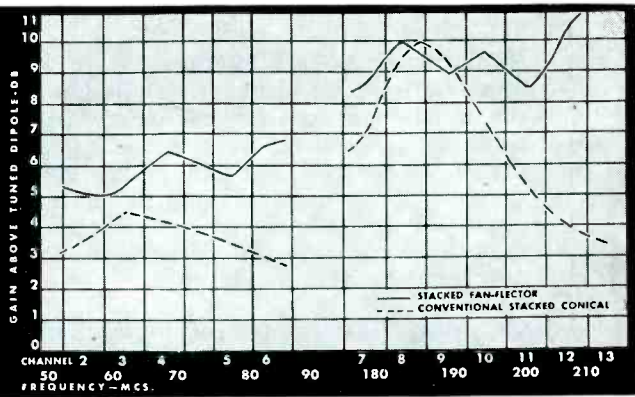
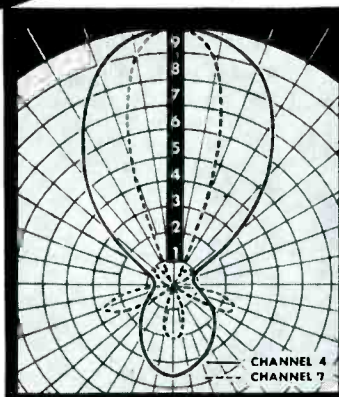
## CHANNEL MASTER'S FAN-FLECTOR

This sensational new preassembled antenna, the Fan-Flector, a development of Channel Master's research laboratories, is the most sensitive all-channel antenna developed to date.

No high band attachments.  
No multiple lead in wires.  
No wasted assembly time.  
Dealer after dealer has made his most difficult fringe installations stick with the Fan-Flector, America's fastest selling antenna.

**OVER 100,000  
SOLD IN 3 MONTHS**

		List
BM312	Fan-Flector	13.75
BM312X2	Stacked Fan-Flector	29.30
BM312X4	Double Stacked Fan-Flector	63.25



### HORIZONTAL POLAR DIAGRAMS

Low band front-to-back ratios between 3 and 4 to 1. Lobe width decreases on high band for ghost-free reception. Vee-Beam engineering minimizes side lobes.

### GAIN CURVES

"Most popular" conventional stacked conical antenna (broken lines) compared to the stacked Fan-Flector (solid lines).

TO: CHANNEL MASTER CORP., ELLENVILLE, N. Y. DEPT. S-12

Please send me:

- Name of nearest Channel Master Distributor
- Technical data and literature

YOUR NAME.....

COMPANY NAME.....

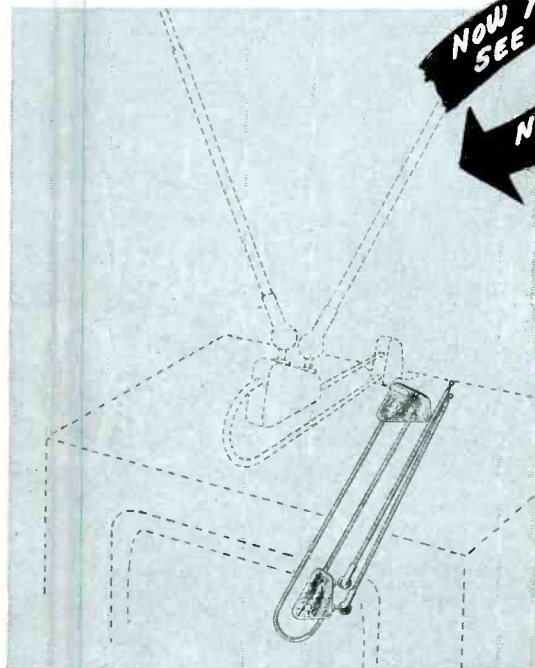
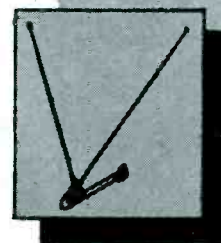
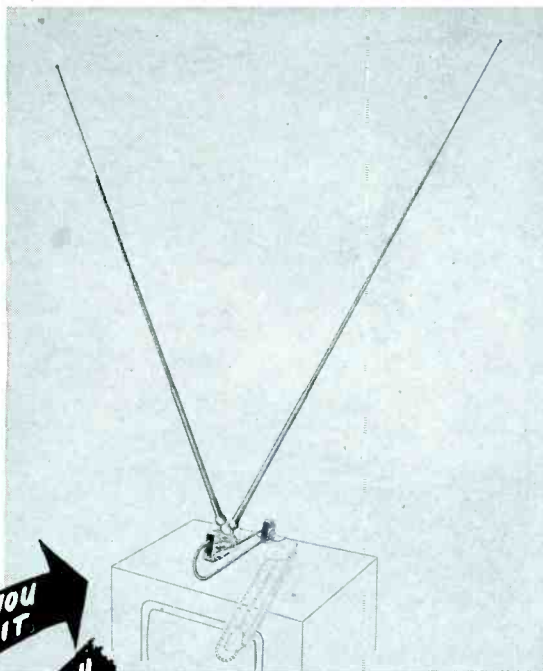
ADDRESS.....

CITY..... STATE.....



# CHANNEL MASTER'S HIDEAWAY

*Combines*  
**THE DISAPPEARANCE  
OF A BUILT-IN ANTENNA**  
*with*  
**THE PERFORMANCE OF  
AN OUT-DOOR ANTENNA**



**NOW YOU  
SEE IT**

**NOW YOU  
DON'T**

Channel Master's exclusive Multiflex Action\* enables this antenna to be hidden away behind the set when not in use. The elements can be arranged to form a horizontal Vee for any channel in any direction thus increasing the gain.

The hand rubbed hardwood surfaces, nickel plated metal components and smart design makes the Hideaway the most attractive indoor antenna on the market today.

**LIST 975**

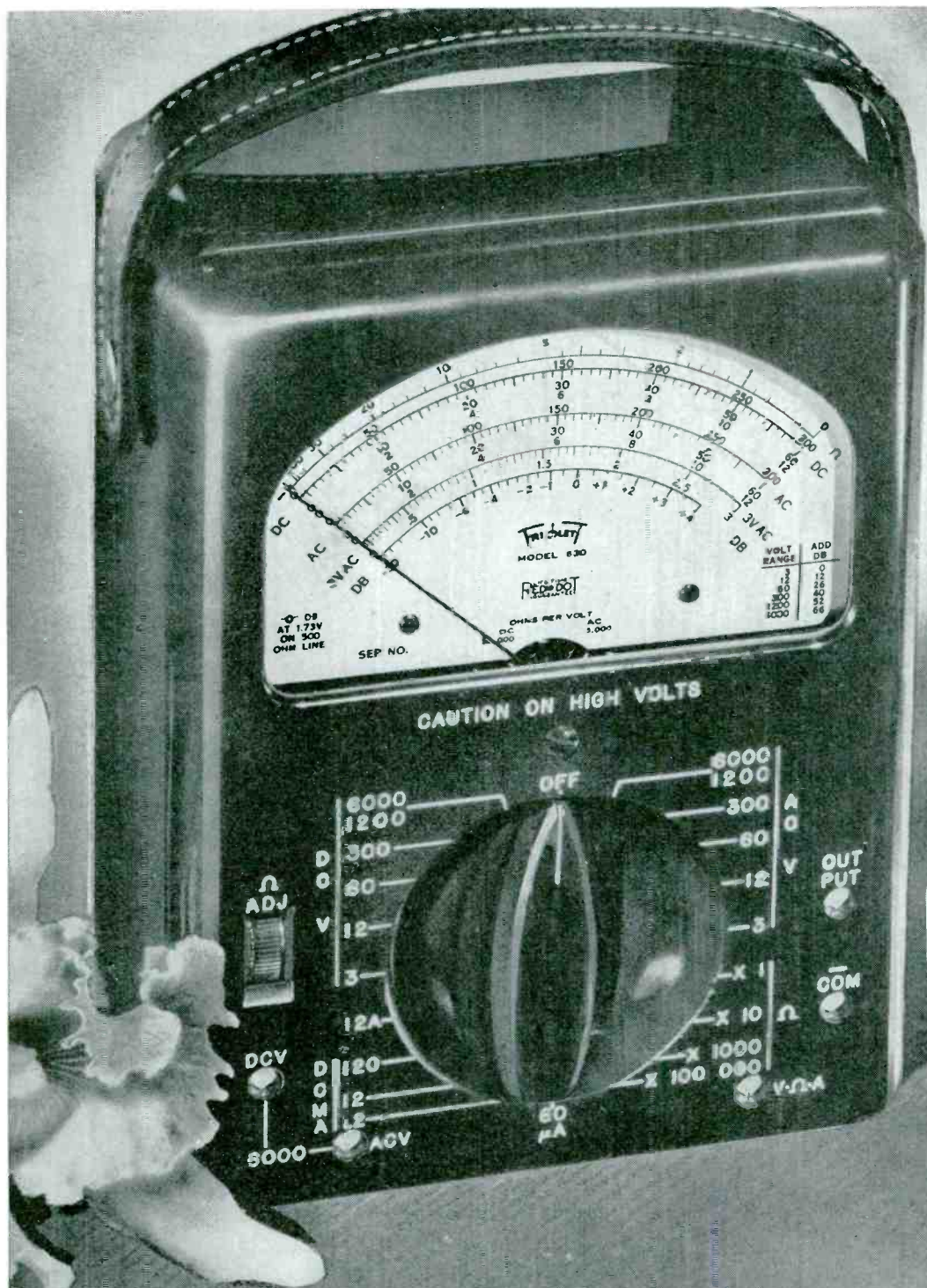
available in blond,  
mahogany and  
walnut

\*Pat. Pend.



**FIRST IN PREASSEMBLED ANTENNAS**





Model  
630

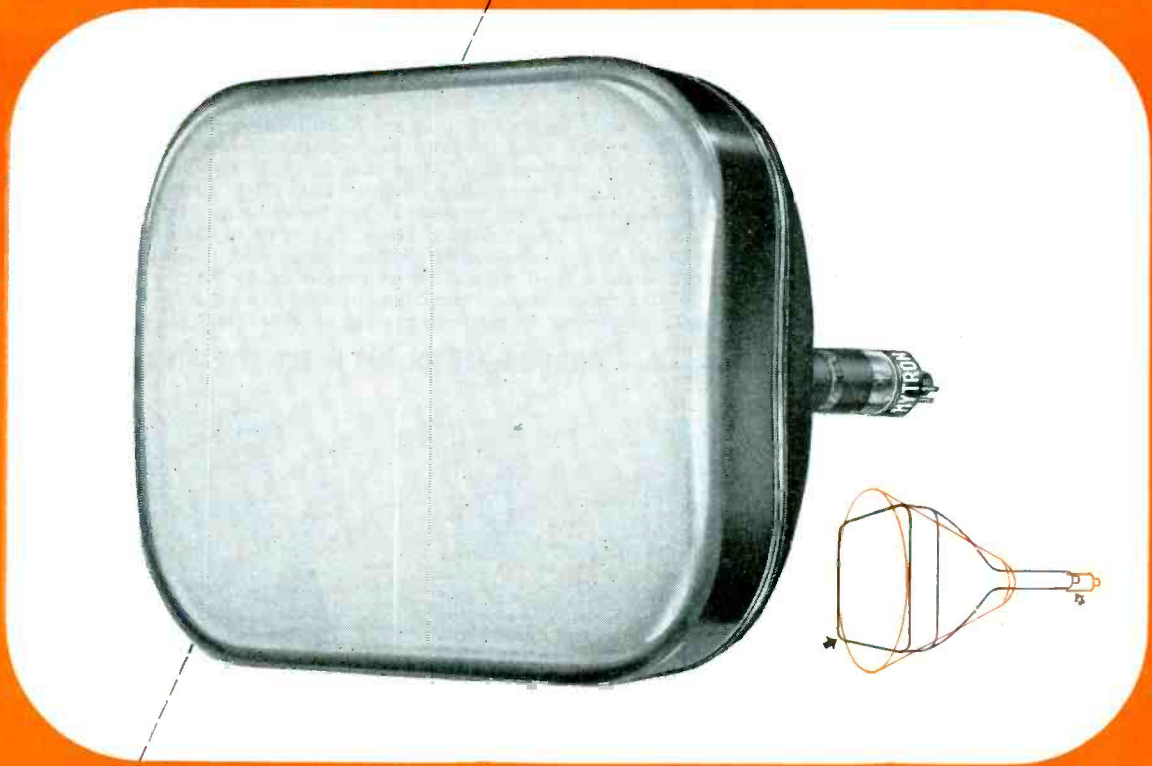
*There is no more useful  
and dependable instrument made*

ONLY \$37.50 AT YOUR DISTRIBUTOR

FOR THE MAN WHO TAKES PRIDE IN HIS WORK  
**Triplet**  
ELECTRICAL INSTRUMENT COMPANY • BLUFFTON, OHIO, U.S.A.



ANOTHER **HYTRON FIRST** YOU'LL BE BUYING SOON



# NEW HYTRON RECTANGULAR all-glass 16RP4

Meet Hytron's space and money saver. The new Hytron 16RP4. Revolutionary 16-inch rectangular picture tube. Takes approximately same cabinet space as 12LP4. Automatically sets the pace for more compact and economical TV set design. You'll be seeing it . . . buying it . . . soon.

The new 16RP4 is latest in a long series of Hytron firsts. Including: The GT tube. Over 50 GT types. The subminiature. Many new miniatures. Special low-cost TV deflection-circuit tubes: 1X2, 6BQ6GT, 5U4GT 25BQ6GT. Check the 16RP4's many features. Watch for it. Buy the best by the leader. Buy Hytron!

OLDEST MANUFACTURER OF RECEIVING TUBES  
**HYTRON**  
RADIO AND ELECTRONICS CORP.



MAIN OFFICE: SALEM, MASSACHUSETTS



With old-style round tube, you lose the corners.



With Hytron 16RP4, you see the picture just as transmitted.

## Features of HYTRON 16RP4

- 1 Rectangular shape permits smaller, less costly cabinets.
- 2 Also just as short as 12LP4.
- 3 Weight is approximately two-thirds that of 16-inch, all-glass round tube.
- 4 Easy to mount. Can't roll or twist.
- 5 No high-voltage isolation of tube required.
- 6 Neutral gray face . . . increases contrast ratio.
- 7 Large viewing screen. You get the entire transmitted picture; no lost corners. Gives picture (with standard 3 by 4 aspect ratio) 10 1/4 inches by 13 1/2 inches.

Write for Bulletin E 147 giving complete data.

**5000 SERVICEMEN  
HAVE PROFITED FROM  
SYLVANIA'S DEALER  
ADVERTISING CAMPAIGNS**

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

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

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

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

## HERE'S WHAT YOU GET IN THE SYLVANIA KIT:



"Now says it squeals too much!"



LOOK FOR THIS  
SIGN OF DEPENDABLE  
RADIO SERVICE

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

# SYLVANIA RADIO TUBES

PRODUCT OF SYLVANIA ELECTRIC PRODUCTS INC.



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



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



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



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



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



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

Mail coupon today for full details on the complete campaign!

Sylvania Electric Products Inc.  
Advertising Dept. R-1912, Emporium, Pa.

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

NAME .....

COMPANY .....

ADDRESS .....

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

# SYLVANIA ELECTRIC

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



RADIO - TELEVISION ELECTRONIC  
**SERVICE**

**The Old and the New**

WITH A BUSTLING YEAR nearing its end and an equally peppery series of days ahead, the Service Man can look backward and forward with exciting glee and toss about quite a few healthy hurrahs for the healthy state of his industry. Yes, '49 has been quite a year for the Service Man and '50 looks even better, with TV again at helm as an income builder.

With close to two-million television receivers in operation, and as Victor Mucher of Clarostat said in a recent report . . . "the sets operating many hours a night and night after night, hundreds of hours of wear and tear are piling up to the gratification of the local Service Man."

In addition, declared Mucher, many of these receivers are from one to two years old and . . . "that means dimming picture tubes requiring early replacement. It also means occasional replacement of other tubes, because even one weak tube out of two or three dozen can mar entertainment. Resistors and capacitors are apt to let go, while controls get noisy or flickery. All of which is sweet music to the Service Man."

Every Service Man can get his share of the 1950 boom business, Mucher pointed out, if he'll . . . "make sure that every installation he makes provides satisfactory performance, and particularly if he equips himself with the proper test equipment and adequate stock of replacements for prompt servicing."

The Service Man can't help but hit the bull's eye, with that kind of a code in operation, Mucher declared.

There are tremendous dollar-building possibilities in TV replacements. Commenting on this vital point, during an address at the Hotel Astor in New York City recently, Robert Sprague of Sprague Electric, said . . . "there are an average of five to seven parts in a TV set to every one in a broadcast model. A typical radio set may have around 130 parts, while a typical television set will have a thousand parts and most of a very special design and construction."

That's quite a market!

Not only are the prospects bright in TV, but sound, too, with practically a new era to explore, thanks to the

slow-speed systems and the accelerated development of tape and wire recorders.

The tape recorders have really carved a sparkling niche for themselves. Today, there are nearly two dozen top-notch recorders and playback units available for a variety of installations. The equipment is finding its way into schools, offices, homes and studios where it is being used for public speaking and dramatic training, speech correction, speech research, educational broadcasting, re-recording of platter music or airplane tunes, etc.

Recorders have been made for from half-hour to four-hour applications. One four-hour unit, using a dual track idea, operates at  $7\frac{1}{2}$ " per second on a  $13\frac{1}{2}$ " reel, and is said to have a frequency response of  $40$  to  $10,000 \pm 2$  db. There is also a dual-track recorder operating at  $7\frac{1}{2}$ " per second with a built-in three-tube tuner, which affords a half hour of continuous recording on a 5" reel and one hour of recording on a 7" reel. For basic voice work there's a single-track type unit with a tape speed of  $7\frac{1}{2}$ " per second using a 7" reel, the frequency response being 100 to 5,000 cycles.

In servicing these units, familiarity with the designs and frequency response is extremely important, for such knowledge makes it possible to evaluate the type of instrument requiring repair. According to audio expert C. J. LeBel, vice prexy of Audio Devices, frequency response generally falls into four categories: Top professional, with a uniform response to 15 kc, at 15" or 30" per second speed; portable and economy professional, with a uniform response to 7.5 kc at 7.5" per second; good home type, with a uniform response to 5 kc at 7.5" per second; and poor home with a uniform response to 3 kc at 3.75" or 7.5" per second. The latter is usually only employed for utility or very general work.

A knowledge of the motors used is also important in servicing. LeBel reports that inexpensive machines use one motor for all drives, and use friction clutches for takeup and supply-tension adjustment. If these clutches are improperly adjusted, the sound quality may suffer (if tension is light) and the tape may be ruined if the tension is excessive. There are other clutch problems to consider, too. For

instance, some clutches automatically change their friction as the amount of tape on the reel changes and some do not. The former type is usually preferred, since it has been found to maintain the tape tension very nearly constant from empty to full reel.

Response tests are also important in tape-instrument servicing. Some makes of home recorders have heads which wear rapidly, resulting in a very poor high-frequency response. Such heads must be checked frequently and carefully.

On the schedule of profit-making activities, we also find the TV antenna installation, which has and will continue to play a stellar role in the Service Man's busy day. We have had an invasion of the built-in antennas, but in the bulk of installations an antenna, particularly of the outdoor type, is still the medium required to provide that sharp, interference-free picture from all the stations in the area.

Speaking about antennas, the multiple-antenna multiple-receiver feed idea is becoming increasingly popular and is destined to become a major installation factor in '50, offering the Service Man an unusual opportunity to serve a new highly lucrative field. An enlightening discussion of this phase of installation will appear in the January issue of SERVICE. Watch for it!

The enterprising Service Man has found and will continue to find new fields to conquer. There's the case of the Service shop in the far west who displayed what could be done with a bit of vision. A highway service agency wanted to cover miles of its difficult roads with a comparatively inexpensive communications system. Handie-talkies were suggested, and they worked so well, that a complete system covering a dozen sites was installed, with a yearly servicing arrangement set up to assure continuous service, *on the spot*, so essential to the emergency facilities provided by the portable units. With the expanding use of these handie-talkies in the commercial world, and the expected growth of the citizens service and the walkie-talkies, the Service Man has another profit-bearing field to add to his lively prospect calendar for the bright new year.—L. W.



## Circuit Analysis of G. E. 12" Tube TV Models and Admiral TV Receivers With FM/AM Tuners.

THE 10" TV models, long a favored type in the home and commercial installations, are surrendering their firm position to the 12" variety. As a result set makers have been processing more of the expanded-view picture-tube receivers than ever. While in the main, the 10" design patterns have been employed for the 12" types, larger-tube models with quite a few circuit alterations have come off the line.

In Fig. 1 appears the circuit of one such model; G. E. 817 and 821, *T* and *S* version.

The front end is quite standard, with the *rf* unit featuring two stages, a converter and local oscillator, constructed as a self-contained sub-assembly, which can be demounted readily from the main chassis. The tube complement consists of two 6AU6s used as *rf* amplifiers and a twin triode 12AT7, one section of which is the converter and the other section the local oscillator. The first *rf* amplifier is connected as a triode amplifier.

The antenna input circuit provides a 300-ohm balanced input. To obtain this, the antenna input is coupled between the grid and cathode sections of the tube so that both of these tube controls perform as signal input elements. The  $G_m$  of a 6AU6 connected as a triode is adjusted so that the input impedance to the cathode is approximately 300 ohms, the grid input being made equivalent to it by shunting its input impedance by a 1,000-ohm resistor to give a balance. The addition of a center-tapped choke,  $L_{201}$ , from the grid to the cathode provides a balance to ground and, at the same time, transfers the cathode and grid impedances to give a total of 300 ohms across the choke terminals, the point of signal input. The inductance of the choke,  $L_{201}$ , is such that it will resonate probably with the capacity in the grid and cathode circuits providing a uniform impedance for all the lower channels. Chokes  $L_{203}$  and  $L_{207}$  have been shunted across the choke  $L_{201}$  on the

high-frequency channels for the same reason. A pair of 5,100-ohm resistors serve to drain static charges from the antenna to ground. Two capacitors,  $C_{201}$  and  $C_{203}$  (510 mmfd), keep the line voltage away from the antenna and form a high-pass filter with  $L_{201}$ ,  $L_{203}$ , and  $L_{207}$  to remove any low-frequency interference.

Tuning of the *rf* amplifier is provided by a shunt-tuned circuit in the plate circuit of each of the *rf* amplifier tubes. Bandwidth is acquired on the low-frequency channels by stagger tuning these two tuned circuits so that the first *rf* amplifier tunes to a lower frequency than that of the second *rf* amplifier plate circuit. On the upper channels, tube loading provides a rounded top of sufficient bandwidth.

The suppressor grid of the 6AU6 *rf* tube is connected directly to the control grid of the 6AG5 second *rf* tube. Since the suppressor grid is in the tube plate electron stream and has interelectrode capacity with the plate, it provides an efficient coupling device. The *rf* choke coils in the output of these tubes are used as a high-pass filter to shunt out any *rf* interference of a low frequency which may be passed from the first *rf* amplifier. A bias derived from the contrast control circuit is applied to the second *rf* amplifier grid circuit.

The triode tube section is connected in a modified Colpitts oscillator circuit which operates on the high frequency side of the *rf* channel frequencies for all channels. Oscillation is provided by a split capacity across the inductance,  $L_{202}$ , consisting of the cathode-to-grid and cathode-to-plate interelectrode and distributed capacities. The choke,  $L_{202}$ , provides a *dc* ground path to the cathode of the tube and maintains the cathode off ground at the *rf* frequencies.

### Video and Audio IF Amplifiers

Three 6AU6 pentodes are used in the video *if* in a stagger-tuned band-

pass arrangement. A single-tuned choke is included in each stage, each tuned to a different frequency and then loaded with suitable resistance to give an adequate over-all band-pass frequency characteristic. The choke inductance in conjunction with the tube and distributed circuit capacity are tuned to approximate frequencies by the variable core adjustments in the chokes.

Intercarrier sound is used in these receivers, and therefore the sound *if* of 21.8 mc formed at the converter is passed through the entire video *if* amplifier to the detector. It is attenuated in passage through the video *if* to give the proper ratio of sound *if* to video *if* signal at the detector. At the detector, the video modulation components are detected from the 26.3-mc video *if* and, also, a 4.5-mc frequency-modulated sound *if* results from the beat between the 21.8-mc sound *if* and the 26.3-mc video *if*. This 4.5-mc signal is amplified by the video amplifier tube sections of the 12AU7 and then applied to a 6AU6 limiter-amplifier tube. Detection of the 4.5-mc signal is accomplished by a 6AL5 ratio detector.

No trap circuits are used in the video *if* amplifier. Shaping of the skirts of the *if* response is accomplished by a choice of frequencies to which each tuned *if* choke resonates and by the loading across this tuned circuit. At the output of the video amplifier, a 4.5-mc series-tuned circuit, consisting of a 2-mmfd capacitor ( $C_{341}$ ) and  $L_{341}$ , is used to attenuate the 4.5-mc FM *if* prior to application of the video signal to the picture tube. Taking voltage across the inductive element of this trap, provides a means of obtaining a slug-tuned input to the limiter stage at the sound *if* of 4.5 mc.

Contrast control bias is applied to the first video *if* amplifier as well as the second *rf* amplifier. On early production receivers (*T* versions), the contrast control obtained its bias from

(Continued on page 32)



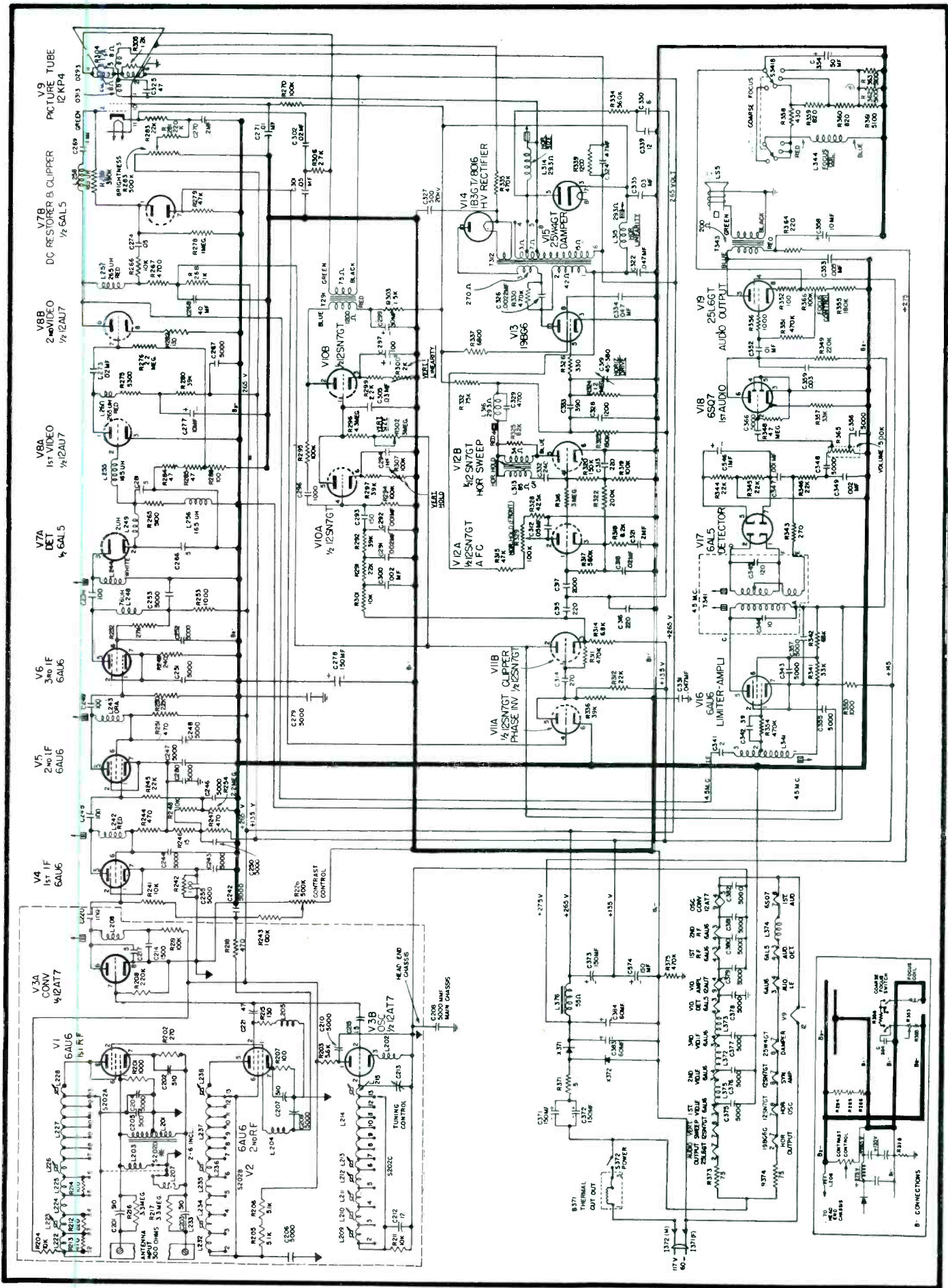


Fig. 1. Circuit of the G. E. models 817 and 821 (*T* and *S* versions) TV receiver.

# PHONO

## installation and service

IN SERVICING a phono player, there is one accessory which requires particularly close attention. It is that small item the stylus, and there appear to be many variables which determine its operational effectiveness.

One of the factors, for instance, which determine how many satisfactory plays can be obtained from a given stylus are the type of record most commonly played and the condition of these records.

Records vary in degree of abrasive action. In general, the higher quality classical records are the best in this respect, but unfortunately, the amount of distortion due to stylus wear which can be tolerated on a classical recording is generally less than that which can be tolerated on a popular recording. The degree of groove modulation is also a factor in record wear, the heavier modulated recordings causing more rapid wear than those which are less highly modulated.

Stylus pressure is another important consideration. Too much or too little stylus pressure both will cause more rapid wear of the stylus and the record. In any reasonably good tone arm, using a cartridge of the variable reluctance type, one ounce should be considered the maximum pressure to be used. The stylus pressure should be adjusted to between one-half and one ounce. For professional type arms, specifically designed for the variable reluctance cartridge, 12 grams have been found sufficient.

The type of equipment with which the cartridge is used is quite related to the wear problem and merits an analysis. Probably the largest number of phono users utilize what might be termed *average* equipment. This means that the amplifier and loudspeaker are of good quality, but are not *high fidelity* in the generally accepted sense of the term. Such equipment probably does not place emphasis on reproduction of frequencies above 7,000 or 8,000 cycles, and, although it provides excellent reproduction there is a tendency to attenuate those frequencies in which the most disagreeable distortion components are found.

There are, however, a large number of users who utilize either the finest or

FR Rating	Hearing References	Typical Uses
20,000 Cycles		
+8 Lim	Ultra High	Audibility Limit (Best Ears - Tone Test)
+7		Noise
+6		Sound Effects
		Percussion Instruments
+5	High	Best Ears
		MUSIC
+4		Avg. Ears
		Music Maximum Audible Range (Average Home Conditions)
+3	Medium	
+2	Fidelity	
+1 Lim	Low	Minimum Acceptable Range For Music
3,000 Cycles		

Frequency-range rating system developed by Jensen. Instead of stating frequency limits of speakers in cycles, the *hf* region between the minimum useful limit for music and maximum limit for hearing has been divided into eight steps, each of which is distinguishable from the next as an audible difference for music. The rating of the speaker is determined from the highest interval at which loudness is maintained at a significantly high percentage of normal.

reasonably priced wide-range audio equipment in the reproduction of their records. When the amplifier and speakers are capable of reproducing the entire range to 10,000 cycles or beyond, the requirements of the entire system with regard to distortion content become very strict, since the disagreeable distortion components will be reproduced fully.

The degree to which the listener is critical ties in quite closely with the foregoing item since, generally speaking, the person who has taken the trouble to provide himself with the finest of equipment will also be the most critical of the results. A critical listener will not tolerate as much distortion as the average listener, nor will he be willing, in most cases, to reduce the high-frequency output by means of a tone control to lessen the effects of distortion when it is present.

The definition of a *critical listener* is not restricted to engineers or experienced musicians who listen expertly for definite manifestations of improper reproduction, but includes those who enjoy and appreciate good

\* Based on data prepared by G.E.

\*\* Jensen Mfg. Co.

music, and find excessive distortion very noticeable and disagreeable.

With these factors taken into consideration it is difficult to specify in exact terms the number of satisfactory plays which can be expected from, let us say, a sapphire stylus. An *average* listener using *average* equipment can obtain approximately 1,500 satisfactory plays before the stylus will need replacement, a play being defined as one side of a 12" record. A critical listener using wide-range equipment may notice distortion due to stylus wear at as low as 200-300 plays, and, although this distortion does not seem to become a great deal worse between the 300 and 1,000 play mark, it is sufficiently objectionable to some listeners to warrant stylus replacement at 300 plays.

The best way to judge whether or not stylus replacement is necessary is to listen for distortion to develop, particularly on heavily modulated inner-grooves, i.e., grooves near the center of the record. It should be borne in mind that many recordings have distortion which will be reproduced by either a new or old stylus, and only a record known to have low distortion should be used in tests of stylus wear.

### New Frequency Rating System

In a recent evaluation of the practice of assigning to loudspeakers frequency range values in cycles, it was found that the use of cycles to define the frequency limit appeared to be inadequate and unsatisfactory. The sound engineers\*\* who made this study declared that in the first place frequency figures do not convey any information as to the ability of the listener to hear differences in frequency range. Secondly, there are no accepted standards for specifying frequency limits and therefore different manufacturers could rate the same speaker quite differently. Some rating practices have been based on cut-off limits which are actually far below the threshold of hearing, thereby implying performance at much higher frequen-



# Variable Reluctance Stylus Wear Factors. Highlights of New Frequency Range Rating System. Features of Westinghouse Two-Speed Changer Needle Control.

by **KENNETH STEWART**

cies than are made available acoustically to the listener.

To solve the problem a new system for rating was evolved. The system employs liminal units (abbreviated *lim*), one *lim* being the listener's sensation corresponding to a just-noticeable change in frequency range.

## Interval Constants

In deriving the new system, the high-frequency region between 3,000 and 20,000 cycles was divided into intervals which authoritative tests have shown constitute just-perceptible changes in frequency range to the ear when reproducing music.\*\*\* The intervals are numbered from +1 to +8 *lim*. The system provides for the assignment of a rating number of the highest interval for a speaker, in which the loudness is maintained at a significantly high percentage of normal as determined from objective measurements in connection with loudness data and checked by means of listening tests.

Since 3,000 cycles is approximately the minimum range which is tolerable for music (representative, for example, of the overall performance of small inexpensive receivers), a par-

ticular rating may be thought of as the number of perceptible steps above this minimum quality due to frequency range extension. Thus, +5 *lim* and +6 *lim* represent the maximum perceivable ranges established by noise and hearing for average and especially favorable home listening conditions; loudspeakers with +5 or +6 *lim* ratings or higher will therefore deliver as wide a range as is useful for normal home listening. Loudspeakers with higher ratings are useful at higher reproduction levels than normal, in the most critical technical applications where sound-effects, noises and percussion instruments must be reproduced with utmost accuracy, and where weight is attached to other performance advantages due to the use of low- and high-frequency units handling their respective portions of the total bandwidth.

The highest interval (+8 *lim*) is that in which hearing cut-off occurs for the best ears. This rating, therefore, is suggested as the maximum which can be applied to any loudspeaker intended for listening purposes.

## Westinghouse 2-Speed Automatic Record Changer

Dual-speed record changers for 78 and 33 $\frac{1}{3}$  rpm are now being made to accommodate twelve ten-inch records or ten twelve-inch records in one loading; all records loaded together must be rated to operate at the same speed.

In one model\*\*\*\* a unique two-position needle control is used to provide the correct needle pressures.

The dual-tip needle extends through the crystal cartridge in such a manner that the standard tip is on one side of the cartridge and the fine tip is on the other side. By turning the needle control, the cartridge is rotated so that the desired needle tip is brought into play. At the same time, a chain and spring arrangement in the pickup arm changes

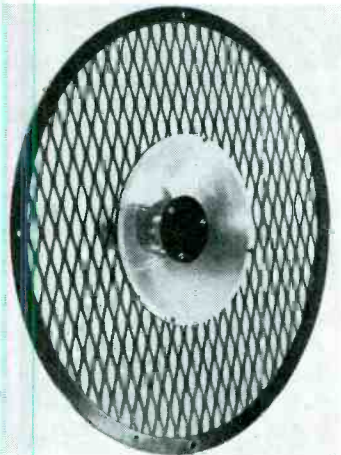
the needle pressure to correspond with the needle tip now in use. When the needle control is turned to bring the fine tip into play (*slow* position), a chain winds around the hub on the cartridge swivel and applies tension to a wire spring which extends along the pickup arm to a bracket on the pickup arm hinge pin. The tension of the spring then lightens the needle pressure. If necessary, the spring tension can be varied by bending the metal bracket on the hinge pin to obtain the required needle pressure of 8 grams. With the needle control in the *standard* position, the chain is not wound around the cartridge swivel hub, and there is no tension on the spring; thus, the necessary 1-ounce needle pressure results.

The fine needle tip is identified by a color, and the side of the cartridge through which the fine tip protrudes is identified in a like manner.

A speed control governs the position of an idler drive wheel through a link assembly. In one position, the drive wheel bears against the larger diameter portion of the motor armature shaft; this results in a turntable speed of 78 rpm. In the other position, the drive wheel is elevated so as to bear against the small diameter portion of the armature shaft, and a turntable speed of 33 $\frac{1}{3}$  rpm results.

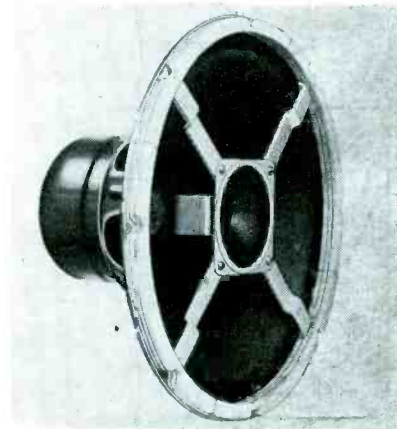
High-frequency tweeter featuring a patented diffuser.

(Courtesy Mark Simpson Manufacturing Co.)



Coaxial-type speaker with a low-resonance woofer and tweeter.

(Courtesy Utah)



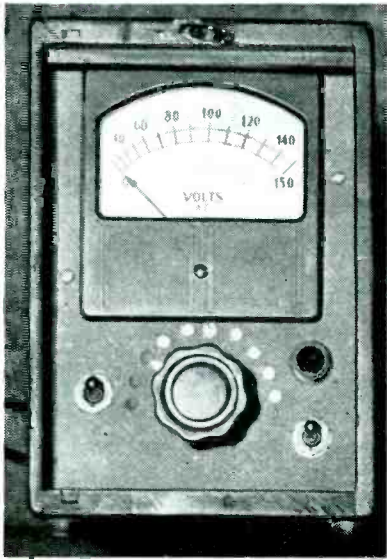
\*\*\* Jensen Technical Monograph No. 3. *Frequency Range and Power Considerations in Music Reproduction.*

\*\*\*\* Westinghouse V-6235.

# TV RECEIVER

## Line-Voltage

### Control-Checker



Front view of the voltage checker.

**Novel Instrument Provides Means of Determining and Correcting Line Voltage Variations Which Cause Picture Flicker.**

by **CARL S. CUMMINGS**

Television Service Supervisor  
Goodman's, Inc., Jersey City, N. J.



Rear view showing the line-cord connections.

ONE OF the most annoying problems in TV servicing is picture flicker. The most prominent causes are external to the TV receiver, and have been traced to either an improper antenna position or line voltage fluctuation.

The line voltage is the most frequent offender and therefore merits first consideration. When the voltage is extremely variable or low, a poor picture and picture flicker are sure to result.

In analyzing the trouble, it was felt that a means of checking the voltage and then controlling it, should provide a solution. As a result of this study, a unit providing such detection and control possibilities was evolved.

Our first construction problem was in the selection of an *ac* voltmeter. It was found that most of the *ac* volt-

meters incorporated in popular testing equipment were highly damped and very slow in reacting to voltage fluctuations, and unless the change was considerable, would fail to respond at all.

An *ac* voltmeter that was only slightly damped was therefore selected. It was found to respond immediately and report the line voltage condition accurately.

In designing the unit it was decided to include another feature, a breakdown test circuit. With the aid of a *variac* the line voltage can be increased to 130, thus exerting additional stress on all the components in the receiver, which prompts weak or faulty parts to break down and therefore show up as defective.

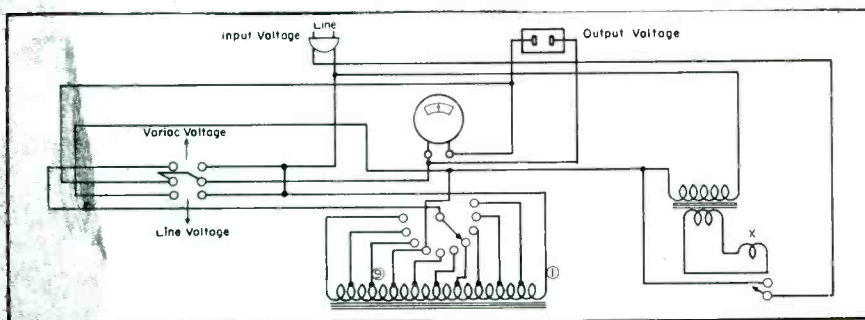
For voltage variation, we included a selector switch on the panel permitting control from 25 to 130 volts, all at 500 watts.

#### Operation

A toggle switch beneath the jewel on the lower right of the control panel was installed to turn the instrument on and off. When the switch is off,

(Continued on page 39)

Circuit diagram of the setup.





Philadelphia Inquirer

WFL-500-Post on Top

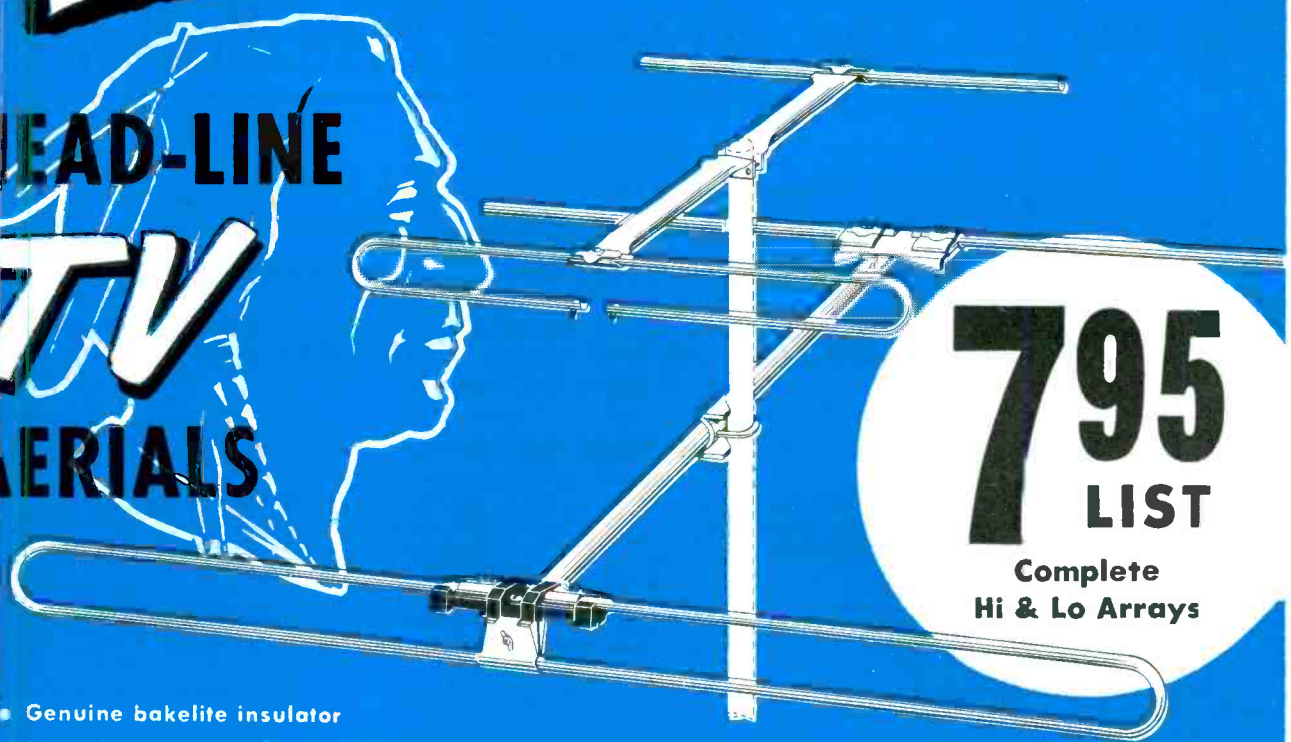
MORNING, SEPTEMBER 21, 1949  
at 200 by Triangle Publishing, Inc. Vol. 21, No. 87

# SNYDER MAKES "HEAD-LINES" WITH AMAZING LOW PRICE

"Insert and Tighten" Construction in Added Line

All those called to the...  
first two...

# HEAD-LINE TV AERIALS



# 795 LIST

Complete  
Hi & Lo Arrays

- Genuine bakelite insulator
- 1/2-inch aluminum elements
- Cadmium plated hardware
- Universal mast bracket

Quick and Easy Installation

*Insert and Tighten!*

**ATTENTION**  
Jobbers • Distributors  
Write for '50 catalog and  
protected territories plan.

# SNYDER MFG. CO.

ANTENN-GINEERS®  
PHILADELPHIA 40, PA., U. S. A.

Export: Roburn Agencies, Inc., N. Y.  
New York Area Distributor: H. L. Dalis, Inc.  
Phila. Area Distributor: Almo Radio Co.



# FIELD TESTED

Installation Information on

# TV and FM

RECEIVING ANTENNAS

## TV . . . FM Antenna Installation

by IRA KAMEN

Manager, Antenaplex and TV Dept., Commercial Radio Sound Corp.

and LEWIS WINNER

Editorial Director, Bryan Davis Pub. Co., Inc.; Editor, SERVICE and COMMUNICATIONS

The only practical book on the all-important item in TV and FM reception . . . based entirely on actual experiences in the most active TV and FM areas in the country. . . . Over 35,000 words of vital data with over 130 photos and drawings.

### TEN CHAPTERS COVERING:

*Installation Tools*  
*Antenna Installation Procedures*  
*Securing 12-Channel Coverage*  
*HF Antenna Installations*  
*TV Interference*

*Fringe Reception*  
*Master Antenna Systems*  
*FM Antennas*  
*Installation Business Practices*  
*Tricks of the Trade*

The first book in which you'll find complete design and installation information on every type of TV and FM receiving antenna. . . . Contains detailed illustration and subject index for rapid reference.

✓✓ "The best book on the market at this time dealing with the problem of television antennas and antenna installation . . . If more Service Men would read this book, it would help them considerably in making better installations and providing better television reception for their customers."—*M. J. Shapp, President, Jerrold Electronics Corp.*

✓✓ "Will recommend it to all the Service Men and technical people I meet."—*Charles Cahn, Field Service Engineer, Bendix Radio.*

✓✓ "Well organized and illustrated, very complete and up-to-date, carefully detailed. It will definitely improve the ability of the man who studies it and therefore is mighty useful to a firm like ours."—*Hamilton Hoge, President, United States Television Mfg. Corp.*

✓✓ "Will certainly fill a long-felt need for some practical information . . . sincerest congratulations."—*George P. Adair, Former Chief Engineer, FCC, and now Consultant in Washington, D. C.*

✓✓ "A thorough-going compendium of the installing art . . . Going to recommend it highly to our Service Control Department and our service organizations."—*Ernest A. Marx, General Manager, Television Receiver Sales Div. Allen B. DuMont Laboratories, Inc.*

✓✓ "Informative and extremely well written."—*R. Morris Pierce, Vice President in charge of Engineering, WJR, WGAR, KMPC.*

**BRYAN DAVIS PUBLISHING CO., INC., Book Dept.**  
**52 Vanderbilt Avenue, New York 17, N. Y.**

Send me a copy of TV . . . FM Antenna Installation, post-paid, for which I am enclosing \$2.00.

(Please print)

NAME .....

ADDRESS .....

CITY AND STATE .....

AT YOUR JOBBER  
 OR ORDER DIRECT



**Price \$2 Post Paid**



# TUBE News

by L. M. ALLEN

THE ACCENT ON TV receiver development and production, too, in many plants has prompted intense studies of tube-type improvements which might be provided for these receivers. The result of one such probe has led to the processing of a series of tubes for horizontal sweep circuits. These tubes,<sup>1</sup> the 1X2, 6BQ6GT, 6U4GT, 6W4GT, 25BQ6GT and 25W4GT, were designed for magnetically-deflected receivers, utilizing either a filament transformer or series-string heaters directly connected to the line.

The 6BQ6GT and 25BQ6GT, identical except for heater ratings, were produced specifically as deflection amplifiers using either direct-coupled, high-impedance deflection yokes or lower-impedance yokes with coupling transformers. With suitable components and circuits, the tubes have been found capable of oversweeping TV picture tubes up to and including the 16" size. Picture-tube anode voltage is provided by the auto-winding of the usual horizontal transformer. In the case of the direct-coupled, high impedance circuit, the voltage is supplied through a charging choke having a step-up winding.

The 1X2, a high-voltage rectifier, designed specifically for supplying anode voltage to the TV picture tube, has a T-6½ bulb and a 9-pin miniature base which is arranged to permit mounting of the filament dropping-resistor and high-voltage filter resistor on the unused socket connections.

Types 6W4GT and 25W4GT are high-perveance diodes designed specifically for use as damping tubes in

(Continued on page 37)

<sup>1</sup>Hytron.

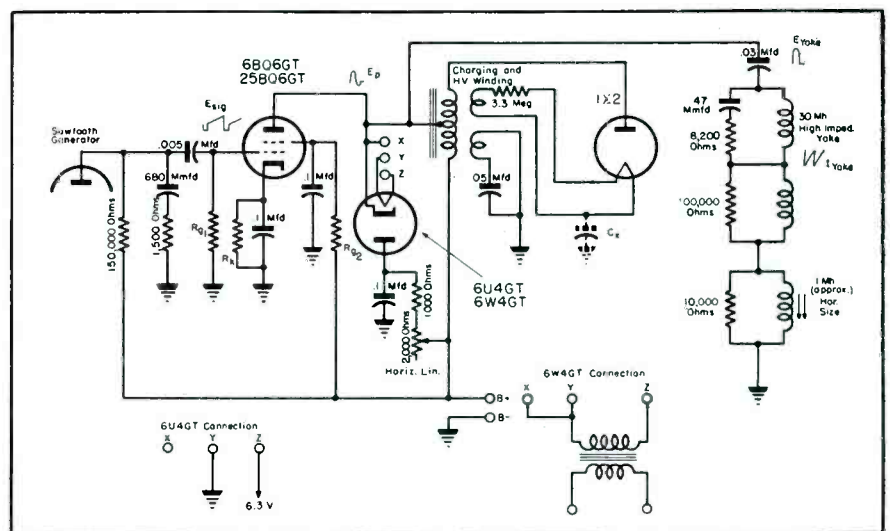
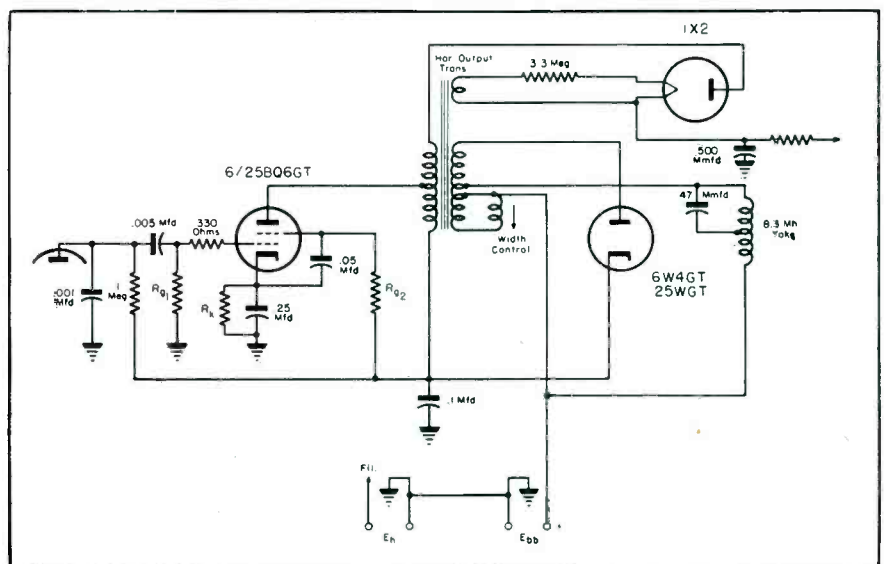


Fig. 1. Circuit for the 6BQ6GT/25BQ6GT direct-coupling system used in the Motorola chassis models TS14 and TS23. The control-grid resistance ( $R_{g1}$ ) is a .47-megohm unit. The cathode-bias resistor ( $R_k$ ) is a .47-ohm resistor, and the screen-dropping resistor ( $R_{g2}$ ) is a 10,000-ohm unit.  $C_s$  is equivalent to the capacity formed by the coating on the picture tube. The filament transformer is a low capacitance type.

Fig. 2. Circuit of a conventional horizontal-sweep system using a standard 8.3-mh yoke and coupling transformer. In this circuit both the damper diode-load resistor and the linearity control have been removed. The control-grid resistance for this system ( $R_{g1}$ ) has the same value as the resistance used in Fig. 1 or .47 megohm. However, the screen dropping resistor,  $R_{g2}$ , and the cathode-bias resistor,  $R_k$ , are different in value. The screen-dropping resistor value is dependent on the transformer used and can be 24,000, 16,000, or 67,000 ohms. Variations in the cathode-bias resistor ( $R_k$ ) are also predicated on the transformer employed and may be 100, 43, or 47 ohms.

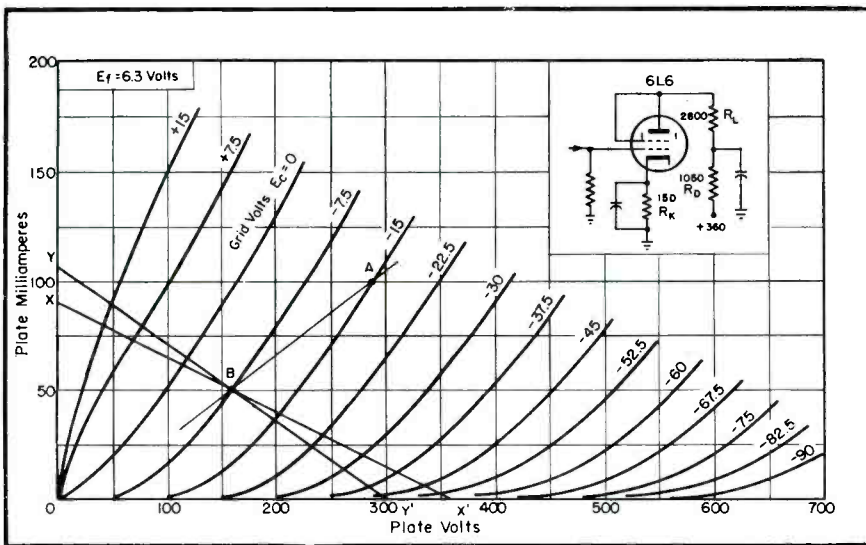


# Performance Diagnosis Of Vacuum-Tube Circuits

## Part II . . . Finding Gain and Grid Bias Values of 6L6 Amplifiers By Way of Characteristic Curves. Cathode-Follower Calculation Procedure.

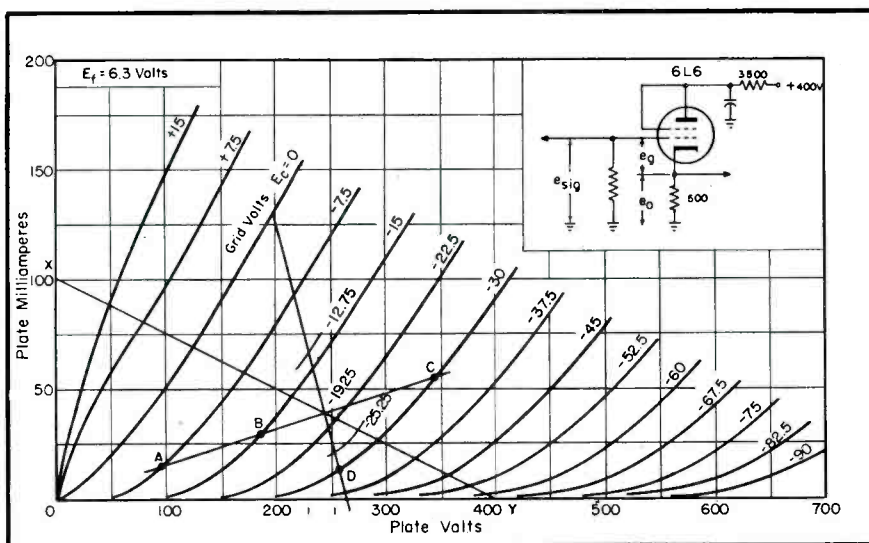
by **EDWARD M. NOLL**

*Instructor in Television  
Temple University*



Figs. 1 and 2. Basic circuit of a 6L6 amplifier and the curves for the tube when connected in triode fashion.

Figs. 3 and 4. Circuit of a 6L6 triode connected as a cathode follower and a plot of the curves for the cathode-follower load lines.



IN APPLYING tube plot curves to study circuit problems, it was pointed out last month that the curves could reveal such factors as power output, decoupling, plate loads, etc.

Let us now see how these plots can be used to find the gain and grid bias applied to a 6L6 amplifier; Fig. 1.

In the first step, we must find the total resistance of the three resistors which because of the presence of plate current, affect the plate voltage of the stage. This total is 4,000 ohms. Then we can draw a 4,000-ohm load line, with the supply voltage-zero plate current as one point.

Assuming that we have a plate-voltage change of 360 and 360/4000 locates another point of the load line at 90 ma on the plate current axis, the line  $XX'$  can be drawn.

Then we can draw the loci of possible bias points for a 150-ohm cathode resistor. To find two points on the line bias, values of -7.5 and 15 were selected for this example.

$$\text{Point A: } I_A = \frac{-E_c}{R_k} = \frac{15}{150} = 100 \text{ ma}$$

$$\text{Point B: } I_B = \frac{7.5}{150} = 50 \text{ ma}$$

Now a line is drawn through points  $A$  and  $B$ . Where this line crosses the plate line, we have the operating point or, at  $-E_c$  of 7.5 volts,  $E_p$  of 160 volts, and  $I_o$  of 50 ma. To check this point we have to multiply  $I_o R_k$  and obtain 7.5 volts. Another check is to subtract the supply voltage 360 from the sum of the resistor voltage drops,  $I_o (R_s \text{ plus } R_L \text{ plus } R_k)$  or

$$E_p = 360 - 50 \text{ ma} (1050 + 2800 + 150) = 360 - 200 = 160$$

The true dynamic load line can now be drawn with a slope of 2,800 ohms

(Continued on page 38)





*3 New Time-Saving, Profit-Building*  
**G-E TELEVISION SERVICE INSTRUMENTS**



**Now — with this new G-E equipment — you can check TV receivers under conditions varying from fringe areas to "under the tower" and predict operation of the sets anywhere in the service area — at a glance!**

**V**ARIABLE Permeability Sweep Generator! Crystal Controlled Marker Generator! Cathode Ray Oscilloscope! Put them all together in one group and you have what manufacturers and servicing dealers have acclaimed the fastest, most accurate answer to television receiver testing problems ever offered!

Here's why—

- Variable Permeability Sweep Generator can be set quickly to any desired frequency, supplying high output and exceptionally wide linear sweep—

- Because of low leakage, complete over-all response from antenna terminals to picture detector can be viewed with contrast at maximum settings.

- All desired markers for complete alignment are obtained by one initial setting of the master dial on the marker generator.

- High quality general purpose oscilloscope presents accurate picture of wide range of phenomena from response curves to composite signal.



**GET THE FACTS TODAY!**

General Electric Company—Room 1070  
 Electronics Park  
 Syracuse, New York

Send me specifications, pictures, and prices on the new G-E Television Test Equipment Package.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

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

SERVICE, DECEMBER, 1949 • 21

*You can put your confidence in—*

**GENERAL  ELECTRIC**

# TV Receiver Production Changes

## Discriminator Performance in the G. E. Horizontal Sweep Generator and AFC System. Changes for Vertical Hold Improvement in Westinghouse TV Models. Damping Tube Replacements.

by DONALD PHILLIPS

IN THE DISCUSSION<sup>1</sup> of the sweep generator and *afc* circuit used in the latest G. E. TV models, it was pointed out that the discriminator, consisting of tube sections, V<sub>22A</sub> and V<sub>22B</sub>, and allied components, is used to develop a *dc* correcting voltage by comparing the phase between the output sawtooth waveform and the incoming horizontal sync pulses.

In Fig. 2 appear discriminator waveforms which illustrate the action taking place. The polarity of the sawtooth wave on each diode is represented as the same, while the polarity of the sync pulses is inverted, with the polarity of the pulse on V<sub>22A</sub> being positive and that on V<sub>22B</sub> negative. The *dc* voltage represented by E<sub>D1</sub> and E<sub>D2</sub> is thus equal to the difference between the *ac* axis (dotted line) of the composite waveform and the peak of the sync pulses. Stable operation of the discriminator is obtained as long as the sync pulse rides on the steep slope of the sawtooth waveshape.

In A, it has been assumed that the sweep generator is operating at exactly

the same phase as the incoming sync pulses. This condition requires that no voltage be derived from the discriminator so that the sweep generator will continue to operate at this same frequency. This condition will only be fulfilled when the sync pulse falls on the steep slope of the sawtooth waveshape at the *ac* axis crossover, for each succeeding cycle as indicated. At this condition, E<sub>D1</sub> will be equal to E<sub>D2</sub>, and from Fig. 1, since E<sub>D1</sub> + E<sub>D2</sub> is equal to the *dc* output voltage and E<sub>D1</sub> has opposite polarity to E<sub>D2</sub>, then the resulting correction voltage applied to the reactance *afc* tube will be zero.

A condition which calls for a correction voltage appears when the sync pulse frequency is higher than the sweep generator frequency. This is exemplified by the pulse-sawtooth relationship where the sweep generator is lagging in phase, as shown in B.

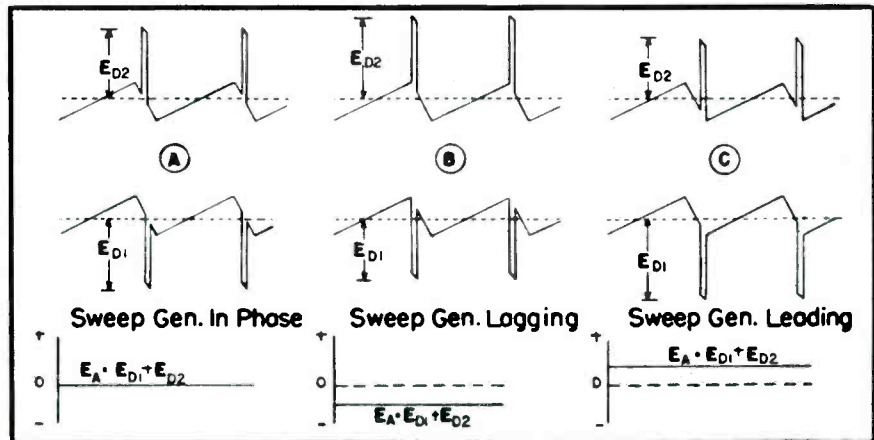
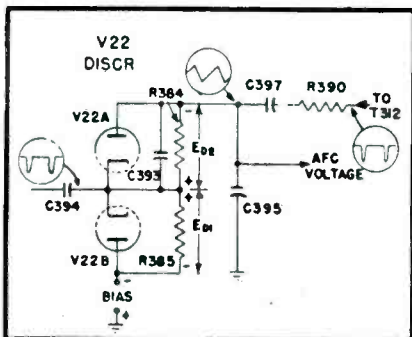
With the sync pulse positioning itself on the steep retrace slope of the sawtooth waveshape so that it falls above the *ac* axis, the composite sync pulse and sawtooth waveshapes cause E<sub>D2</sub> to be greater in amplitude than that of E<sub>D1</sub>, resulting in E<sub>D1</sub> + E<sub>D2</sub>, providing a negative polarity correction voltage. This negative voltage, applied to the grid of the sine-wave tube, will cause the sweep generator to operate at higher frequency than in A. This higher frequency thus maintains this new phase relation with time, resulting in an identical frequency for the sweep generator and incoming sync pulses. In other words, the correcting voltage formed by the sync pulses having a higher frequency than the 15,750 cps frequency of the sawtooth generator, causes the generator to run at a new frequency (higher), which corresponds to that of the sync pulses.

The opposite condition of B, which calls for a correcting voltage also, is when the sync pulse frequency is lower than the sweep generator mean frequency of 15,750 cps. This is the condition shown in C, where the sweep generator is leading in phase. In this case, the pulse positions itself below the *ac* axis of the sawtooth waveshape, with the result that E<sub>D2</sub> will be smaller in magnitude than E<sub>D1</sub>. Thus, when E<sub>D2</sub> is added to E<sub>D1</sub>, we have a resultant positive polarity voltage which

(Continued on page 29)

Fig. 2. Discriminator wave forms. These plots illustrate the addition of the sync and sawtooth waveshapes when they are at different phase relations to each other and the resulting *dc* voltage derivation.

Fig. 1. Discriminator circuit.





# Servicing Helps

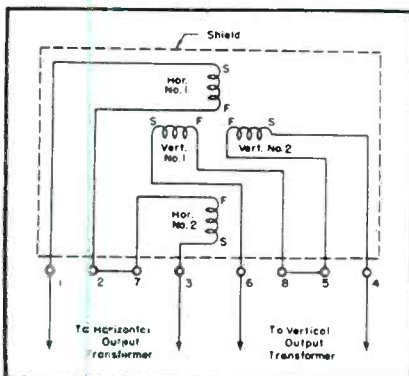
THERE ARE a variety of unusual components in every TV receiver, particularly in the picture-tube circuit. There is, for instance, the magnetic deflecting yoke, processed for the specific size picture tubes. One model<sup>1</sup> has been designed for use with picture tubes having neck diameters of  $1\frac{1}{8}$ " and deflection angles up to about 60°. Designed for use with the 10BP4 and 12LP4, it has a molded spool and a molded-iron core. The start and finish of each of four coils are brought out to terminals, as shown in Fig. 1. This yoke will be found installed with its capped end toward the base of the picture tube.

## Horizontal-Deflection-Output and High-Voltage Transformer

Another extremely interesting and vital picture-tube component is the horizontal-deflection-output and high-voltage transformer<sup>2</sup> designed for use in pulse-operated power supplies with no-load picture-tube anode potentials up to 12 kv. This unit can provide full deflection for either a 10BP4 or a 12LP4 with a single driver tube (such as a 6AU5GT) and requires about 15 watts in a typical deflection circuit for a 10BP4, as shown in Fig. 2. To assure quiet operation a powdered-iron core is used. The windings are impregnated with a moisture-resistant compound which does not support combustion. Leads and filament windings are insulated with polyethylene plus polyvinyl chloride compound to minimize fire hazard.

Autotransformer action of the unit provides high voltage to two 1V2 rec-

Magnetic deflecting yoke circuit.



## Application Notes on Deflecting Yokes and Horizontal-Deflection Output and High-Voltage Transformers. How to Make External Antenna Connections to BC Loops.

by M. A. MARWELL

tifiers connected in a voltage-doubling circuit. Two windings provide filament power to these tubes. On the transformer is a terminal board with two sockets for mounting the high-voltage 1V2s. In addition, the transformer has holes for mounting three high-voltage capacitors on the terminal board, and terminals are also provided for connecting a width<sup>3</sup> and a linearity control.<sup>4</sup>

### BC External Antennas\*

THE NEED for the use of an external antenna for the broadcast band is so infrequent that this provision is omitted on most receivers.

However, there are occasions when an external antenna is necessary.

Two methods have been found quite effective for such applications. The first involves winding of primary turns around the present loop.

One or two turns of wire such as No. 18 insulated bell wire are wound around the loop antenna along the outer surface, near the outside turn, to provide a suitable means for coupling from an outside antenna. One end of this two-turn loop antenna should be connected to the outside antenna while the opposite of starting end should be connected to the receiver chassis or ground. Additional turns will generally not show too much improvement over the use of two turns and in addition may require retuning the antenna circuit by adjustment of the trimmer capacitor. When using this method the loop antenna is still effec-

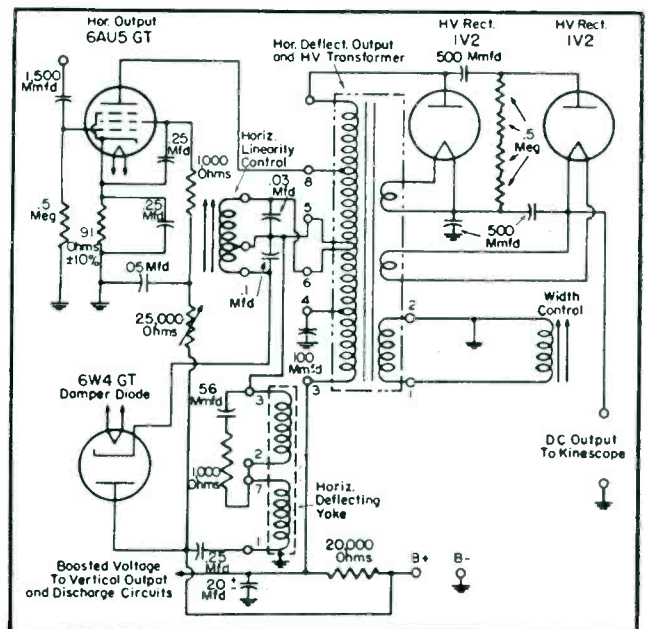
<sup>1</sup>RCA-205 D1.

<sup>2</sup>RCA 217T1. <sup>3</sup>RCA 206R1. <sup>4</sup>RCA 207R1.

\*From RCA service notes.

(Continued on page 36)

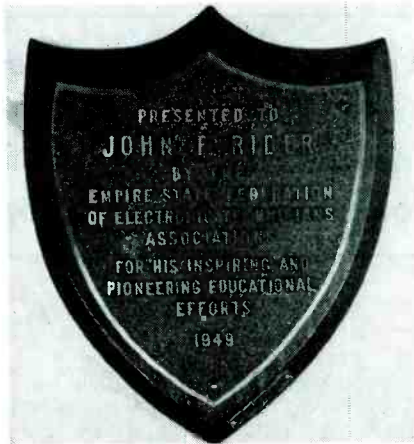
Horizontal deflection circuit and pulse-operated high-voltage supply for the 10BP4 and 12LP4. Leads from terminals 8 and 10 must be dressed away from each other, the chassis, and other wiring. In equipment where it is impractical to maintain this lead dress, the temperature at point of lead contact must never be more than 80° C for any condition of operation.



# ASSOCIATIONS



David Leibowitz, son of Max Leibowitz, ARTSNY prexy, presenting the ESFETA plaque (right) to John F. Rider during a banquet held at Locust Lawn, Ionia, New York.



At a recent ARTSNY TV lecture, at the Central Commercial High School in New York City, which featured a talk by John Meagher of RCA. Left to right: Arthur Silverberg, association recording secretary; Gerard Nierenberg of the association's legal staff; Hal Bersche, RCA; Max Liebowitz, ARTSNY prexy, and John Meagher.

## ESFETA

JOHN F. RIDER received an award recently, for his efforts on behalf of radio-TV Service Men of the country, from the Empire State Federation of Electronic Technicians' Associations at a banquet of the Radio Technicians' Guild of Rochester, New York, at Locust Lawn, Ionia, New York.

Rider was instrumental in inaugurating the current ESFETA lecture series.

## FRSAP

PAUL W. SMITH, program chairman of a speakers' schedule for 1950 for the Federation of Radio Servicemen's Associations of Pennsylvania, has reported that manufacturers are now being contacted requesting speakers on topics of interest to all Service Men.

Smith suggests that any manufacturer who would like to be represented on the program should write him at 306 Chestnut Street, Harrisburg, Pa.

## RTG

AT THE ANNUAL MEETING of the Whaling City chapter (New Bedford, Mass.) of the Radio Technicians' Guild of New England, John Tavares was named president.

Al Gagnon was elected vice president; J. L. Shepley, secretary; J. Sumner, treasurer; Louis Senra, sergeant-at-arms and Frank Cambra, librarian.

Six were named to the board of directors; Ted Gurgan; M. F. Correia;

W. England; A. Roy; W. G. Sousa and J. Santos.

## ART of BC

THE ASSOCIATED RADIO TECHNICIANS of the Vancouver chapter held a convention recently at the Stanley Park Pavilion, which featured several lectures by outstanding Canadian authorities.

Miles Green, assistant radio engineer of the B. C. Laboratories Co., Ltd., provided a report on the telephony, FM, and microwave technique practices in British Columbia. Don Hinges of Electronic Laboratories of

## TEN YEARS AGO

From the Association News Page of SERVICE, December, 1939

JOHN F. RIDER appeared at the Los Angeles chapter and presented one of his cross-country series of service lectures sponsored by RCA. . . . RSA announced chapters in Amsterdam, New York; Marinette, Wisconsin; and Minneapolis, Minnesota. . . . PRSMA announced that their weekly classes on television were an outstanding success. Frequency modulation and facsimile were subjects of special talks during the month. . . . NAB-RSA program was in full swing, NAB member stations carrying a consistent schedule of spot announcements advising listeners to improve their listening by keeping their receivers repaired.

Canada, presented a talk on the general television conditions in Vancouver and TV receiver design characteristics.

Nick Foster of the Edison Vocational Schools of Seattle, presented a spirited talk on TV installation and servicing.

## PRSMA

TELEVISION has received special consideration in a revised edition of the constitution and by-laws of the Philadelphia Radio Service Men's Association. In two amendments, two classes of members have been established: television electronic technician and television installation specialist.

In an amendment of the by-laws, covering the requirements of eligibility for these classifications, the passing of special examinations are described as a requisite.

## ARTSNY

THE TV LECTURES recently initiated by the Associated Radio-Television Servicemen of New York have become extremely popular and attracted large audiences.

Members of Westinghouse and Emerson appeared to discuss video *if* and sound circuits, respectively. At subsequent meetings, representatives of RCA and Allen B. DuMont covered detector and video amplifiers, and picture tubes.

All lectures, which are incidentally presented in cooperation with the Empire State Federation of Electronics Technicians' Associations, are well illustrated and, in most instances, accompanied by demonstrations.



# Television Arithmetic

*\$200 Television Set + \$5 Antenna = \$5 Picture*

*\$200 Television Set + \$25 Antenna = \$225 Picture*

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

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

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

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

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

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



**THE RADIART CORPORATION • CLEVELAND 2, OHIO**

*Reprints of this advertisement  
available upon request.*

JANUARY-DECEMBER, 1949

ANTENNAS

Antenna Installation Tricks of the Trade. Feb.  
 TV; *Ira Kamen*.  
 Antenna Installation Hints, TV. Apr.  
 Antennas, TV (*Editorial*). May  
 Coax Fitting Problems. Oct.  
 Coax Line Installation Practices; *Ira Kamen*. Sept.  
 Coax Line Installation Practices (*Part II*); *Ira Kamen*. Oct.  
 Construction of Attenuation Pads for 72-300-Ohm Lines. Feb.  
 End Termination Problems at 200 Mc. Sept.  
 Fringe Area Reception, Aligning the TV Receiver for; *J. F. Bigelow*. Apr.  
 Jumper Link Assemblies for Folded Dipoles and Broadband Straight Dipoles. Feb.  
 Practical Hints on Installation of Auto Antennas. May  
 Rhombic TV Antenna Installation; *Ira Kamen*. Aug.  
 Shielded-Line Variables. Oct.  
 Splicing Techniques for Coax. Sept.  
 The Tap-On Splice Technique. Oct.  
 The Philco Built-In TV Antenna System. Sept.  
 Those TV Antennas (*Editorial*). Feb.  
 TV Antenna Divider and Decoupling Networks. Feb.  
 TV Antenna Tower Installations; *Ira Kamen*. July  
 TV Tunable Built-In Antenna System. Sept.

AUTO RECEIVERS

Auto Power Supply Testing With a 'Scope. May  
 Auto Radio Antennas. May  
 Auto Radio Custom Designs. May  
 Auto Radio Extension Speaker Installation. May  
 Auto Radio Installation; *Lewis Martin*. May  
 Auto Radio Service Aids; *P. M. Randolph*. Sept.  
 Auto Radio Servicing; *Jack Darr*. May  
 Auto Radio Speaker Installation. May  
 Auto Voltage Testing. May  
 Basic Cures for Dead Receivers. Sept.  
 Eliminating Noise Originating in Ignition of Generator and Wheels. May  
 Eliminating Noise Rattles, Pickup Noise and Wheel Static. Sept.  
 How to Build and Apply Special Types of Auto Test Accessories. May  
 Improving Control Shaft Fittings. Sept.  
 Remedying Pushbutton Sticking. Sept.  
 Taxicab Radio (*Editorial*). Jan.  
 Testing Car Sets on the Bench. May  
 Underdash and Firewall Mount Data. May

CIRCUITS

Admiral 119-1 TV Filter Circuit. Aug.  
 Admiral 21A1 TV and 4K1 FM and AM Tuner. Nov.  
 Admiral 3-Way Player. May  
 Amplifier Which Can Be Adapted to TV Receivers to Improve Fidelity. June  
 Approved Electronic A-400 (*Cover*). Sept.  
 Anchor ARC-101-50 (*Cover*). May  
 Audio Demonstration Board. May  
 Audio Peak Limiter Circuit. June  
 Ballast Tube in a Circuit Using Too Large a Current. Apr.  
 Bendix 1524, 1525 With Hush-O-Matic System. Aug.  
 Bendix 235 (TV). Jan.  
 Bendix 2,000-3,000 Series. Oct.  
 Bendix TV Receiver IF Alignment Setup. Mar.  
 Browning RV-10 (FM Tuner). Jan.  
 Capacitor Checker. Apr.  
 Circuit With a Ballast Where the Current Is Too Small. Apr.  
 Coax Line Parallel Setups. Feb.  
 Coax Switch Attenuation Control System. Feb.  
 Connection of Ballast Tube in AC or DC Circuits. Apr.  
 ECA FM/TV Signal Generator. Mar.  
 DuMont RA 105. Aug.  
 DuMont RA 105 Power Supply. Sept.  
 DuMont RA 105 TV Receiver. Sept.  
 Espy 513 (FM/AM Tuner and AF Amplifier; *Cover*). Feb.  
 Flexible TV Signal Level Pads. Feb.  
 FM IF Limiter and Discriminator Stages. Mar.  
 G. E. SPX-001 (*Preamp. Equalizer*). Jan.  
 G. E. Table Model Clock Mechanism. Oct.  
 G. E. 12" TV Models. Dec.  
 G. E. Variable Reluctance Phono Preamp. June  
 Hallicrafters T-61/T-67 (*Push-Button TV Model*). Jan.

Hallicrafters T64, 50, 510 (*Circle-Standard Screen TV*). July  
 High Fidelity TV Amplifier. Aug.  
 Horizontal-Deflection and Pulse-Operated TV Supply for 10BP4 and 12 LP4. Dec.  
 Horizontal Sweep Circuit. Dec.  
 How to Connect a Ballast Tube in Circuit Using Transformer. Apr.  
 Inverse Feedback Circuit in a Single-Ended Amplifier. June  
 I.F. Compensation Circuit. Feb.  
 Magnavox TV Horizontal AFC System. Feb.  
 Magnetic Deflecting Yoke Circuit. Dec.  
 Mallory Converter Circuits (*Inductance Tuning*). Jan.  
 Meissner 8C (FM Tuner). Jan.  
 NC-TV-7/NC-TV-7M (*Cover; Complete Circuit*). Jan.  
 National TVB-1 Booster (*Cover*). Aug.  
 National Videometer (*Cover*). Dec.  
 Olympic RTU-3 (TV Duplicator). Jan.  
 Otarian Hearing-Aid Analyzer (*Cover*). June  
 Philco Built-in TV Antenna System. Sept.  
 Philco 41-609 LP Adapter Switch Kit. Mar.  
 Philco 48-700 Width Control. Nov.  
 Philco 48-1001 TV. Mar.  
 Philco 48-1000 Width Control. Nov.  
 Philco 49-1040 Width Control. Nov.  
 Philco 50-T1630 (*Inpnt*). Sept.  
 Picture-Tube Conversion Circuit. Sept.  
 Pilotuner (*Capacity-Tuned FM Unit*). Jan.  
 RCA 8T270, 8TC270, 8TC271 (16" Metal Picture-Tube Receiver). July  
 RCA 8V112 Magic Monitor Circuit. Aug.  
 RCA 9EY3 45-RPM Amplifier. June  
 Rock-Ola Crystal Pickup Adapter Circuit. June  
 Rock-Ola Input Circuit. June  
 Rock-Ola Quick-Heater Relay System. June  
 'Scope Using 3RP1. Sept.  
 Selenium Cell Doubler Circuits. Nov.  
 Selenium Forward Voltage Drop Test Circuit. Nov.  
 Selenium Rectifier Half-Wave Circuits. Nov.  
 Selenium Reverse Testing Circuits. Nov.  
 6BQ6GT/25BQ6GT Sweep Circuit. Dec.  
 Sola Constant-Voltage Transformer Circuit. June  
 Sparton AVC1/AVC2 (*Cover*). Mar.  
 Sparton 4939TV/4940TV/4941TV. Feb.  
 Speaker Transformer Primary Measurement System. June  
 Supreme 665 (*Cover*). Oct.  
 Supreme 665 (*Dot Signal Channel Circuit*). Oct.  
 Supreme 665 (*Timer Section*). Oct.  
 Supreme 660 TV 'Scope. Apr.  
 72-ohm Coax Line Pads. Feb.  
 TV Alignment Bias Box System. Oct.  
 TV Antenna Insertion Circuits. Sept.  
 Tech-Master BC-1223 (*Cover*). Nov.  
 300-ohm Selector Switch System. Feb.  
 TV Divider and Decoupling Networks. Feb.  
 TV Receiver Line-Voltage Control-Checker; *Carl S. Cummings*. Dec.  
 UHF Antenna Installation Layout. Oct.  
 Videola VS 160, 165. Sept.  
 Vision Research Model 20-20 (*Cover*). Apr.  
 Voltage-Doubler Picture-Tube Conversion Circuit. Sept.  
 Westinghouse II-196. Oct.  
 Westinghouse H196 TV Sound Circuit. Aug.  
 Westinghouse H196 Sweep Circuit. Aug.  
 Westinghouse H196 TV Receiver. Apr.  
 Westinghouse 223, 242, 251, 231 and 226 (*Circuit to Eliminate Blooming*). Oct.  
 Westinghouse 242 (*Improved Horizontal Multivibrator Circuit*). Oct.  
 Westinghouse 242 (*Improved Vertical Multivibrator Circuit*). Oct.  
 Zenith 28F20, 28F21 and 28F22 (*Circular Screen TV*). Mar.

COVER DIAGRAMS

Anchor ARC 101-50 (1-Tube TV Pre-amp.). May  
 Approved Electronic A-400 (TV and FM Sweep Signal Generator). Oct.  
 Espy 513 (AM/FM Tuner and AF Amplifier). Feb.  
 Hallicrafters T64, 509, 510 (*Circle-Standard Screen TV*). July  
 National TVB-1 (Two-Tube Booster). Aug.  
 National Videometer (Signal Strength TV Test Set). Dec.  
 NC-TV-7/NC-TV-7M (Rotary Switch "TV"). Jan.  
 Otarian Hearing Aid Analyzer. June  
 Supreme 665 (*Composite Video Signal Generator*). Oct.  
 Stewart Warner, AVC1 and AVC2 (Reflector System TV Model). Mar.  
 Tech-Master BC-1223 (Keyed AGC TV Model). Nov.  
 Vision Research 20-20 (20-Tube 12 1/2" TV Model). Apr.

EDITORIALS

AM and TV Circuitry. Oct.  
 A Report on Sound. June  
 Broadcaster and the Service Man. May  
 Broadcasters and Service Men. July  
 Choice of UHF IF. Nov.  
 Compensation for Your Knowledge. Feb.  
 Just What the Doctor Ordered. June  
 Long-Playing Records. Jan.  
 Loudspeakers. Mar.  
 Preventive Maintenance. July  
 Preventive Maintenance. Aug.  
 Preventive Maintenance Campaign, The Harrisburg. Apr.  
 Preventive Maintenance Control. Oct.  
 Preventive Maintenance Now a Headliner. Oct.  
 Production Changes. Jan.  
 Selling Your Service. Mar.  
 Taxicab Radio. Jan.  
 Telephone, Mail and the Doorbell. July  
 The Eyes and TV. Sept.  
 The TV Surge. Mar.  
 The TV Swing. Sept.  
 The Ultrahighs. Aug.  
 TV Antennas. May  
 TV Demonstration Boards. Mar.  
 TV, FM and Sound. Jan.  
 TV in '49. Feb.  
 TV Safety Rules. June  
 The TV Service Operation. Aug.  
 TV Servicing. Apr.  
 TV Servicing. May  
 TV Servicing Pitfalls. Nov.  
 UHF Design Study. Nov.  
 Ultrahighs and the Service Man. Nov.  
 Viewing Distances. Mar.

FEATURES

Alignment of FM Receivers; *R. D. Hickok and W. A. Weiss*. Mar.  
 Aligning the TV Receiver for Fringe Area Reception; *J. F. Bigelow*. Apr.  
 Aligning the Westinghouse H-196; *Irving Silberg*. Oct.  
 AM/FM Tuner and AF Amplifier (*Cover*). Feb.  
 Annual Index, SERVICE, 1949. Dec.  
 Association News. Jan.  
 Association News. Feb.  
 Association News. Mar.  
 Association News. Apr.  
 Association News. May  
 Association News. June  
 Association News. July  
 Association News. Aug.  
 Association News. Sept.  
 Association News. Oct.  
 Association News. Nov.  
 Association News. Dec.  
 Auto Radio Installations; *Lewis Martin*. May  
 Auto Radio Service Aids; *P. M. Randolph*. Sept.  
 Auto Radio Servicing; *Jack Darr*. May  
 Capacitor Checker Design and Application; *P. M. Randolph*. Apr.  
 Coax Line Installation Practices; *Ira Kamen*. Sept.  
 Coax Line Installation Practices (*Part II*); *Ira Kamen*. Oct.  
 Coin-Operated Automatic Phono Servicing; *Jack Darr*. June  
 Composite Video Signal Generator; *Allan Lytel*. Oct.  
 Constant Voltage Sources for TV Receivers; *Hans U. Hjermstad*. June  
 Custom Audio Installations; *Irving Greene*. May  
 Custom Audio Installations; *Irving Greene*. June  
 Custom-Built Cabinets; *Martin W. Elliott*. Feb.  
 Custom TV Installations. July  
 Design, Application and Servicing of Selenium Rectifiers; *Irwin Wolf*. Nov.  
 Design and Construction of a Custom Cabinet; *Clifford Stubbs*. June  
 FM Tuner Design; *John B. Ledbetter*. Jan.  
 Hearing-Aid Servicing; *Clifford W. Carlson*. June  
 Horizontal AFC System in Magnavox TV Receivers; *J. F. Bigelow*. Feb.  
 1-Tube TV Preamp. (*Cover*). May  
 Performance Diagnosis of Vacuum-Tube Circuits; *Edward M. Noll*. Nov.  
 Performance Diagnosis of Vacuum Tube Circuits; *Edward M. Noll*. Dec.  
 Phono Installation and Service; *Kenneth Stewart*. May  
 Phono Installation and Service; *Kenneth Stewart*. June  
 Phono Installation and Service; *Kenneth Stewart*. July  
 Phono Installation and Service; *Kenneth Stewart*. Aug.  
 Phono Installation and Service; *Kenneth Stewart*. Sept.



Phone Installation and Service; <i>Kenneth Stewart</i> .....	Oct.
Phone Installation and Service; <i>Kenneth Stewart</i> .....	Nov.
Phone Installation and Service; <i>Kenneth Stewart</i> .....	Dec.
Reflector System TV Model (Cover).....	Mar.
Rhombic TV Antenna Installation; <i>Ira Kamen</i> .....	Aug.
Rotary Switch 7" TV Model (Cover).....	Jan.
Ser-Cuits.....	Jan.
Ser-Cuits.....	Feb.
Ser-Cuits.....	Mar.
Ser-Cuits.....	Apr.
Ser-Cuits.....	May
Ser-Cuits.....	July
Ser-Cuits.....	Sept.
Ser-Cuits.....	Oct.
Ser-Cuits.....	Nov.
Ser-Cuits.....	Dec.
Servicing 45-RPM Changers; <i>Thomas Y. Flythe</i> .....	June
Servicing Helps; <i>P. M. Randolph</i> .....	Jan.
Servicing Helps; <i>P. M. Randolph</i> .....	Feb.
Servicing Helps; <i>P. M. Randolph</i> .....	Mar.
Servicing Helps; <i>P. M. Randolph</i> .....	Apr.
Servicing Helps; <i>M. A. Marwell</i> .....	Sept.
Servicing Helps; <i>M. A. Marwell</i> .....	Oct.
Servicing Helps; <i>M. A. Marwell</i> .....	Nov.
Servicing Helps; <i>M. A. Marwell</i> .....	Dec.
Signal Strength TV Test Set (Cover).....	Dec.
Solder and The Service Man; <i>Franklin S. Hoffman</i> .....	May
Sound Installation Servicing Helps; <i>Ira Kamen</i> .....	June
Stepping Up Your TV Service Income; <i>R. J. Guilfoyle</i> .....	May
Stepping Up Your TV Service Income; <i>R. J. Guilfoyle</i> .....	June
Sweep Generator Operating Hints; <i>Victor I. Robinson</i> .....	Sept.
Ten Years Ago in Associations.....	Jan.
Ten Years Ago in Associations.....	Feb.
Ten Years Ago in Associations.....	Mar.
Ten Years Ago in Associations.....	Apr.
Ten Years Ago in Associations.....	May
Ten Years Ago in Associations.....	June
Ten Years Ago in Associations.....	July
Ten Years Ago in Associations.....	Sept.
Ten Years Ago in Associations.....	Oct.
Ten Years Ago in Associations.....	Nov.
Ten Years Ago in Associations.....	Dec.
The Business Aspects of TV Installations; <i>Ira Kamen</i> .....	Jan.
The Harrisburg Preventive Maintenance Campaign.....	Apr.
The Philco Built-In TV Antenna System.....	Sept.
Those TV Controls and Adjustments; <i>Alan Lytel</i> .....	Mar.
Tube News; <i>L. E. Stewart</i> .....	Apr.
Tube News; <i>L. M. Allen</i> .....	Sept.
Tube News; <i>L. M. Allen</i> .....	Dec.
TV Antenna Installation Tricks of the Trade; <i>Ira Kamen</i> .....	Feb.
TV Antenna Tower Installations; <i>Ira Kamen</i> .....	July
TV and FM Sweep Signal Generator (Cover).....	Sept.
TV Hi-Fi Audio Installations; <i>Irving Greene</i> .....	Aug.
TV Model With Keyed AGC System; <i>Walter H. Buchsbaum</i> .....	Nov.
TV Picture Tube Safety Rules.....	July
TV Receiver Line Voltage Control-Checker; <i>Carl S. Cummings</i> .....	Dec.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Jan.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Mar.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Apr.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Aug.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Oct.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Nov.
TV Receiver Production Changes; <i>Donald Phillips</i> .....	Dec.
TV Receiver Servicing; <i>Carl Quirk</i> .....	Aug.
TV Receiver Servicing; <i>Carl Quirk</i> .....	Sept.
TV Receiver Visual Alignment Techniques; <i>Lester L. Libby</i> .....	Jan.
TV Receiver Visual Alignment Techniques; <i>Lester L. Libby</i> .....	Mar.
TV Receiver Visual Alignment Techniques; <i>Lester L. Libby</i> .....	Apr.
20-Tube 12½" TV Model (Cover); <i>Walter H. Buchsbaum</i> .....	Apr.
Two-Tube TV Boster (Cover).....	Aug.
Viewing Areas of TV Receivers; <i>Robert P. Wakeman</i> .....	Feb.
Visual TV Alignment Procedures; <i>Victor I. Robinson</i> .....	July
Visual TV Alignment Procedures; <i>Victor I. Robinson</i> .....	Aug.

**FM**

Admiral Receiver With FM/AM Tuner.....	Dec.
ECA FM/TV Signal Generator.....	Mar.
Espey 513 AM/FM Tuner and Amplifier (Cover).....	Feb.

FM Receivers, Alignment of; <i>R. D. Hickok and W. A. Weiss</i> .....	Mar.
FM and Sound, TV (Editorial).....	Jan.
FM Tuner Design; <i>John Ledbetter</i> .....	Jan.
'Scope and FM Signal Generator Limiter and Discriminator Stages and Ratio Detector Alignment.....	Mar.
TV and FM Sweep Signal Generator (Cover).....	Sept.
Tuner Design, FM; <i>John B. Ledbetter</i> .....	Jan.

**MANAGEMENT**

Broadcasters and Service Men (Editorial).....	July
Just What the Doctor Ordered (Editorial).....	June
Preventive Maintenance (Editorial).....	July
Preventive Maintenance (Editorial).....	Aug.
Preventive Maintenance Control (Editorial).....	Sept.
Preventive Maintenance Now a Headliner (Editorial).....	Oct.
Selling Your Service (Editorial).....	Mar.
Stepping Up Your TV Service Income; <i>R. J. Guilfoyle</i> .....	May
Stepping Up Your TV Service Income; <i>R. J. Guilfoyle</i> .....	June
The Broadcaster and The Service Man (Editorial).....	May
The Business Aspects of TV Installations; <i>Ira Kamen</i> .....	Jan.
The Harrisburg Preventive Maintenance Campaign (Editorial).....	Apr.
The TV Service Operation (Editorial).....	Aug.
Telephone, Mail and the Doorbell (Editorial).....	July
TV Servicing (Editorial).....	May

**PRODUCTION CHANGES**

Adding AFC to Motorola VT71.....	Jan.
Addition of Bias to Converter Grid of G. E. 810, 811 and 814.....	Apr.
Addition of Power Transformer Fuse to Admiral TV Sets.....	Oct.
Admiral 19A1 Revised Horizontal Sync Filter System.....	Aug.
Admiral 30A, B, C and D Audio Output Change to Increase Gain.....	Aug.
Alternate Audio IF Transformer for Admiral 30A1.....	Mar.
Bendix 235 Changes (Codes D and E).....	Jan.
Changes for Vertical Hold Improvement in Westinghouse Models.....	Dec.
Damping Tube Replacements.....	Dec.
Discriminator Performance in the G.E. Horizontal Sweep Generator and AGC System.....	Dec.
Eliminating AF IF Regeneration in G. E. 810, 814, 820, 830 and 835.....	Apr.
Eliminating Blooming in Westinghouse TV Sets.....	Oct.
Eliminating Vertical Bars and Horizontal Line Humps in Westinghouse TV Models.....	Oct.
Horizontal Sweep Generator and AFC Circuit for G. E. Receivers.....	Nov.
Improving Audio IF Selectivity and Brightness Control and Removing Howl in G. E. 810.....	Jan.
Improving Tube Focusing in G. E. 901 and 910.....	Mar.
Improvement of Picture Definition in Westinghouse TV Models.....	Oct.
Installation of AGC and Improved Horizontal Oscillator in Admiral Receivers.....	Oct.
New String Tuning Drive for G. E. 810.....	Jan.
Picture Tube Interchange in G. E. 801, 802, 803.....	Mar.
Picture Tube Mask Change in G. E. 801 and 802.....	Mar.
Removing Microphonics in Admiral 30A1.....	Mar.
Removing Raster Wiggle in G. E. 814.....	Apr.
Removal of Vertical Retrace Lines in G. E. 810, 811, 814.....	Apr.
Substituting 6AU6s for 6AG5s in Admiral 30A1.....	Jan.
Transmission Line Wave Traps.....	Apr.
Westinghouse H196 Audio Circuit Revision for Removal of Hum.....	Aug.
Westinghouse H196 Altered Sweep Circuit.....	Aug.
Westinghouse H196 Horizontal Oscillator Modification to Curb Drift.....	Aug.
Westinghouse H196 Revamped Sound Circuit.....	Aug.
Westinghouse H196, H207 and H217 Revised Picture Circuit to Eliminate Picture Foldover.....	Aug.
Westinghouse H196 Sync System Change.....	Aug.
Westinghouse Receiver Vertical Hold Improvement.....	Dec.

**SERVICING HELPS**

Adjusting RF Transformers in G. E. TV Sets.....	Sept.
Admiral 20 and 30 Series Service Notes.....	Oct.
Application Notes on Deflection Yokes.....	Dec.
Auto Antenna Installation Hints.....	May
Auto Control Head Installation Notes.....	May
Auto Extension-Type Speakers.....	May
Auto Underdash and Firewall Mount Notes.....	May
Avoiding Picture-Tube Damage Caused by Incorrect Adjustment of Ion Trap.....	Oct.
Basic Cures for Dead Auto Receivers.....	Sept.

How to Disconnect Dynamic Limiters in Belmont Chassis.....	Oct.
Black Line—White Line Problems.....	Nov.
Capacitor Checker.....	Apr.
Cathode Follower Calculation Procedure.....	Dec.
Connecting LP Adapter to Philco Receivers Using Beam-of-Light Reproducers.....	Mar.
Converting 630 TS Chassis for 12½, 15, 16 and 20-Inch Picture Tubes.....	Sept.
Eliminating Noise Originating in Ignition or Generator Systems and Wheels.....	May
Eliminating Noise Rattles, Pickup Noise and Wheel Static in Auto Installations.....	Sept.
Eliminating Picture Distortion in Metal Tubes Due to Magnetism.....	Oct.
Eliminating Tube Failures in AC/DC Chassis.....	Sept.
Eliminating Sync Troubles.....	Nov.
External Antennas for BC Sets.....	Dec.
Finding Gain Values of 6L6 Amplifiers Via Tube Curves.....	Dec.
G. E. 64 and 65 Sweep-Receiver Clock-Booster Springs.....	Oct.
G. E. 805 Detent Index Button.....	Oct.
Horizontal Deflection Output and High-Voltage Transformers.....	Dec.
Improving Auto-Set Control-Shaft Fitting.....	Sept.
Minimizing Bass Response in Westinghouse Receivers.....	Sept.
Philco Picture Width-Control Circuits.....	Nov.
Preamp Equalization, Variable Reluctance.....	Jan.
Preamp Equalization.....	Feb.
Ratio-Detector Alignment Notes.....	Oct.
Reducing Hum Level in Bendix Models.....	Sept.
Remedying Pushbutton Sticking.....	Sept.
Selecting Coax Cables.....	Feb.
Sound Installation Circuit Aids.....	June
Sound Installation Formulas.....	June
Tuning Drift in TV Models.....	Nov.
TV Installation Hints.....	Apr.
TV Receiver RF Amplifier Circuits.....	Sept.
Variable Reluctance Preamp Equalization.....	Jan.

**SOUND**

Admiral RC210 and RC211.....	May
Admiral 30A1 TV Audio IF.....	Mar.
A Report on Sound (Editorial).....	June
Automatic Phono Servicing, Coin-Operated; <i>Jack Davr</i> .....	June
Bendix Hush-O-Matic.....	Aug.
Bendix V800D 2-Speed Systems.....	May
Checking 3-Speed Changers.....	July
Custom Audio Installations; <i>Irving Greene</i> .....	May
Custom Audio Installations; <i>Irving Greene</i> .....	June
Design and Construction of Custom Cabinet; <i>Clifford Stubbs</i> .....	June
Duo-Cone Hi-Fi Speaker Design.....	Oct.
Features of 3-Speed Changers, Record Players and Assemblies.....	June
45 RPM Replacement Cartridges.....	Sept.
G. E. 811, 814, 820, 830 and 835 Modifications to Curb Audio IF Regeneration.....	Apr.
Gram Scale Application to Check Tone Arm Needle Pressure and Vertical Friction.....	Oct.
Hearing-Aid, Servicing; <i>Clifford W. Carlson</i> .....	June
Hi-Fi Amplifiers.....	Sept.
How to Curb Groove Skipping and Minimize Hum-to-Signal Noise Ratios on Microgroove Players.....	June
LF Compensation Circuit.....	Feb.
LP Adapter-Switch Kit, Beam-of-Light System.....	Mar.
LP Player Attachments.....	Sept.
Long-Playing Records (Editorial).....	Jan.
Loudspeakers (Editorial).....	Mar.
Magnetic Tape Recorder—Playback Systems.....	Nov.
Needle Changer Mechanisms of Long-Playing Combination Changers.....	June
New Frequency Rating System.....	Dec.
Phono Installation and Service; <i>Kenneth Stewart</i> .....	May
Phono Installation and Service; <i>Kenneth Stewart</i> .....	June
Phono Installation and Service; <i>Kenneth Stewart</i> .....	July
Phono Installation and Service; <i>Kenneth Stewart</i> .....	Aug.
Phono Installation and Service; <i>Kenneth Stewart</i> .....	Sept.
Phono Installation and Service; <i>Kenneth Stewart</i> .....	Oct.
Phono Installation and Service; <i>Kenneth Stewart</i> .....	Nov.
Phono Installation and Service; <i>Kenneth Stewart</i> .....	Dec.
Phono Systems Using 2 and 3-Speed Record Changers.....	May
Philco 41-609 Audio Circuit.....	Mar.
Philco Three Speed Unit Employing a Six-Gram High-Compliance Crystal Pickup.....	Sept.
Philco Two-Arm Standard-LP Setup.....	Aug.
Preamp Equalization.....	Feb.
Remedies for Too Slow or Too Fast Turntable Speeds.....	July
RCA Magic Monitor.....	Aug.
Servicing 45-RPM Changers; <i>Thomas Y. Flythe</i> .....	June
Sound, TV, FM and (Editorial).....	Jan.
Sound Installation Servicing Helps; <i>Ira Kamen</i> .....	June

(Continued on page 28)

**WHAT MEDICAL TEXTS  
ARE TO THE PHYSICIAN  
RIDER BOOKS  
ARE TO THE  
ELECTRONIC TECHNICIAN**

**RADIO OPERATOR'S LICENSE  
Q AND A MANUAL**

by Milton Kaufman

This book is a most complete and comprehensive treatment of the subject and should prove especially valuable as a quick review of essential theory, as well as a refresher for advancement in the field. It lists all the QUESTIONS and ANSWERS for the FCC examinations. However, the outstanding feature of this volume is its thorough FOLLOW-THROUGH... a carefully simplified discussion of the answer to the technical question... so necessary for a complete and absolute understanding of the question. Useful appendices, which include Small Vessel Direction Finders and Automatic Alarm, not ordinarily available in a book of this type, provide a valuable "extra". An indispensable reference volume for the student and operator. 608 pages. 193 explanatory diagrams.

**\$6.00**

**FM TRANSMISSION and RECEPTION**

by John F. Rider and Seymour D. Uslan

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

**\$3.60**

**TV PICTURE PROJECTION  
and ENLARGEMENT**

by Allan Lytel

Timely... Complete... Authoritative

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

**\$3.30**

**BUSINESS HELPER**

by Leslie C. Rucker  
(Rucker Radio Wholesalers)

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

**\$2.00**

**OTHER RIDER BOOKS**

- The Oscillator at Work. 254 pages.....\$2.50
- Broadcast Operator's Handbook  
278 pages.....\$3.30
- Inside the Vacuum Tube. 420 pages.....\$4.50
- Servicing by Signal Tracing. 370 pages \$4.00
- Understanding Microwaves. 396 pages \$6.00
- A-C Calculation Charts. 168 pages.....\$7.50
- Vacuum Tube Voltmeters. 188 pages.....\$2.50
- Radio Amateur's Beam Pointer Guide  
32 pages.....\$1.00
- Automatic Frequency Control  
Systems. 154 pages.....\$1.75
- Installation and Servicing of Low  
Power Public Address Systems  
208 pages.....\$1.89
- Understanding Vectors and Phase  
158 pages.....Cloth Cover. \$1.89  
Paper Cover. \$ .99
- Radars—What It Is. 80 pages.....\$1.00

**RIDER BOOKS**

JOHN F. RIDER PUBLISHER, INC.  
480 Canal Street, New York 13, N.Y.

**INDEX**

(Continued from page 27)

- Stylus Pressure Gauge Design and Op-  
eration..... July
- Three-Way Player-Converter..... Aug.
- Two-Speed Record Changers for 7" Rec-  
ords..... Oct.
- TV Hi-Fi Audio Installations; *Iraing  
Greene*..... Aug.
- Variable Reluctance Preamp Equalization..... Feb.
- Variable Reluctance Stylus Factors..... Dec.
- Vinylite Record Static-Discharge Liquid..... Sept.
- Westinghouse 2-Speed Changer Needle  
Control..... Dec.

**TELEVISION**

- Addition of Power Transformer-Fuse to  
Admiral TV Sets..... Oct.
- Admiral AM/FM Tuner and 16" Tube TV  
Chassis..... Nov.
- Admiral TV Receiver With FM/AM  
Tuner..... Dec.
- Adjusting RF Transformers in G. E. TV  
Sets..... Sept.
- Alignment Techniques, TV Receiver Vis-  
ual; *Lester L. Libby*..... Jan.
- Aligning the Westinghouse II-196; *Iraing  
Silberg*..... Oct.
- Analyzing TV Circuits..... Sept.
- Application Notes on Deflecting Yokes..... Dec.
- Bendix 235..... Jan.
- Bendix 16-Tube TV Chassis..... Oct.
- Choice of UHF IF (Editorial)..... Nov.
- Circle-Standard Screen TV (Hallcrafters  
T64, 509, 510)..... July
- Coax Line Installation Practices; *Ira Ka-  
men*..... Sept.
- Coax Line Installation Practices (Part II);  
*Ira Kamen*..... Oct.
- Coax Switch Attenuation Control System..... Feb.
- Coax Line Parallel Setups..... Feb.
- Constant Voltage Sources, TV Receivers;  
*Hans U. Hjerstad*..... June
- Composite Video Signal Generator; *Allan  
Lytel*..... Oct.
- Converting 630TS Chassis for 12", 15",  
16" and 20" Picture Tubes..... Sept.
- Custom TV Installations..... July
- DuMont RA 105..... Sept.
- Eliminating Blooming in Westinghouse TV  
Sets..... Oct.
- Eliminating Vertical Bars and Horizontal  
Line Humps in Westinghouse TV Sets..... Oct.
- End Termination Problems at 200 Mc..... Sept.
- Farnsworth CV 260 Differentiation and  
Horizontal Control System..... Jan.
- Flexible TV Signal-Level Pads..... Feb.
- G.E. 817 and 821 (T and S Versions)..... Dec.
- Hallcrafters T-61/T-67 (Push-Button TV)..... Jan.
- Horizontal AFC System in Magnavox  
TV Receivers; *J. F. Bigelow*..... Feb.
- Horizontal-Deflection Output and High-  
Voltage Transformers..... Dec.
- Installation of AGC and Improved Hor-  
izontal Oscillator in Admiral TV Re-  
ceivers..... Oct.
- 1-Tube TV Preamp..... May
- Picture-Tube Conversion..... Sept.
- Picture-Tube Rasters..... Feb.
- Probing Picture Tube Patterns..... Sept.
- Reflector System TV Chassis..... Mar.
- Rhombic TV Antenna Installation; *Ira  
Kamen*..... Jan.
- RCA 16" Metal Picture-Tube Receiver  
(8T270, 8TC270, 8TC271)..... July
- 72-ohm Coax Line Pads..... Feb.
- 7" TV Model, Rotary Switch (Cover)..... Jan.
- Signal Strength TV Test Set (Cover)..... Dec.
- Sound and Picture IF Carriers..... Oct.
- Spartan Indirect Viewing TV Models..... Feb.
- Splining Techniques for Coax..... Sept.
- Stepping Up Your TV Service Income;  
*R. J. Guilfoyle*..... May
- Stepping Up Your TV Service Income;  
*R. J. Guilfoyle*..... June
- Sweep Circuit TV Tube Design and Ap-  
plication..... Dec.
- Sweep Generator Operating Hints; *Victor  
I. Robinson*..... Sept.
- Motorola VT-71 (AFC Revision)..... Jan.
- National Videometer (Cover)..... Dec.
- NC-TV-7/NC-TV-7M (Cover)..... Jan.
- Olympic RTU-3 (TV Duplicator)..... Jan.
- The Business Aspects of TV Installations;  
*Ira Kamen*..... Sept.
- The Eyes and TV (Editorial)..... Sept.
- The Philco Built-In TV Antenna System..... Sept.
- The TV Surge (Editorial)..... Mar.
- The TV Swing (Editorial)..... Sept.
- 300-Ohm Selector Switch System..... Feb.
- TV Antennas (Editorial)..... May
- TV Antennas, Those (Editorial)..... Feb.
- TV Antenna Insertion Circuits..... Sept.
- TV Antenna Installation Hints..... Apr.
- TV Antenna Installation Tricks of the  
Trade; *Ira Kamen*..... Feb.
- TV Antenna Tower Installations; *Ira  
Kamen*..... July
- TV Amplifier..... June
- TV Built-In Tunable Antenna System..... Sept.
- TV Circuitry, AM and (Editorial)..... Oct.
- TV Controls and Adjustments; *Allan  
Lytel*..... Mar.

- TV Demonstration Boards (Editorial)..... Mar.
- TV Divider and Decoupling Networks..... Feb.
- TV, FM and Sound (Editorial)..... Jan.
- TV and FM Sweep Signal Generator  
(Cover)..... Sept.
- TV Hi-Fi Audio Installations; *Iraing  
Greene*..... Aug.
- TV in '49 (Editorial)..... Feb.
- TV Installations, The Business Aspects  
of; *Ira Kamen*..... Jan.
- TV Model With Keyed AGC System;  
*Walter H. Buchsbaum*..... Nov.
- TV Picture Tube Safety Rules..... July
- TV Picture Pattern Observation Practices..... Mar.
- TV Preamp (Anchor ARC-101-50)..... May
- TV Receiver for Fringe Area Reception,  
Aligning the; *J. F. Bigelow*..... Apr.
- TV Receiver IF Variations..... Sept.
- TV Receiver Line-Voltage Control-Checker;  
*Carl S. Cummings*..... Dec.
- TV Receiver Production Changes; *Donald  
Phillips*..... Jan.
- TV Receiver Production Changes; *Donald  
Phillips*..... Mar.
- TV Receiver Production Changes; *Donald  
Phillips*..... Apr.
- TV Receiver Production Changes; *Donald  
Phillips*..... Aug.
- TV Receiver Production Changes; *Donald  
Phillips*..... Oct.
- TV Receiver Production Changes; *Donald  
Phillips*..... Nov.
- TV Receiver Production Changes; *Donald  
Phillips*..... Dec.
- TV Receiver RF Amplifier Circuits..... Sept.
- TV Receiver Servicing; *Carl Quirk*..... Aug.
- TV Receiver Servicing; *Carl Quirk*..... Sept.
- TV Receiver Visual Alignment Techniques;  
*Lester L. Libby*..... Jan.
- TV Receivers, Viewing Areas of; *Robert P.  
Wakemen*..... Feb.
- TV Receiver Visual Alignment Techniques;  
*Lester L. Libby*..... Mar.
- TV Receiver Visual Alignment Techniques;  
*Lester L. Libby*..... Apr.
- TV Safety Rules (Editorial)..... June
- TV "Scope"..... Apr.
- TV Servicing Pitfalls (Editorial)..... Nov.
- TV Servicing (Editorial)..... Apr.
- 20-Tube 12 1/2" TV Model; *Walter H.  
Buchsbaum*..... Apr.
- Two-Tube Booster (National TVR-1)..... Aug.
- Ultrahighs and the Service Man (Edi-  
torial)..... Nov.
- UHF Antenna Installation Layout..... Oct.
- UHF Design Study (Editorial)..... Nov.
- Videola TV Models..... Sept.
- Viewing Distances (Editorial)..... Mar.
- Visual Alignment Techniques, TV Receiver;  
*Lester L. Libby*..... Jan.
- Visual TV Alignment Procedures; *Victor I.  
Robinson*..... July
- Visual TV Alignment Procedures; *Victor I.  
Robinson*..... Aug.
- Westinghouse H196 Model..... Apr.
- Westinghouse 242 Multivibrator Circuits..... Oct.
- Zenith Circular Screen TV Models..... Mar.
- Zenith Circular Screen TV Receivers..... Apr.

**TEST EQUIPMENT**

- Approved Electronic Instrument A-400  
(TV and FM Sweep Signal Generator)..... Sept.
- Auto Power Supply Testing With a "Scope"..... May
- Auto Voltage Testing..... May
- Alignment Procedure for Westinghouse  
II-196 Sound and IF Sections..... Sept.
- Capacitor Design and Application..... Apr.
- ECA FM/TV Signal Generator..... Mar.
- How To Build and Apply Special Types of  
Auto Test Accessories..... May
- IF Marker, Sweep Generator and "Scope"  
Alignment Setup..... Sept.
- Interpreting TV Alignment "Scope Pictures"..... July
- RCA 630TS Alignment Techniques..... Aug.
- "Scope and FM Signal Generator for Align-  
ment of FM Receivers With Limiter and  
Discriminator Stages and Ratio De-  
tectors..... Mar.
- "Scope Type Alignment of 630TS..... July
- Signal Strength TV Test Set (National  
Vidometer)..... Dec.
- Supreme 665 (Composite Video Signal  
Generator)..... Oct.
- Sweep Generator Operating Hints; *Victor  
I. Robinson*..... Sept.
- Sweep and Marker Equipment for Align-  
ment..... Jan.
- Sweep and Marker Setups for Alignment..... Mar.
- Testine Car Sets on the Bench..... May
- TV Alignment Procedures, Visual; *Victor  
I. Robinson*..... July
- TV Receiver Visual Alignment Techniques;  
*Lester L. Libby*..... Jan.
- TV Receiver Visual Alignment Techniques;  
*Lester L. Libby*..... Mar.
- Visual TV Alignment Procedures; *Victor I.  
Robinson*..... Aug.

**TUBE NEWS**

- Ballast Tubes..... Apr.
- Design and Application Feature of 3RP1  
Three-Inch CRT..... Sept.
- Sweep Circuit TV Tube Design and Ap-  
plication..... Dec.



## TV Production Changes

(Continued from page 22)

serves as correction voltage for the reactance tube. This causes the sweep generator frequency to run at a lower frequency, which is the desired resultant for a sync-pulse frequency, which is less than the mean of 15,750 cps.

Since correction takes place from either direction, it is only necessary to set the horizontal-hold control for a mean sync condition, and when any change takes place, such as line-voltage fluctuations which would tend to change the sweep-generator frequency, a correcting action takes place.

The ability of this circuit to work in the presence of noise is partially due to the fact that the discriminator acts as a balanced input device. Furthermore, the RC filter circuit in the grid of the control circuit consisting of  $C_{205}$ ,  $C_{300}$ , and  $R_{367}$ , is a low-pass filter, with a relatively long-time constant. Thus, random noise pulses are absorbed without any affect on the bias.

Westinghouse H-196 and H-217

**Vertical Hold Improvement:** If insufficient range of the vertical hold control makes it difficult or impossible to lock-in the picture, the value of the fixed resistor in the grid circuit of the 12AU7 vertical oscillator ( $R_{87}$  in H-196, and  $R_{410}$  in H-217) should be checked. In the original production, the resistor was a 1.5 megohm unit, and it was used in series with a 1-megohm vertical hold control ( $R_{10}$  in H-196 and  $R_{407}$  in H-217). Later, the fixed resistor was changed to 1 megohm, and the hold control was changed to 2 megohms to provide greater hold control range. However, some sets used a 1-megohm fixed resistor and a 1-megohm hold control. In these sets the range of the hold control is limited, and better results may be obtained by changing the fixed resistor to 1.5 megohms.

Westinghouse H-217

**Damping Tube:** The receiver must not be operated with a defective damping tube as indicated by a white streak down the left side of the picture. Under this condition  $C_{131}$  (4 mfd) is operating at reversed polarity and may become damaged.

WHAT A BASIC MEDICAL REFERENCE LIBRARY IS TO THE PHYSICIAN...

# RIDER MANUALS

ARE TO THE ELECTRONIC TECHNICIAN



And, should you ask any Doctor — "What does your medical reference library mean to you?"

His answer probably would be — "Medical science grows more complex every day. And while no man can be expected to retain the millions of details in his mind, he MUST have them AT HIS FINGERTIPS. My library furnishes me with COMPLETE, ACCURATE and AUTHENTIC DATA. It gives me all of the factual information that I want... WHEN I NEED IT."



And now, ask yourself — "What Do RIDER MANUALS mean to me?"

Your answer probably would be — "Electronic science grows more complex each day. And while no man can be expected to retain the millions of details in his mind, he MUST have them AT HIS FINGERTIPS. My RIDER MANUALS furnish me with COMPLETE, ACCURATE and AUTHORIZED MANUFACTURER'S DATA. They give me all of the factual information that I want... WHEN I NEED IT."

## RIDER MANUALS

ARE EQUALLY IMPORTANT TO YOU IN YOUR WORK!



### RIDER TV MANUAL VOL. 3

★ Larger Page Size, 12" x 15"!

All Pages In Place!

★ Easier To Use!

★ Complete, Accurate, Authentic Data Direct From The Manufacturers Themselves!

74 manufacturers. 441 models. 243 chassis. Easier to use than ever before. Diagrams and related text are more closely positioned. Giant pages have been retained, but now have only one fold for greater convenience and durability. For greater efficiency, for more information, for more value for your money, order RIDER TV MANUAL Vol. 3 from your Jobber!

Equivalent of 2032 Pages (8½ x 11) Plus Cumulative Index Volumes 1, 2 and 3, Plus the famous Rider "How It Works" Book ..... Complete **\$21.00**

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

## RIDER MANUALS mean SUCCESSFUL SERVICING

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

### RIDER RIDER MANUAL VOLUME XX

Available Soon at Your Jobber's. Reliable, authentic, factory-authorized servicing information covering the latest AM-FM Radio, Auto Receivers, Record Changers, etc. Complete in every respect, but with the added advantage of text and double spreads assembled in position. More than 1700 pages. More than 70 manufacturers. Price \$18.00. Publication February 1950.

PLACE YOUR ORDER TODAY! NOW!

#### RIDER MANUALS

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

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





# Test Set

[See Front Cover]

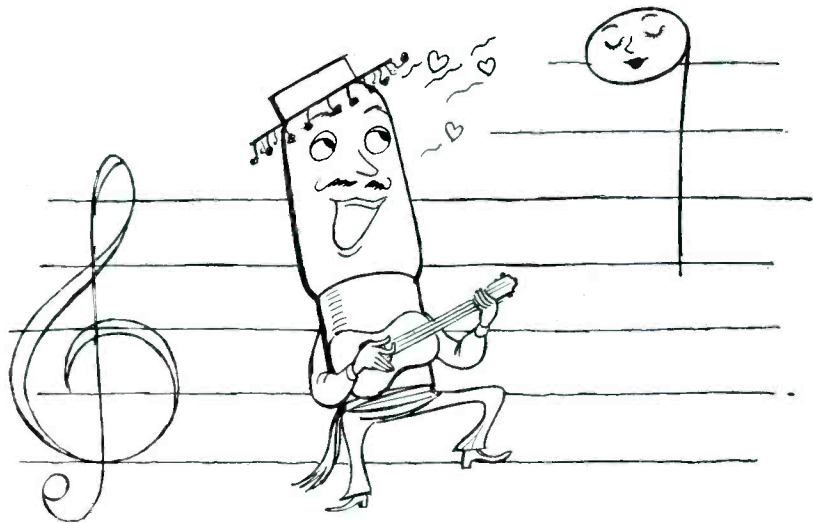
TO PREDICT TV receiver operation at a given location, as well as to provide a visual test of operation from the standpoint of interference, a 7" TV receiver (*National Videometer*) featuring a field-intensity meter system was developed recently. The basic circuit of this system, shown on the cover this month, includes a selector switch in the meter circuit which makes it possible to read either line voltage (0-150-volt scale) or field intensity (0-10 scale). In the latter position, the field intensity meter reading may be converted directly into microvolts by means of a chart provided with the receiver.

When the meter selection switch on this instrument is connected to the *ac line* position, the line voltage at the receiver input terminal may be read directly. Rotating the switch to the *signal strength* position provides a means of reading signal intensity on the meter. This reading is independent of the contrast or brightness control settings, being a function only of the signal strength at the antenna terminals of the receiver.

The instrument can be used for adjustment of antenna feeders, check on antenna orientation to provide maximum signal strength and elimination of ghosts or interference, etc.

The first *rf* amplifier uses a 6AU6, while a 5AG5 is employed as a mixer and a 6C4 serves as a local oscillator. Three 6AU6s are used in the first, second and third *if* stages. A 6AL5 has been included as a video detector *age* diode. In the video amplifier is another 6AU6. A pair of 6SN7GTs are used in the horizontal sweep oscillator and horizontal sweep output, while another pair of 6SN7GTs are used in two vertical sweep oscillator circuits. The 6AU6s serve also as a sync clipper and *dc* restorer, and as a ratio detector driver. The output of this driver feeds into a 6T8 ratio detector, its output being fed into one-half of a 6T8 audio amplifier and finally to a 6V6GT audio output. In the *rf* high-voltage power supply there is a 12AU7 high-voltage oscillator and a 1B3GT-8016 high-voltage rectifier. The general power supply includes a 5V4G rectifier and a 6X5GT B- rectifier. The picture tube is a 7JP4 type.

Left: Circuit of the National videometer signal-strength check receiver.



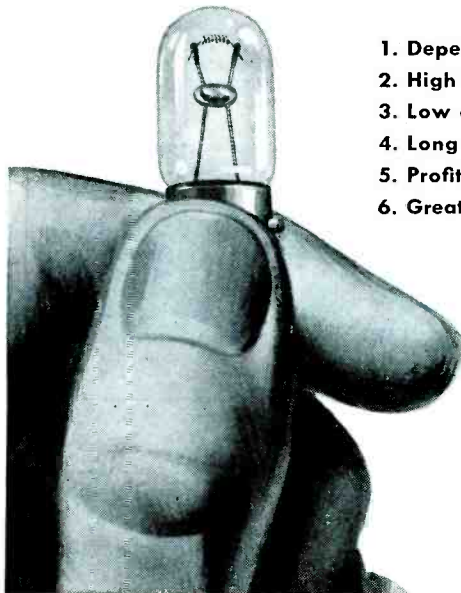
## The little lamp that learned to love "high C"

**A** SOPRANO'S "high C" can be just too much for many dial lamps. Severe vibrations caused by such high notes are often sufficient to tear an old-style lamp filament apart. General Electric engineers found a simple way to minimize this cause of early lamp failure. By making the filament supports longer and moving the bead closer to the coil, they greatly reduced the effects

of vibration.

That's why G-E dial lamps have actually learned to like "high C"... and to give long life in spite of the continuous vibration.

For information on prices and types of G-E miniature lamps, call your nearby G-E Lamp office. Or write to General Electric Company, Div. 166-S12, Nela Park, Cleveland 12, Ohio.



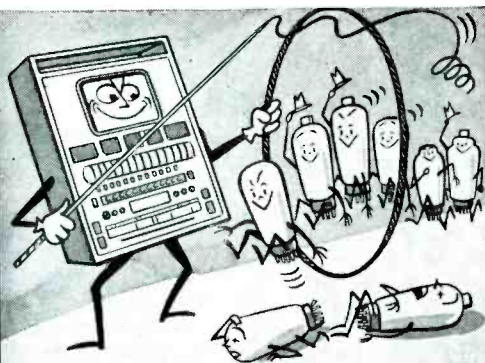
1. Dependable, trouble-free performance.
2. High level of maintained light output.
3. Low current consumption.
4. Long life.
5. Profitable to handle.
6. Greater dealer acceptance.

 Radio  
Dial Lights

You can put your confidence in—

GENERAL  ELECTRIC

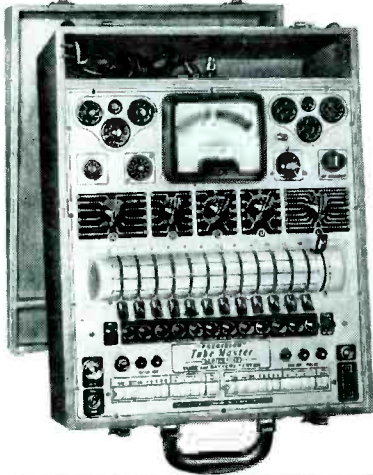
**You Get  
OVERALL  
Test  
Performance  
With...**



**PRECISION**  
**SERIES 10-12 Electronamic\***  
**TUBE PERFORMANCE TESTER**  
\*Reg. U.S. Patent Office

**with 12 ELEMENT free-point Master Lever Selector System**

★ To test modern tubes for only one characteristic will not necessarily reveal overall performance capabilities. Tube circuits look for more than just Mutual Conductance or other single factor.



**MODEL 10-12-P** (illustrated): in sloping, portable hardwood case with tool compartment and hinged removable cover. Size 13 3/4" x 17 1/4" x 6 3/4".....\$96.10  
**MODEL 10-12-C** (Counter Type).....\$99.40  
**MODEL 10-12-PM** (Panel Mount).....\$99.40

★ In the Precision Electronamic Circuit, the tube PERFORMS under appropriately phased and selected individual element potentials, encompassing a wide range of plate family characteristic curves. This complete Path of Operation is integrated by the indicating meter in the positive PERFORMANCE terms of Replace-Weak-Good.

- ★ Facilities to 12 element prongs.
- ★ Filament voltages from 3/4 to 117 volts.
- ★ Tests Noval 9 pins; 5 and 7 pin acorns; double-capped H.F. amplifiers; low power transmitting tubes; etc. REGARDLESS OF FILAMENT OR ANY OTHER ELEMENT PIN POSITIONS.
- ★ ISOLATES EACH TUBE ELEMENT REGARDLESS OF MULTIPLE PIN POSITIONS.
- ★ DUAL short check sensitivity for special purpose tube selection.
- ★ Battery Tests under dynamic load conditions.
- ★ 4 1/2" Full Vision Meter.
- ★ Built-in Dual-Window, brass-g geared roller chart.
- ★ FREE Replacement Roll Charts and supplementary tube test data service.

**See**

the "Precision" Master Electronamic Tube Testers at leading radio equipment distributors. Write for catalog describing Precision Test Equipment for all phases of modern A.M., F.M., and TV.

**PRECISION APPARATUS CO., INC.**  
92-27 Horace Harding Boulevard, Elmhurst 6, New York  
Export Division: 458 Broadway, New York, U.S.A. • Cables—Morhance

**Ser-Cuits**

(Continued from page 12)

a fixed negative voltage source, while on the *U* and *W* version receivers this bias was obtained from the video detector and clipper tube circuits which furnished a variable source of bias for *agc* purposes.

**Video Detector and Video Amplifier**

The video amplifier output is coupled to one section of a 6AL5 dual

diode, which is connected as a series diode so as to develop a negative-going signal across a 5,100-ohm diode load resistance. The signal is then amplified by two triode-amplifier stages using a 12AU7 dual triode. L<sub>255</sub> and L<sub>256</sub>, series compensating chokes, and L<sub>250</sub>, L<sub>250</sub>, and L<sub>257</sub>, shunt compensating chokes, are used to obtain the required high-frequency response and provide sharp cut-off at frequencies above the useable band. The combination of C<sub>260</sub> and

C<sub>261</sub> (5-mmfd capacitors) and L<sub>246</sub> and L<sub>255</sub> serve as an *if* filter to prevent any of the *if* or harmonic frequencies from being amplified by the video amplifier.

In addition to amplification, the first section of the 12AU7 video amplifier operates as a noise limiter. The B+ voltage applied to this tube is relatively low and the video signal applied to the grid is negative-going. Any large excursions of voltage above sync level, such as introduced by transient noise, will drive the grid voltage sufficiently negative to cause plate current cut-off. Thus, the interference will be limited close to the level of the super-sync signal. This improves the signal-to-transient noise interference ratio without affecting the video signal.

Since capacity coupling of the video amplifier stage is used, the *dc* component of the video signal must be restored to maintain the proper background illumination. This is accomplished by one-half of a 6AL5 diode. The negative-going output signal of the 12AU7, which is coupled to the picture tube, is also applied to the cathode of the 6AL5 through a resistor (10,000 ohms)-capacitor (.05 mfd) coupling. The rectification of this signal causes the .05-mfd capacitor to charge to the peak value of the sync pulse. Since this charge will vary with the amplitude to the pulse above the *ac* axis, the resulting *dc* voltage will provide the required restoration of the *dc* component. This *dc* is supplied to the *ac* video component through a 390,000-ohm resistor, so that the grid of the picture tube will have a composite video signal with a *dc* component.

On early *T* version models, the 6AL5 diode also performed the function of the first clipper, developing the sync pulse voltage across a resistor (R<sub>270</sub>) to be passed on to an additional clipper and the sync circuits which followed. On later *U* and *W* receivers this tube was not used as a clipper, its only function being to restore the *dc* component at the picture tube grid.

By connecting the cathode of the picture tube to a variable positive voltage source, the picture tube may be biased so as to change the brilliance. A potentiometer control which changes this bias voltage is brought out to the front panel as the brightness control. In addition to the bias supplied to the cathode, a voltage waveform derived from the vertical sweep output is supplied through a .002-mfd capacitor. The positive peak voltage corresponds to retrace time so that by application to the cathode circuit, it causes the picture tube to be biased to cut off during its duration. This results in



the removal of most of the retraced lines.

[To Be Continued]

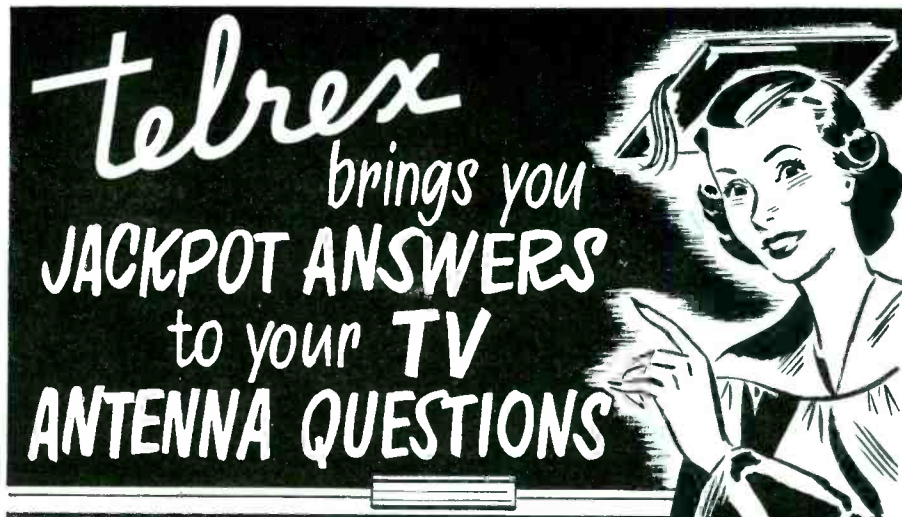
### Admiral TV/FM/AM

CONTINUING OUR analysis of the Admiral TV and FM/AM tuner model (21A1 TV and 4K1 FM/AM), we find that a 6AU6 pentode pulsed-type amplifier provides an automatic bias voltage to the control grids of the *rf* amplifier and the first two video *if* amplifiers, based on the transmitted sync pulse level. The grid of this tube is supplied with signal voltage from the output circuit of the video amplifier. A secondary winding on a width control,  $T_{405}$ , serves as a source of pulsed plate voltage (15.75 kc). This voltage is supplied to the plate of the tube through a .001-mfd capacitor,  $C_{130}$ , and no *dc* flows through the secondary of  $T_{405}$ . The application of the 15.75 kc pulsed-plate voltage to the plate of the 6AU6 causes the tube to conduct only during positive half cycles; *agc* voltage is therefore developed during this period only. Rectified voltage is developed across a pair of 47,000-ohm resistors ( $R_{330}$  and  $R_{417}$ ), and 27,000-ohm and 100,000-ohm resistors ( $R_{302}$  and  $R_{305}$ ), varying in accordance with the level of the sync pulses applied to the grid of the 6AU6.  $R_{417}$ ,  $R_{302}$  and  $C_{417}$  (.005-mfd) act as a filter to the pulse ripple. A *dc* bias voltage is developed across  $R_{208}$  (and  $R_{201}$ ) which is dependent upon the transmitted sync pulse level and this voltage is applied to the controlled stages through appropriate decoupling networks. Sync pulses are used to control the grid of the *agc* tube, since they remain at a constant level with respect to the carrier. If the video signal were used, the *agc* voltage would fluctuate with variations of black and white.

### Video Amplifier

The video amplifier is a pentode voltage amplifier with a constant *K* filter for a plate load; a 250-microhenry coil wound on a 33,000-ohm resistor, another 250-microhenry coil wound on a 33,000-ohm resistor and a 4,300-ohm resistor ( $L_{310}$ — $R_{322}$ ,  $L_{311}$ — $R_{321}$ ,  $R_{344}$ ). The gain of this stage is controlled by a 25,000-ohm potentiometer,  $R_{304}$ , which serves as a contrast control by varying the voltage applied to the screen of the 6AC7. The plate load circuit is direct-coupled through a 1-megohm resistor,  $R_{323}$ , to the cathode of the picture tube, eliminating the need for *dc* reinsertion. Sync voltage

(Continued on page 34)



# Telrex brings you JACKPOT ANSWERS to your TV ANTENNA QUESTIONS

- QUESTION**—What's the one antenna that cuts installation troubles and service call-backs to the bone in all locations?

**ANSWER**—Telrex Conical Antennas, the conical "V" beams that cover all TV channels and FM, and afford best reception in every signal area. There's an engineer-designed, service-tested model for every TV location.
- QUESTION**—Why have Telrex Conical "V" beams replaced every possible combination of antennas for TV reception?

**ANSWER**—Because Telrex "V" beams are the only antennas offering true conical performance—top TV reception without bulky metal cones. For experience-designed models to meet every problem, workmanship that gives longer service . . . continue to look to Telrex!
- QUESTION**—Who has built 95% of all conical antennas installed today?

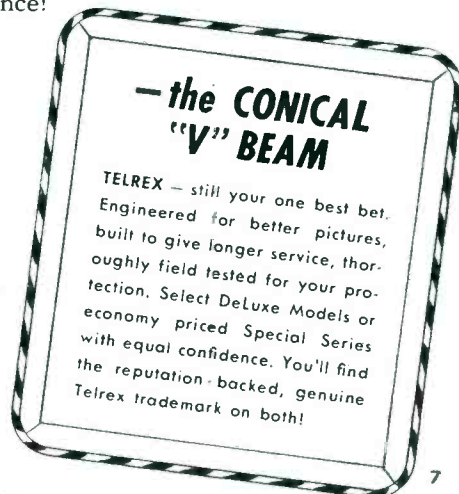
**ANSWER**—Telrex! Leadership in engineering and quality keeps Telrex out in front. The Telrex staff is ever seeking better methods, improved materials and design advancements. Supply a Telrex antenna on your next TV installation—you'll see the difference!

### TELREX MODEL 2X-BD



- Bi-Directional Stacked Conical "V" Beam
- Low Vertical Angle
- Extremely High Signal to Noise Ratio
- Constant Center Impedance
- Uses 72, 150 or 300 Ohm Transmission Lines
- Universal Mounting Clamp

PATENTS PENDING  
COPYRIGHT 1949



Telephone—ASBURY PARK 2-7252



AMERICA'S  
OUTSTANDING  
TELEVISION  
BEAM

ASBURY PARK 4, N. J.

# ACES UP! SERVISHOP



MODEL  
8573

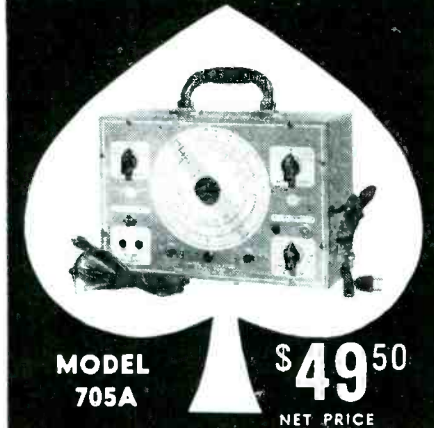
\$99<sup>95</sup>  
NET PRICE

TUBE TESTER • SET TESTER • BATTERY TESTER • CONDENSER TESTER • AUDIO R. F.-F. M. • SIGNAL GENERATOR

Every square inch solid-packed with value! Look what you get in this phenomenally low-priced tester: (1) A complete tube tester with over 800 listings in its famous Rollindex roll chart, (2) A battery tester indicating actual voltage under rated load, (3) A capacitor tester, (4) A fixed point calibrated AM-FM signal generator, (5) An audio oscillator; and a dozen additional features. Readable scale divisions on the ohm meter start at 0.05 ohm to 25 megohms.

DC Volts: 0, 2.5, 10, 50, 250, 1000, 5000  
AC Volts: 0, 10, 50, 250, 1000, 5000  
DC Milliamps: 0, .5, 2.5, 10, 50, 250, 1000  
DC Amps: 0, 10  
Megohms: 0, 2.5, 25  
Ohms: 0, 250, 2500, 25000  
Decibels: - to +15, 15 to 29, 29 to 49, 32 to 55  
Output Voltmeter: 0, 10, 50, 250, 1000, 5000  
Complete with tubes, batteries and test leads, output leads, etc., housed in natural finish oak case; hammer-tone gray panel.

## SIGNAL GENERATOR



MODEL  
705A

\$49<sup>50</sup>  
NET PRICE

FOR FM-AM  
DOUBLE MODULATION 30% & 80%

Not one—but two percentages of modulation add greater checking performance to your service tests. All exclusive feature in this low price precision generator. Fully dependable. Excellent for FM alignments.  
Range from 95 kc. to 100 mc. Fundamental frequencies in 5 bands, continuously variable. Accurate to 2% for broadcast bands—3% for h.f. bands.  
Planetary drive condenser with accurate double and tuning indicator. 5 step ladder attenuator controls voltages from 0 to maximum. Covers all new FM bands—useful signals can be obtained as high as 150 mc.  
Negligible leakage due to complete shielding. Complete, ready for the shop. Just plug in any standard 110 V., 60 Cycle A.C. line and go to work. Grey hammer-tone case—portable, only 11 lbs.

SEE THESE OUTSTANDING BUYS AT YOUR  
JOBBER TODAY  
WRITE FOR CATALOG DS

RADIO CITY PRODUCTS CO., INC.

152 West 25th Street,  New York 1, N. Y.

(Continued from page 33)

is taken from the resistive branch of the plate load.

### Sync Limiter

The second half of the 6AL5 dual diode functions as a limiter on the grid of the sync inverter ( $\frac{1}{2}$  6SN7) limiting the level of the sync signal, thereby eliminating transient or impulse noise peaks.

### Sync Separator

The sync separator,  $\frac{1}{2}$  of a 12AU7, separates the sync pulses from the composite video signal. The second half of this tube amplifies the sync pulse and also clips peaks off impulse noises.

### Sync Inverter

One-half of a 6SN7 dual triode serves as a phase inverter for providing a balanced voltage to the horizontal sync discriminator. Vertical sync pulses are taken from the cathode circuit of this stage and fed to the vertical integrating circuit.

### Horizontal Sync Discriminator

Balanced horizontal sync voltage from the sync inverter is supplied through an RC coupling circuit to the sync discriminator. A reference voltage from the horizontal output circuit is fed from a secondary winding on T<sub>105</sub> (width control) through an RC network made up of a 18,000-ohm resistor (R<sub>425</sub>) and a .01-mfd capacitor (C<sub>414</sub>) to the junction of pins 1 and 2 of the 6SN7GT.

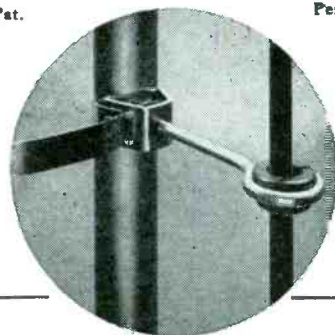
The discriminator develops a dc voltage across a 4,700-ohm resistor (R<sub>428</sub>) that is proportional to the phase difference between the transmitted sync pulse voltage and the horizontal sweep voltage. When the frequency and phase relationship between these two voltages is correct, the sync discriminator supplies normal operating bias to the first triode section of the 6SN7 horizontal oscillator. When a change in the phase/frequency relationship between the transmitted sync pulse voltage and the horizontal sweep voltage occurs, the dc output voltage across R<sub>428</sub> changes accordingly. This dc voltage is fed to the horizontal oscillator through an RC filter (470,000-ohms, .01-mfd and .05-mfd capacitors; R<sub>429</sub>, C<sub>413</sub> and C<sub>416</sub>) which removes any noise or sync voltage.

### Horizontal Oscillator

A 6SN7 dual triode combines the

Pat.

Pend.



**NOW! NEW LOW PRICE  
FOR PHOENIX PAM-11**

.. Fastest, Strongest Antenna  
Mast Stand-Off Insulator

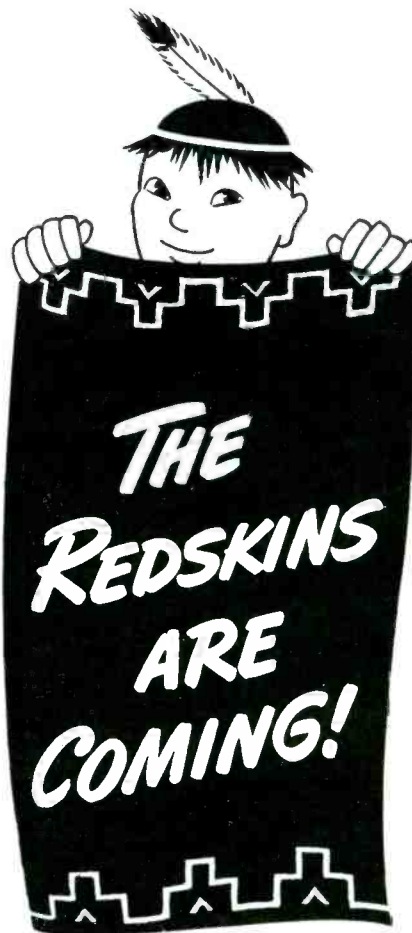
• Attaches to  
any size mast in  
10 seconds!

• Genuine Poly-  
ethylene parts.

**19<sup>c</sup>** list

**PHOENIX  
ELECTRONICS, INC.**  
Lawrence, Mass.

AT LEADING  
JOBBER  
Write for  
folder M of  
complete line  
of television  
accessories.





two functions of horizontal oscillator and control tube within one envelope. The circuit is that of a modified Franklin oscillator. Frequency of oscillation is largely controlled by an iron-slug coil, .0039-mfd capacitor, 8,200-ohm resistor, 100,000-ohm resistor and 50,000-ohm pot;  $L_{401}$ — $C_{415}$ ,  $R_{433}$ ,  $R_{440}$  and  $R_{408B}$ . A slug adjustment,  $L_{401}$ , serves as the horizontal lock control while  $R_{408B}$  is a vernier frequency adjustment which acts as the horizontal hold control. The circuit differs from the conventional Franklin oscillator in that the grid of the first triode section is isolated for control purposes and plate circuit feedback is through the common cathode 1,500-ohm resistor,  $R_{432}$ .

The *dc* output voltage of the horizontal sync discriminator supplies a bias voltage which is added to the normal operating bias of the first triode section of the 6SN7 provided by the drop across cathode resistor  $R_{432}$ . The frequency of oscillation is determined not only by  $L_{401}$ ,  $C_{415}$ ,  $R_{433}$ ,  $R_{440}$  and  $R_{408B}$ , but is also affected by the plate resistance of the first triode section. The plate resistance in turn is determined by the bias applied to the control grid. A shift in phase or frequency between the transmitted sync pulse and the horizontal sweep voltage produces a change in the output voltage of the sync discriminator which is fed to pin No. 1. This voltage results in the required horizontal oscillator phase or frequency correction.

#### Horizontal Output

A 6BG6 beam tetrode in the horizontal output circuit has the dual function of providing driving power for the horizontal deflecting coils and a high potential pulse for the 1B3GT second anode rectifier.

The output of the horizontal amplifier is transformer-coupled to  $T_{404A}$ , the horizontal deflecting coils.  $T_{405}$  is shunted across a portion of  $T_{403}$ , the horizontal output transformer and, by means of a slug adjustment, functions as a width control.  $T_{405}$  has a secondary winding which supplies pulsed plate voltage to the *agc* tube and an *ac* reference voltage to the horizontal sync discriminator.

#### Second Anode Supply

A 6BG6G horizontal output amplifier is the source of pulsed voltage for the 1B3GT/8016 second anode voltage rectifiers. This voltage is increased by auto-transformer action in  $T_{406}$  and rectified by a cascade rectifier

(Continued on page 36)

NORTHERN COLD

SOUTHERN HEAT

EASTERN RAIN

WESTERN WIND



## WHERE THE TWAIN MEETS

Whatever the operating conditions the

Turner Model 33D Dynamic will stand the gaff . . . and perform. Its ruggedness is only surpassed by its sensitivity.

Regardless of the application; voice or music, studio or public address, the Turner Model

33D delivers crisply and clearly. Volume and tone gradations are faithfully retained. It's the microphone that combines high output over a wide range of frequencies.

Yes, whatever your requirements, you can depend on the Turner Model 33D to perform and conform to high standards. It is also available as 33X Crystal. Write for complete details.

## THE TURNER COMPANY

930 17TH STREET N. E. • CEDAR RAPIDS, IOWA

IN CANADA: Canadian Marconi Co., Ltd.  
Montreal, P. Q., and branches

EXPORT: Ad Auriema, Inc.  
89 Broad St., New York 4, N. Y.

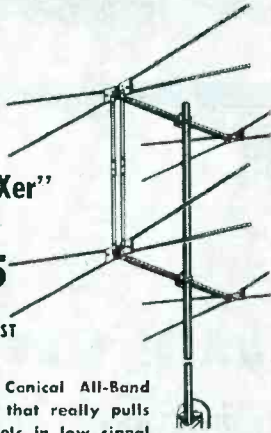


Crystals licensed under patents of the Brush Development Company

**JFD**  
has the  
**KNOW-WHAT**  
and the  
**KNOW-HOW**

JFD is a TV pioneer. We know what's needed and we know how to make it. Equally important, we sell it to you at a price on which you can make a good profit.

**JFD**  
**TA161**  
Double "D-Xer"  
Antenna  
**\$29.25**  
LIST



Stocked Conical All-Band Antenna that really pulls in channels in low signal areas. A bang-up job at economy price!

**JFD**  
**SNAP-ON TWIN LEAD INSULATORS**

PAT. PEND.

Snap-on in a jiffy... stay put permanently. Two models: No. SPT-100 for 1" Masts, No. SPT-125 for 1 1/4" Masts.

**10c**  
LIST

**JFD R3**  
**RANGER TV**  
**ANTENNA**

All-Channel Duct-Orienting Hi-Lo array. As simple to assemble as opening an umbrella! Another JFD "Economy" Value.

**\$12.35**  
LIST

Write for FREE JFD Catalog of TV Accessories No. TV100

More than a catalog, it contains installation and servicing data of invaluable interest to every Serviceman.

Also FREE for the asking... JFD Catalog of Radio Accessories, No. 438.



**JFD**  
MANUFACTURING CO., Inc.  
6109 16th Avenue  
Brooklyn 4, N. Y.  
FIRST IN TELEVISION ANTENNAS AND ACCESSORIES

(Continued from page 35)

arrangement having an output of 12,000 volts.

#### Pulse Duration Control

The positive half-cycle of the  $T_{400}$  primary voltage is a short duration pulse of very high amplitude. The negative half-cycle has relatively low amplitude and is of longer duration. During the first positive half-cycle,  $V_{407}$  conducts, charging a 500-mmf capacitor,  $C_{427}$ , to the peak value of the full  $T_{400}$  primary voltage pulse. The 1B3 tube does not conduct during this period. During the negative half-cycle, neither rectifier conducts and the sum of  $T_{400}$  primary voltage plus the charge on the  $C_{427}$  (acquired during the first positive half-cycle) charges a 100-ohm resistor,  $C_{443}$ , through a pair of 1-megohm resistors,  $R_{455}$  and  $R_{456}$ . The next positive half-cycle causes both 1B3s to conduct;  $V_{409}$  conducts by virtue of the charge on  $C_{443}$  adding to the positive pulse of the primary of  $T_{400}$ . Conduction through  $V_{407}$  recharges  $C_{427}$  to the peak value of the positive pulse. Conduction through  $V_{409}$  charges a 2,200-ohm resistor,  $C_{440}$ , through the  $T_{400}$  primary circuit to approximately half the potential of  $C_{443}$ . The potential of  $C_{447}$  plus that of  $C_{440}$  produces a total of 12,000 volts.

#### Damper

A 6W4 damper is connected in a manner which provides an effective increase in plate voltage to the horizontal output amplifier. The plate current of this tube flows through the 6W4 for the major portion of the horizontal trace.

#### Capacitive Networks

A pair of capacitors, .05 and .1 mfd,  $C_{420}$  and  $C_{431}$ , are fully charged during this period and supply current to the 6BG6 during the time that the 6W4 is not conducting. An average voltage due to the 6W4 current is developed at the network consisting of a pair of .05-mfd capacitors and an iron-core coil,  $C_{420A}$ ,  $L_{402}$  and  $C_{420B}$ , which adds about 50-60 volts to the supply voltage. The network provides linearity control by adjusting the cathode wave form (bias) of the damper tube.  $R_{444}$  and  $C_{420B}$  provide some RC damping in the output circuit in addition to the damping provided by the 6W4.

## AMPERITE

Studio Microphones  
at P.A. Prices

Ideal for  
BROADCASTING  
RECORDING  
PUBLIC ADDRESS

"The ultimate in microphone quality," says Evan Rushing, sound engineer of the Hotel New Yorker.

• Shout right into the new Amperite Microphone—or stand 2 feet away—reproduction is always perfect.

• Not affected by any climatic conditions.  
• Guaranteed to withstand severe "knocking around."



Models  
RBLG—200 ohms  
RBHG—Hi-imp.  
List \$42.00



"Kontak" Mikes  
Model SKH, list \$12.00  
Model KKH, list \$18.00

Special Offer: Write for Special Introductory Offer, and 4-page illustrated folder.

**AMPERITE Company, Inc.**

561 BROADWAY • NEW YORK 12, N. Y.

Canada: Atlas Radio Corp., Ltd., 560 King St. W., Toronto

## Servicing Helps

(Continued from page 23)

tive if the external antenna is disconnected. When the external antenna is connected the loop still acts as a means for picking up a certain amount of signal and, of course, noise if noise is present in the immediate vicinity.

If local noise is present, a separate antenna transformer may be used in place of the loop antenna.

The most suitable arrangement when using an external antenna is believed to be a method whereby the loop antenna is removed entirely from the circuit and in its place a conventional antenna transformer, consisting of a primary and secondary is used. The secondary winding should have the proper inductance to track with the gang capacitor across the band. A transformer having a variable inductance such as those employing a magnetite core is advantageous to provide proper tracking. When using a separate antenna coil instead of a loop the connecting leads for the circuit should be kept short to avoid pick up on these leads.



## Tube News

(Continued from page 19)

the horizontal sweep circuit, as well as for power rectifiers.

The 6U4GT is also a high-perveance diode, designed as a damper in circuits employing direct coupling between the horizontal-deflection amplifier and the yoke. A high heater-cathode pulse rating makes it possible to eliminate the usual low-capacitance heater transformer, with an attendant reduction in the distributed capacitance of the circuit.

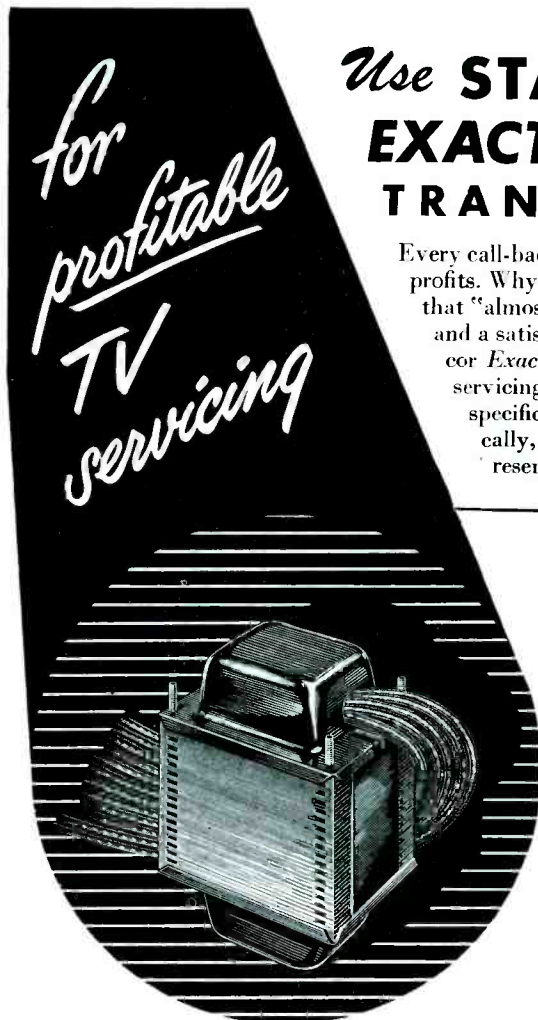
A circuit for the 6BQ6GT/25BQ5GT employing a direct-coupled system is shown in Fig. 1; page 19.

The grid of the 6BQ6GT is driven by a negative peaked sawtooth. This causes a linear current to be drawn through the yoke. At the end of the grid pulse, the 6BQ6GT is driven into cut-off. At this point the energy stored in the yoke collapses and a high spike of voltage is generated. The period of this transient corresponds to the period of the LC circuit comprising the yoke, the charging transformer, and the stray capacitances. This period will be of the order of the retrace time; 1.7500 second, approximately.

At the end of the first half-cycle of transient oscillation, the 6U4GT damper tube starts to conduct heavily and quenches any further oscillation. The degree of damping is controlled by adjusting the diode bias. Linearity of scan is controlled over a range by this means. The horizontal size is controlled by means of a variable series inductance in the yoke circuit. This series inductance acts as a current control for the yoke and therefore, as a size control for the picture.

When the energy collapses in the yoke circuit, the pulse generated by the energy collapse is induced in the charging winding. By auto-transformer and resonant principles, the high voltage is stepped up to a high value, sufficient upon rectification to supply the second anode of the picture tube.

There are several novel economies affected in a circuit of this type. The first is the use of the picture tube coating as a filter capacitor. As a rule, this coating offers a capacitance ranging from 500 to 2,500 mmfd, adequate to filter the rectified high voltage. The use of the 6U4GT as a damper tube is also unique. An examination of the damper circuit shows that the cathode has the high potential applied to it. The use of a 6W4GT or 5Y4GT as a damper requires a low-



## Use STANCOR EXACT DUPLICATE TRANSFORMERS

Every call-back you make means lost time and profits. Why take a chance with transformers that "almost fit?" You're sure of a good job and a satisfied customer when you use Stancor *Exact Duplicate* transformers for TV servicing. These units meet the exact specifications, electrically and physically, of the original components. Representative types are listed below.

**Vertical Blocking - Oscillator Transformer.** Stancor Part Number A-8121. Exact duplicate of RCA type 208T2. For generation of 60 cps required to drive grids of vertical discharge tubes.

**Plate and Filament Transformer.** Stancor Part Number P-8156. Exact duplicate of RCA type 201T6 used in model 630TS receiver.

**Deflection Yoke.** Stancor Part Number DY-1. Exact duplicate of RCA type 201D1. For use with direct viewing kinescopes such as 7DP4 and 10BP4.

**Focus Coil.** Stancor Part Number FC-10. Exact Duplicate of RCA type 202D1. For use with magnetically focused kinescopes such as RCA type 10BP4.

**Horizontal Deflection Output and HV Transformer.** Stancor Part Number A-8117. Exact duplicate of RCA type 211T1. For use with direct viewing kinescopes, such as types 7DP4 and 10BP4.

For complete specifications and prices of these and other Stancor TV replacement components, see your Stancor distributor or write for Television Catalog 337.

**JUST PUBLISHED** — Ask your Stancor distributor or write for your free copy of the **New STANCOR TV COMPONENTS REPLACEMENT GUIDE**, Bulletin 338C. Lists Stancor replacement components for two-hundred and fifteen models and chassis made by forty-three leading receiver manufacturers.



## STANDARD TRANSFORMER CORPORATION

3588 ELSTON AVENUE • CHICAGO 18, ILLINOIS

capacitance filament transformer to isolate the heater and cathode from ground. The 6U4GT, however, has been designed to withstand a heater-cathode potential up to 3,850 volts peak pulse with a duty cycle not exceeding 15%. Incorporation of the 6U4GT eliminates, therefore, the need for a filament isolating transformer.

In Fig. 2 (p. 19) appears a conventional sweep system using a standard 8.3-mh yoke and coupling transformer. This circuit works similarly to horizontal systems in general use today, except that the damper diode-load resistor and the linearity control have been removed from the circuit. Elimination

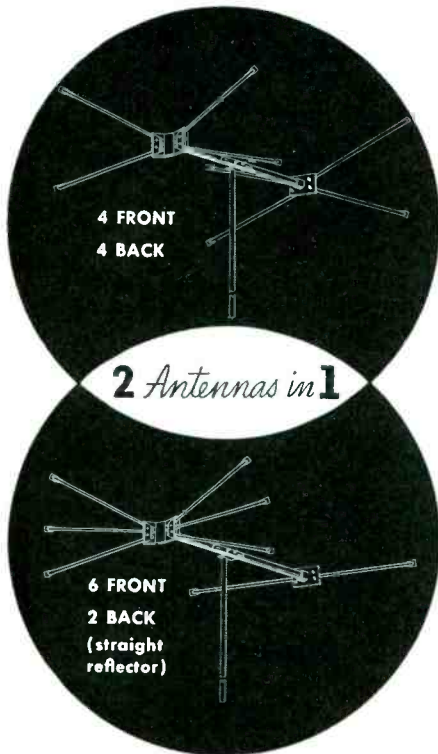
of the damper load resistor is possible because the transformers used were designed to present the proper load across the damper tube. The elimination of this linearity control has little effect on the linearity. It has been found that better linearity correction can be obtained by changing the drive to the sweep amplifier tube.

In both the direct-coupled and the transformer-coupled circuits, the high voltage rectifier used is the miniature type 1X2 tube. In the direct-coupled system, the lower 1X2 plate-to-filament capacitance has been found to provide about 500 volts more anode voltage than is obtainable from a 1B3GT.

# RMS

## ALL-CHANNEL

# VERSACONE



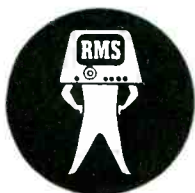
Model V-1  
(8 rods) — list \$ 10.60  
W-2 stacked — list 21.95

By simply shifting the 8 rods in the versatile, preassembled insulator and reflector plates, either arrangement can be installed in seconds!

- Insulator is 1-piece molded Bakelite—sturdy, all-weather resistant.
- Back plate of plated steel, rib-reinforced.
- Sturdy construction withstands rugged service conditions.
- Provides high signal gain for both moderate and fringe areas.
- Dipole ends are so sealed as to prevent wind noise—yet allow water drainage.

See your local Jobber

**RADIO MERCHANDISE SALES, INC.**  
550-S Westchester Ave., New York 55



## Performance Diagnosis

(Continued from page 20)

and with the operating point of this line already located. If we assume a plate voltage change from the operating point of 160 volts,

$$\Delta I = \frac{\Delta E}{R_L} = \frac{160}{2800} = 57 \text{ ma}$$

$$I_Y = 57 \text{ ma} + 50 \text{ ma} = 107 \text{ ma}$$

This value added to  $I_o$  will provide the current point on the zero plate-current axis.

Now we can draw a load line  $YY'$ . From this gain can be found. Let us assume a conservative grid swing of 15 volts peak-to-peak.

$$\text{Gain} = \frac{198 - 120}{15} = \frac{78}{15} = 5.2$$

It is interesting to note that the voltage separation between  $X'$  and  $Y'$  along the plate voltage axis is 60 volts or actually the sum of the *dc* voltage drops across  $R_d$  and  $R_k$ .

### Cathode-Follower Calculation

A similar procedure can be used to determine the operating characteristics of a cathode follower. The unusual feature of the cathode-follower procedure is that the plate load is the actual cathode resistor across which the output is developed. As an example, let us probe the characteristics of the circuit shown in Fig. 3.

First, we have to plot a load line  $XY$  with a slope of 4,000 ohms and the supply voltage as one point of line.

We can then plot the cathode line by finding current points  $I_A$ ,  $I_B$ , and  $I_C$  for bias points of 7.5, 15, and 30.

The operating point is located where two lines intersect:  $I_o$  of 38.5 ma,  $-E_c$  of 19.25 volts, and  $E_p$  of 245 volts.

The true dynamic load line must now be drawn with a slope of 500 ohms, with the operating point as one point on the slope. To do so, let us assume a plate voltage change of 15 volts from the operating point:

$$\Delta I_p = \frac{\Delta E_p}{R_k} = \frac{15}{500} = 30 \text{ ma}$$

We find that this represents a change of 30 ma in the 500-ohm slope. Therefore, it is necessary to locate a second point of the slope which is at  $D$  (38.5 ma - 30 ma = 8.5 ma and 245 volts + 15 volts = 260 volts).

A load line is now drawn between the operating point and  $D$ . This line can now be used to calculate gain, grid drive, etc.

In a cathode follower the applied signal voltage is always greater than the output voltage or:

$$e_{sig} = e_g + e_o$$

The parameter which is presented

# HOT

## nails



**HOT NAILS, INC. NEW YORK**

**SAVES YOU DOLLARS ON TV INSTALLATIONS**

Easily pierces brick, mortar between brick, most concrete. Acts as a mast coupler and stand-off insulator!

Write for **FREE** sample today!

**HOT NAILS, INC.**

40 WEST 4th STREET, NEW YORK 12, N. Y.

## MARCH OF DIMES



**JANUARY 16-31**

You'll be interested in

**TV** engineering

First issue—  
January



on the characteristic curve is  $e_r$  and not  $e_{s1r}$ . It is therefore necessary to calculate  $e_{s1r}$ . This is done by assuming an  $e_r$  change of 13 volts peak-to-peak. The plate-voltage change or  $e_o$  from the load line is  $254 - 230$  or 24 volts. Then we can find the signal voltage with the formula:

$$e_{s1r} = e_r + e_o$$

$$e_{s1r} = 15 + 24 = 39$$

$$\text{Gain} = \frac{e_o}{e_{s1r}} = \frac{24}{39} = .615$$

## Control-Checker

(Continued from page 16)

current cannot flow through any of the components. On the left side of control panel was placed a toggle switch for connecting the female receptacle on the rear of the instrument to the male plug also on the rear so that the voltage at the output receptacle (female) could be fed directly from the wall receptacle. This occurs when the switch is thrown down.

With the switch in the upward position the variac voltages can be applied to the output (female) receptacle.

### Voltmeter Readings

The voltmeter, connected to the output receptacle, provides a reading at all times.

Should the line voltage during a check be found to be low, it is only necessary to throw the toggle switch to the variac position and adjust the selector switch until the voltmeter reads the desired voltage.

### BURLINGAME ASSOCIATES EXPANDS

Burlingame Associates and its affiliate, Brujac Electronic Corporation, have moved to 103 Lafayette Street, New York 13; phone number, DIgby 9-1240.

The new facilities, occupying an entire floor of 4,000 square feet, include a technical sales and customers service department, a conference and show room which is sound-treated, and a fully equipped repair and service department.

Bruce O. Burlingame and Jack Grand are partners in the company.

Companies represented by Burlingame Associates include: Hewlett-Packard Co., The Erush Development Co., Audio Development Co., Sorenson & Co., Tel-Instrument Co., etc. Brujac Electronic Corporation is the sole distributor for Tektronix Inc., Brown Electro-Measurements Corp., Beta Electronic Corp. and Electronic Measurements Co.

# TELEVISION SELLS Alliance Tenna-Rotor *Right in the Home!*

"Son, there's the answer!  
clearer pictures...  
...more stations  
ALLIANCE TENNA-ROTOR!"



**4,500,000 Viewers  
Around 40 TV Stations  
See TENNA-ROTOR in Action—Each week!**

Every TV set owner wants more distance—less interference—clearer pictures! Alliance Tenna-Rotor means faster antenna installations—fewer call-backs—happier customers! *Guaranteed for one year!*

**ALLIANCE MANUFACTURING COMPANY • Alliance, Ohio**

Export Department: 401 Broadway, New York, N. Y., U. S. A.

### AEROVOX ACQUIRES ELECTRICAL REACTANCE CO.

The entire outstanding stock of Electrical Reactance Co., has been purchased by Aerovox Corp., New Bedford, Mass.

Electrical Reactance, with plants at Franklinville, N. Y., Jessup, Pa., and Myrtle Beach, S. C., will be operated as a wholly-owned subsidiary under the continuing management of Charles E. Krampf as president. Krampf, largely responsible for the development and growth of Electrical Reactance, manufacturer of ceramic capacitors, becomes a director of Aerovox.

### SYLVANIA ELECTRIC RADIO-TV SERVICE MEN'S CAMPAIGN

Facilities of radio and television Service Men will be promoted by the radio division of Sylvania Electric Products Inc., in a series of national ads in the *Saturday Evening Post*, *Life*, *Look*, *Collier's*, and *Radio & Television Best*, scheduled to start in January.

Sylvania will supplement the ads with a cooperative campaign kit for Service Men and dealers which includes four-color window posters based on the monthly ad, two-color streamers, three-color postal cards, free mats for local newspaper advertising, and radio spot announcements.

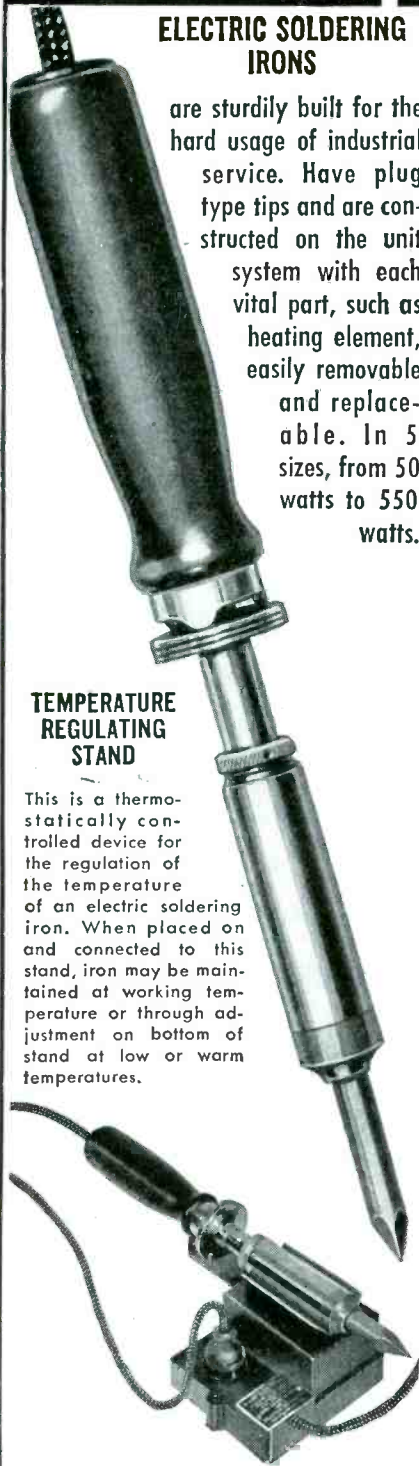
# American Beauty

## 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

110-1

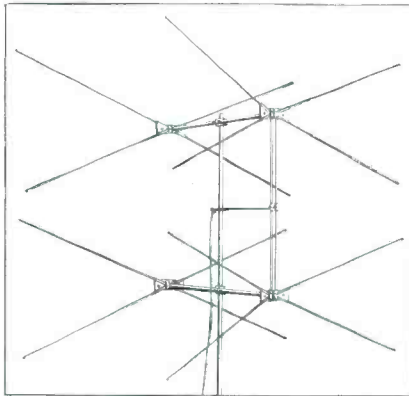
**AMERICAN ELECTRICAL  
HEATER COMPANY  
DETROIT 2, MICH., U. S. A.**

## New TV Parts . . . Accessories

### C-D CONICAL TV ANTENNA

A conical TV antenna, the *Mighty-N Skyhawk*, has been announced by Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

Available in two models: LZN-2, a 2-bay package, complete with an 8-foot mast, and model LZN, a single-bay package without a mast. Separate wave-jumpers available for stacking.



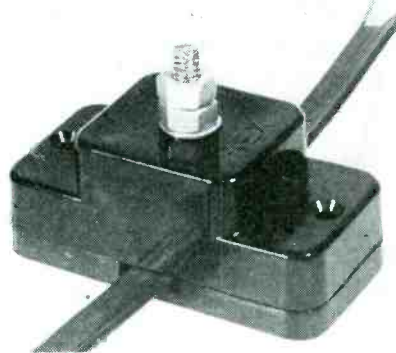
\* \* \*

### LENNOX TV/FM LIGHTNING ARRESTER

A lightning arrester, Rex type, for FM and TV, which it is said can be used on flat 300 ohm, round 300-ohm, and the shielded twin-line has been announced by Lennox Industries, Inc., 6007 Euclid Ave., Cleveland 3, Ohio.

One side of the bottom plate, which holds leadin in place, has a shallow groove for flat twin leads. The other side of the plate has a half round groove which fits both the round and shielded lines.

All insulating parts are of polystyrene. Electrical circuit consists of a balanced bleeder network and a small gap for each wire in the leadin. Listed by the Underwriters Laboratories.

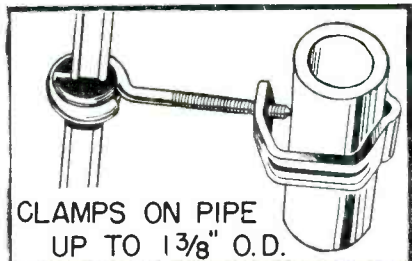


\* \* \*

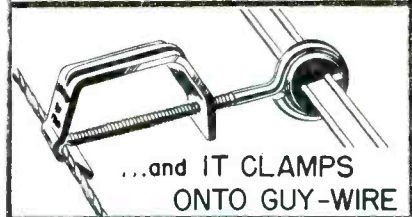
### PHILCO TV AND SOUND ACCESSORIES

Three types of biconical TV antennas six alignment jigs, a three-speed record changer, 45-rpm record adapter discs and non-slip driver have been announced by the accessory division of Philco.

## *Muller* TENNA-CLAMP COMPLETELY NEW AND DIFFERENT



CLAMPS ON PIPE  
UP TO 1 3/8" O.D.



...and IT CLAMPS  
ONTO GUY-WIRE

SUPPORTS TV LEAD-INS ON MASTS,  
PIPES, CROSS-ARMS, GUTTERS  
AND GUY-WIRES

- ONE STANDARD SIZE solves all sorts of lead-in problems.
- BRINGS LEAD-IN TO EDGE OF ROOF—right where you want it—holds lead-in away from gutters.
- DULL POINTED SCREW—solid grip on mast.
- ON MASTS TOO BIG for clamp—use the guy-wire.
- AVAILABLE FOR COAX and double lead-ins.

LOW PRICES!

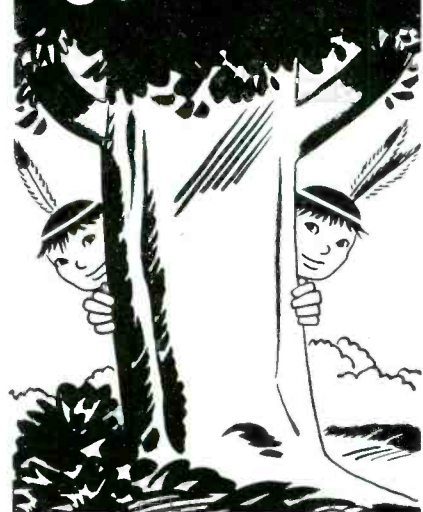
9c net—only \$7.80 per 100

SEND FOR FREE SAMPLE AND CATALOG 810

*Muller Electric Co.*

1565 E. 31st ST., CLEVELAND 14, OHIO

# THE REDSKINS ARE COMING!





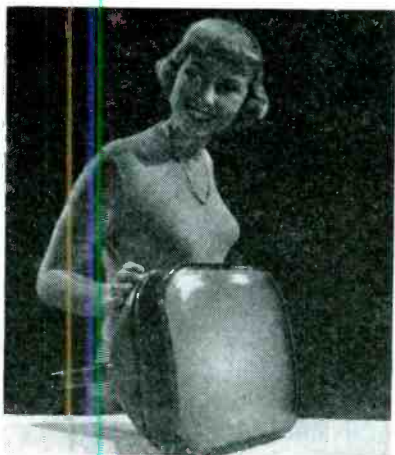
### HYTRON RECTANGULAR ALL-GLASS TV PICTURE TUBES

A 16-inch picture tube, type 16RP4 with a rectangular screen is now being manufactured by Hytron Radio & Electronics Corp., Salem, Massachusetts.

Tube is said to take approximately the same cabinet space as a round 12-inch picture tube.

The picture, with standard 3 by 4 aspect ratio, has a usable screen area of 138.7 square inches. A neutral gray face increases contrast ratio.

Weight of the 16RP4 is said to be approximately two-thirds that of the 16-inch, all-glass round tube. Magnetic focus and deflection are employed.



\*\*\*

### SNYDER WALKER-DUALCOTED STEEL TV MASTS

Walker dualcoted steel masts, which it is claimed, offer greater protection against corrosion, are being used with the Redi-Mount and Head-Line antennas made by Snyder Mig. Co., at 22nd and Ontario Streets, Philadelphia 40, Pa. Both inner and outer tube walls are said to be protected by a double safety coating that will not crack or chip if bent during installation.

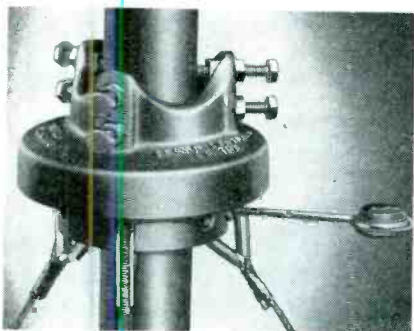
\*\*\*

### CROWN CONTROLS MAST GUY RINGS

A roller bearing guy ring, designed so that masts of antenna can be rotated without loosening the guy wires, has been announced by Crown Controls Company, Inc., 24 S. Washington St., New Bremen, Ohio.

Housing of the guy ring is of a one piece aluminum casting, molded of a material which is said to have high corrosion resistance qualities. Has a patented *Weather Guard* feature which directs water and ice formations out of the path of the bearing race.

Unit is packaged with three guy thimbles, one stand-off insulator, and all the necessary locking bolts and nuts, ready for installation.



# Aluminum

## VOICE COILS

ASSURE FINER PERFORMANCE





## Cletron

### QUALITY FEATURES

- ✓ **WEATHER-PROOF**  
Speakers play under water.
- ✓ **STRONG CONSTRUCTION**  
3" speaker supports 300 lbs.
- ✓ **INDIVIDUALLY PACKED**  
In strong corrugated cartons.
- ✓ **A COMPLETE LINE**  
An Alnico V or EM speaker for every sound need.

# Aluminum

## DISSIPATES HEAT QUICKLY AND ALLOWS HIGHER POWER

**ALUMINUM VOICE COILS** have proved tops in performance! They handle greater power than ordinary coils without distortion or heat. Aluminum withstands any climatic condition... there's no warping, buckling or corrosion. Test them all... you'll choose Cletron Aluminum Voice Coil Speakers.

Cletron

## RADIO LOUDSPEAKERS

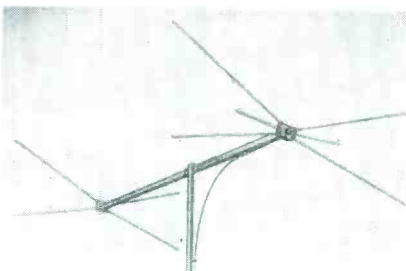
CLEVELAND ELECTRONICS, INC.  
6611 EUCLID AVENUE  
CLEVELAND, OHIO  
MORHAN EXPORTING CORP.  
458 BROADWAY, NEW YORK, N.Y.

### CLEAR BEAM V-CONE TV ANTENNA

A V-cone line of TV antennas featuring phenolic heads, have been announced by Clear Beam Antennas, 618 North La Brea Avenue, Los Angeles 36, Calif.

Head is said to be guaranteed for five years.

Antennas, with the new head are available in three models, for normal, fringe, and low signal areas.



### INSULINE TV MULTIPLIER PROBE

A multiplier probe, the *Kilovoltter*, which, in effect, is said to add 15,000 volts to the scale readings of conventional high-resistance voltmeters, has been announced by the Insuline Corp. of America, 3602 35th Ave., L. I. City, 1, N. Y. Three models are available, for 50, 100 and 200-microampere meter movements.



**MERIT**  
NEWS



Merry  
Christmas

May  
You

MERIT

The  
Best In

1950



PRODUCTS OF MERIT



ANNIVERSARY  
25  
MERIT  
COIL & TRANSFORMER CORP.

4435 NORTH CLARK ST., CHICAGO 40, ILL.

**TRIO YAGI ANTENNA**

A yagi (double-folded dipole) TV antenna has been announced by the Trio Manufacturing Co., Griggsville, Illinois.

Antenna is available for each of the 12 TV channels.

Antenna is said to have a gain of 10 db on the optimum channel, front-to-back ratio of over 25 db.

Available for channels 2 to 6 with mast and mounting hardware, and for the high bands, less mast.



\* \* \*

**RMS TV ANTENNAS**

Two antenna models, Versacone and Jackknife, have been announced by Radio Merchandise Sales, Inc., 550 Westchester Ave., N. Y. 55.

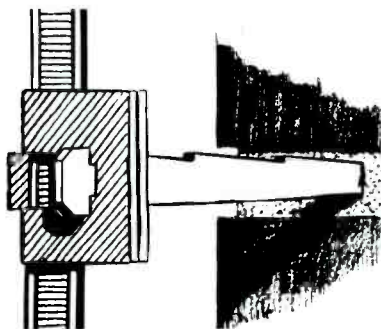
Versacone is a conical which is said to be adaptable in various arrays by shift of rods in the reflector and insulator plates. The Jackknife is a pre-assembled, all-channel model that requires no manipulation of the rods, in conical, folded and straight dipole models.

\* \* \*

**TV INSTALLATION HOT NAILS**

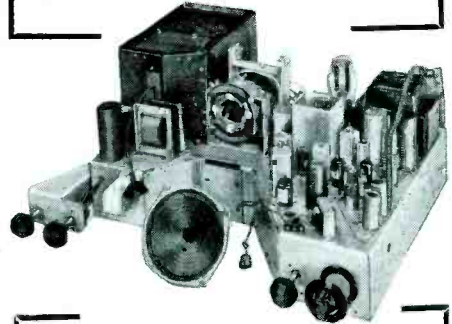
Hot Nails which are said to pierce brick, mortar between bricks, wood or even most concrete have been announced by Hot Nails, Inc., 40 West 4th Street, N. Y. C. Furnished with a polyethylene insulator. Fits all types of transmission line including light and heavy 300 ohm—50 and 72 ohm coaxial cable. On the antenna itself, a Hot Nail acts as a mast coupler.

Made of high carbon steel, 3 1/4" long.



New **TECH-MASTER**  
**BLUE RIBBON**  
**TELEVISION KIT**  
featuring **AGC**

(automatic gain control)

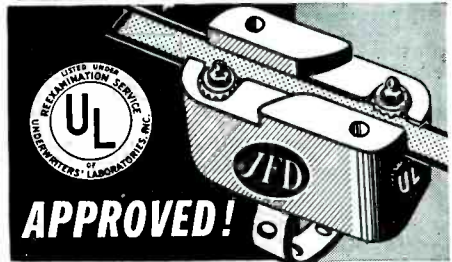


**for 10" or 12" KINESCOPES**

Four-stage video IF—4 Mc band width. Completely assembled . . . ready to wire. Factory tested parts of finest make. Trouble-free wiring diagrams permit wiring in a week-end. Write for complete information on the "Blue Ribbon" and other Tech-Master TV products. Complete with all tubes, less Kinescope . . . . . \$119.95

**TECH-MASTER PRODUCTS CO.**  
443-445 Broadway, New York 13, N. Y.

More leading engineers and technicians have built Tech-Master for their own use than any other Television Kit.



for **OUTDOOR-INDOOR USE**

**JFD SAFE TV GUARD**  
Twin Lead  
**Lightning Arrester**

Protects Television Sets Against Lightning and Static Charges **\$225** LIST

The **ONLY** Twin Lead Lightning Arrester Approved by **UL** for Outdoor-Indoor Installation.

**SIMPLE TO INSTALL** . . . attaches to any grounded object—pipe, radiator, roof, wall—at any position between antenna and the set, indoor or outdoor.

**NO WIRE STRIPPING** or **CUTTING** or **SPREADING** of lines necessary. 300 ohm impedance . . . does not unbalance line.

One Dozen To Package with **FREE** Self-Selling Display Card.  
No. AT102-12

Advertised in Consumer Publications To Help Your Sales

©1950, JFD MFG. CO., Inc.

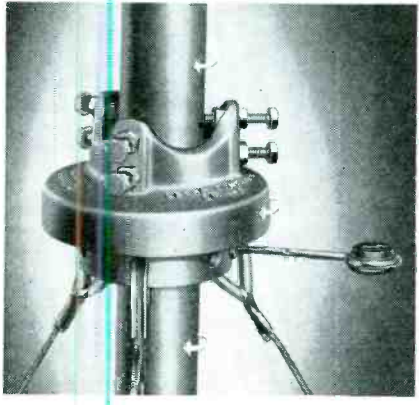




**NEW...**

**ALL-WEATHER  
ROLLER BEARING  
GUY RING**

(patents pending)



**Permits TV and FM Antenna  
Masts to be Rotated  
Without Touching Guy Wires**

Furnished complete with standoff insulator, nuts, and guy wire thimbles. Laughs at rain, snow, and ice. Corrosion free. For use with or without antenna rotators.

Write for name of nearest jobber.



**CROWN CONTROLS CO., INC.,**  
New Bremen, Ohio

**New Parts, Accessories**

**ASTRON METALLIZED PAPER CAPACITORS**

A midget self-healing metallized paper capacitor, in both hermetically sealed and cardboard tubular design, has been announced by Astron Corp., 900 Passaic Avenue, East Newark, N. J.

Known as type MQ, they are available now in voltage ratings up to 600 volts and are supplied with glass-to-metal hermetic terminal seals.

Officers of Astron include Joseph Frank, president; John H. Fisher, chief engineer and Irving Black, production director and vice president, all former Solar Mfg. Corp. employees.



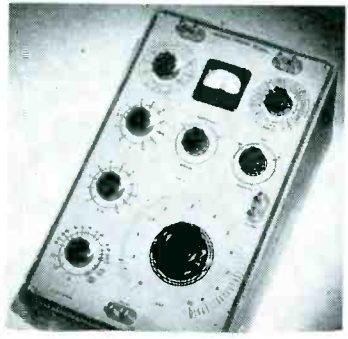
\* \* \*

**HEATH IMPEDANCE BRIDGE KIT**

An impedance bridge kit featuring use of a General Radio main calibrated control and 1,000-cycle hummer, Mallory ceramic switches with 60° indexing, 200 microamp zero center galvanometer and 1/2 of 1% ceramic non-inductive decade resistors has been announced by the Heath Co., Benton Harbor, Mich.

Measures inductance from 10 microhenries to 100 henries; capacitance from .00001 mfd to 1,000 mfd; resistance from .01 ohms to 10 megohms; dissipation factor from .001 to 1 and Q from 1 to 1,000.

Circuit utilizes Wheatstone, Hay and Maxwell circuits.



**FOR ORIGINALITY**

**LOOK TO XCELITE**

**WHAT BETTER BUY  
In Quick-Change Tools?**



Here's a real saving over buying separate tools! Faster work, too! The XCELITE No. 99 Kit has 9 chrome plated detachable nut drivers, 3/16"-1/2"; 2 screwdriver sizes in chrome plated detachable blade; detachable reamer; big, comfortable XCELITE combination handle that fits them all. In compact, good-looking metal case—all for **\$9.95!**

ASK YOUR TOOL SUPPLIER NOW!  
Or write:

**PARK METALWARE CO., INC.**

Dept. V

Orchard Park, N. Y.



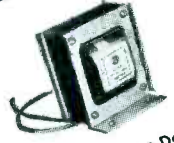
**RCA  
TELEVISION  
COMPONENTS**

**FIRST** in engineering  
**FIRST** in quality

Type 208T2 Vertical-Blocking Oscillator Transformer



Type 211T5 Horizontal-De-Reflection Output and HV Transformer



Type 204T2 Vertical-De-Reflection-Output Transformer

• **Better** because they're RCA-engineered . . . **widely accepted** because they're backed by the leader in television . . . RCA standard television components mean greater sales and service volume for you throughout the year.

RCA television components are the quality standards of the field for all TV replacement requirements.

**Always keep in touch  
with your RCA Distributor**

TURN TO NEXT PAGE



**ELECTRONIC COMPONENTS  
RADIO CORPORATION OF AMERICA  
HARRISON, N. J.**



Three decades of radio-television "know-how"

insist on.....insuline

- ... for superb television
- ... for fidelity FM reception
- ... for high quality
- ... for low prices

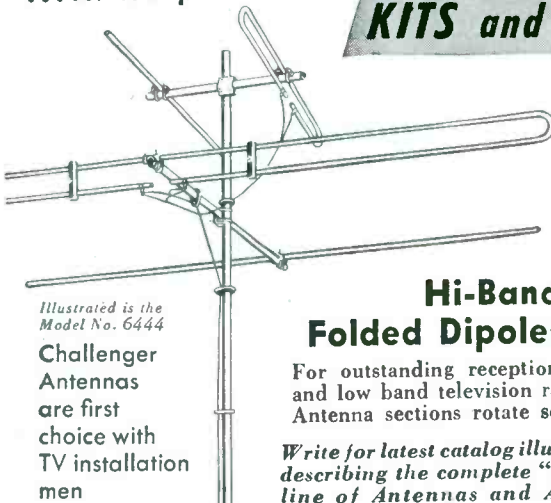
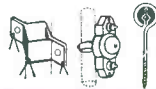
# Challenger ANTENNAS KITS and ACCESSORIES

The "Challenger Line" features precision engineering... manufacturing skill... maximum performance... competitive prices. There is an Insuline "Challenger" for every requirement... outdoor, indoor, window.

## Hi-Band Lo-Band Folded Dipoles and Reflectors

For outstanding reception over the entire high band and low band television range. Ideal for "fringe" areas. Antenna sections rotate separately. Easy to install.

Write for latest catalog illustrating and describing the complete "Challenger" line of Antennas and Accessories.



Illustrated is the Model No. 6444

Challenger Antennas are first choice with TV installation men



## insuline CORPORATION OF AMERICA

INSULINE BUILDING • 36-02 35th AVENUE • LONG ISLAND CITY, N. Y.  
West Coast Branch and Warehouse: 1335 South Flower Street, Los Angeles, Calif.  
Exclusive Canadian Sales Agents: CANADIAN MARCONI COMPANY, Montreal

## ELECTRO-VOICE OMNI DIRECTIONAL CRYSTAL MICROPHONE

An omni directional crystal microphone, the *Spherex*, has been announced by Electro-Voice, Inc., Buchanan, Michigan.

Features 360° omnidirectional polar pattern, frequency response that is said to be substantially flat from 60-7000 cps, output level -50 db, standard 5/8" -27 thread for desk or floor stand mounting. Size, 2 1/4" diameter. Net weight, 8 ounces. High impedance; can be used with any standard amplifier or recorder employing high impedance input.



\*\*\*

## AEROVOX BANTAM ELECTROLYTICS

Miniaturized bantam-type electrolytics, type SRE, have been announced by Aerovox Corp., New Bedford, Mass.

Hermetically-sealed in tubular aluminum cases. Wax-impregnated cardboard insulating jackets. No. 18 gauge tinned-copper leads said to assure positive mechanical and electrical contacts even with the smallest units.

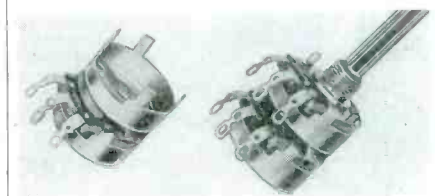


\*\*\*

## IRC MULTISECTION CONTROLS

Complete control sections, *Multisections*, that can be added to any of the recently announced IRC miniature Q, PQ, or RQ volume controls, just as switches are attached, have been announced by the International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. Each *Multisection* adds 19/32" depth to the basic control.

*Multisections* are made in 17 different standard resistance values ranging from 1,000 ohms to 10 megohms. Bulletin DC1A contains complete data.



### 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 BATTERY ELIMINATOR KIT** \$22.50

**Heathkit TELEVISION GENERATOR KIT** \$39.50

**Heathkit SIGNAL TRACER KIT** \$19.50

**Heathkit ELECTRONIC SWITCH KIT** \$34.50

**Heathkit CONDENSER CHECKER KIT** \$19.50

**Heathkit R.F. SIGNAL GEN. KIT** \$19.50

**Heathkit VACUUM TUBE VOLTMETER KIT** \$24.50

**NEW Heathkit IMPEDANCE BRIDGE SET** \$69.50

**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 Handi-Tester), all tubes, coils assembled and calibrated, panel already printed, chassis all punched, formed and plated, every part supplied. Each kit is provided with detailed instruction manual for assembly and use. Heathkits provide the perfect solution to the problem of affording complete service equipment on a limited budget. Write for complete catalog.

## HEATH COMPANY

BENTON HARBOR, 11 MICHIGAN

EXPORT DEPARTMENT  
13 EAST 40th STREET  
NEW YORK 13, N.Y.  
CABLE - ARAC - N.Y.



**RIDER MANUAL VOL. 20 OUT IN JANUARY**

Rider's Manual, volume 20, with servicing data on AM, FM, auto receivers, and record changers, will be published in January by John F. Rider Publishers, Inc., 48C Canal St., New York 13.

A *How it Works* book with cumulative index for volumes 16 through 20 will be included.



*only*

**QUAM**

*offers you this PLUS value*

Among all the radio speakers made today there's only one that's different.

Only Quam has the adjustable voice coil, permitting accurate centering after assembly, and virtually eliminating rubbing voice coil trouble!

Only Quam has the U-Shaped Coil Pot, providing an unbroken path for the magnetic flux, thus producing a stronger magnetic field, greater efficiency and better performance.

Only Quam has these plus values, only Quam is different.

Specify Quam for all replacements!

Mail this coupon for free catalog.



QUAM-NICHOLS CO.  
526 E. 33rd Place  
Chicago 16, Illinois

Please send me Quam catalog.

Name .....  
Address .....  
City ..... State .....

**PRECISION APPARATUS MANAGEMENT CHANGES**

S. M. Weingast who was the co-founder, with the late Murray Mentzer, of the Precision Apparatus Company, Inc., Elmhurst, L. I., N. Y., 17 years ago, has been elected president and general manager of the company.

The company's chief engineer, G. N. Goldberger, has been named vice president, in charge of engineering, and treasurer.

J. M. Kirschbaum has been named vice president in charge of sales. A. S. Weingast, formerly personnel and production manager, has been advanced to the office of secretary and director of purchasing.

\* \* \*

**WORKSHOP ASSOCIATES CATALOG**

A four-page brochure describing beacon antennas (144-152, 152-162, 162-174, 450-460, 460-470 mc) has been published by The Workshop Associates, Inc., 66 Needham St., Newton Highlands 61, Mass.

Described are principle of operation, installation hints, electrical and mechanical specifications. A page is devoted to a description of adaptors and connectors used with the antennas.

\* \* \*

**HICKOK OSCILLOGRAPH BOOKLET**

A 50-page booklet, *The Oscillograph*, prepared by Walter Weiss, has been published by The Hickok Electrical Instrument Company, 10521 Dupont Avenue, Cleveland 8, Ohio.

Covered are application data on the power supply, oscillator section, first detector, if amplifier, first and second audio stages, final audio, and TV and FM alignment. Book, with actual diagrams of wave shapes drawn from a scope screen, available at \$1 per copy.

\* \* \*

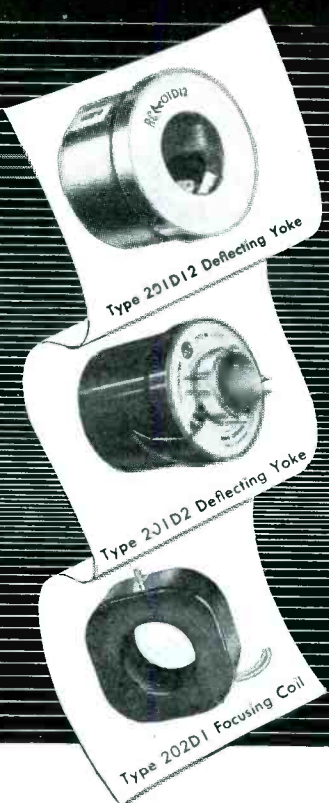
**TV BOOSTER FAN MAIL**



William J. Doyle, left, general sales manager of The Astatic Corporation, Conneaut, Ohio, reviewing fan mail from users of Astatic's Channel Chief booster, with F. H. Woodworth, company president.

**RCA TELEVISION COMPONENTS**

**A complete line for replacement purposes**



● RCA has all the major components required for television receiver repair or construction. Designed at "Television Headquarters," RCA vertical and horizontal output transformers, yokes, focusing coils, etc., are the originals around which modern television receivers are designed. And you can get them all from one dependable source of supply... your local RCA Distributor.

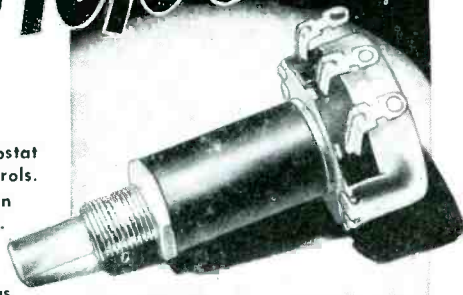
**Always keep in touch with your RCA Distributor**

TURN TO NEXT PAGE



# SAFE at 10,000V!

- ★ Factory-fitted to most Clarostat carbon and wire-wound controls.
- ★ Control-to-ground breakdown rating better than 10,000 v.
- ★ New design eliminates troublesome backlash. Permits more critical settings.



## IMPROVED HIGH-VOLTAGE CONTROLS

Improved design high-voltage controls for TV sets, oscillographs and other high-voltage electronic assemblies. Safe operation up to 10,000 v.

Straight-through plastic shaft simplifies and improves operation. No back-lash to throw off critical adjustments. Cheaper. Better. Simpler.

Ask your Clarostat jobber for these controls and other aids to TV and radio servicing.



CLAROSTAT



*Controls and Resistors*

CLAROSTAT MFG. CO., INC. • DOVER, NEW HAMPSHIRE • In Canada: CANADIAN MARCONI CO., LTD. Montreal, P. Q., and branches

## 1950 RCA VESTPOCKET TUBE REFERENCE BOOK

The 1950 edition of the RCA Tube Department's, *Tube Reference and Calendar Notebook*, is now available from RCA Tube Department distributors.

Edition includes television service data and the latest information on tubes and batteries. The book contains 47 pages of receiving tube characteristics and socket-connection diagrams, and 12 pages of technical data on 300 RCA power, cathode-ray, photo-, and special tubes. Included are a *Quick Selection Buying Guide*, and a *Replacement Directory* listing RCA tubes that are directly interchangeable with or similar to corresponding types.

A four-page section on batteries features chart giving descriptions, voltages, and sizes of 80 RCA batteries plus an interchangeability chart.

\* \* \*

## LAFAYETTE RADIO HI-FI MUSIC GUIDE

A twelve-page booklet, *High-fidelity Music Guide*, has been issued by Lafayette Radio, 100 Sixth Avenue, New York City.

Brochure was created by David Randolph, music consultant for Lafayette.

Guide presents parts assemblies, together with suggestions for cabinets and their location, a glossary of technical terms, a chart of the range of musical sounds, and a technical explanation of the requirements for high fidelity sound reproduction.

\* \* \*

## CARL J. HOLLATZ NOW RCA TUBE DEPARTMENT CONSULTANT

Carl J. Hollatz has been retained as a consultant to the sales division of the tube department of RCA. Hollatz, formerly vice president of the Belmont Radio Corporation, will make his headquarters in Chicago.



\* \* \*

## WALDOM CATALOG

A 24-page illustrated catalog with a listing of replacement cone assemblies, both postwar and prewar, including some 1948 and 1949 models, has been published by Waldom Electronics, Inc., 911 North Larrabee Street, Chicago, Illinois.

Information offered includes part number, set model number, outside diameter of cone and pertinent dimensions consisting of outside diameter of speaker, inside diameter of voice coil, depth of cone, type of spider, etc.

\* \* \*

## NEWARK ELECTRIC CATALOG

A catalog covering television receivers, kits and wired chassis, cabinets, tubes, parts, etc., test instruments, FM-AM tuners, amplifiers, speakers, record changers, wire, tape, and disc recorders, phono, record discs and accessories, has been released by Newark Electric Co., Inc., 242 West 55th St., New York 19.

**THE REDSKINS ARE COMING!**

**SHOOTS TROUBLE FASTER!** Makes more money for you on job at service bench!



PRICE \$9.95 at distributor or postpaid, direct. Sorry, no C.O.D.'s. Orleans add 3% State Sales Tax.

**Signalette**

### MULTI-FREQUENCY GENERATOR

In radio service work, time means money. Locate trouble faster, handle a much greater volume of work with the SIGNALETTE. As a trouble shooting tool, SIGNALETTE has no equal. Merely plug in any 110V. 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 distributor or order direct.

**Clippard** INSTRUMENT LABORATORY Inc.

DEPT. S. 1125 BANK STREET  
CINCINNATI 14, OHIO  
QUALIFIED JOBBERS WRITE.  
WIRE FOR DETAILS.



*Nation-wide*  
**ACCEPTANCE**  
on Proven Superiority



**ANCHOR**  
**TV PRE-AMPLIFIER**  
Here's Proof of Distributor Acceptance

SOUTH BEND, IND.—"We have found Anchor TV Pre-Amplifier to be superior in performance to anything else on the market. It has been a profitable item on which we have built up dealer good will."

COMMERCIAL SOUND & RADIO CO.—A. E. Kester, Pres.

PHILADELPHIA, PA.—"Anchor Booster's consistency, its high gain and its performance in outer fringe areas have built for it a reputation which cannot be beat in our area. The excellency of this product has opened up many television areas and many additional sales in Television Receivers, their component parts and accessories."

RADIO ELECTRIC SERVICE COMPANY OF PENNSYLVANIA  
Albert N. Kass, Sales Manager

**ANCHOR** has established general acceptance and good will for all good boosters through its own top-notch performance!

Unanimous proven verdict of users. Anchor's engineering is not approached—nor will it ever be.

The ANCHOR BOOSTER is built to help you make the best TV installations possible for your customers.

Why then be satisfied with the ordinary? Anchor builds demand for reliable boosters—making more sales—adding good will. Tie Anchor Booster into every television sale.

Here is dependability with instant sales appeal—2½ times average gain (Voltage Ratio), guaranteed coverage of low and high band—precision with beauty—pride in having the best!

Get in touch with your jobber—or write ANCHOR ANCHOR ENGINEERING ALWAYS A YEAR AHEAD



**QUICK-WEDGE SCREW-HOLDING SCREWDRIVER**

Holds, Starts, and Drives Screws with same tool! Eliminates Fumbling!

6 inch 90c 8 inch 95c

Made In Three Types  
Light Duty 2" to 8"  
Medium Duty 4" to 8"  
Heavy Duty 4" to 14"

ASK YOUR JOBBER OR ORDER DIRECT  
**Machinery Sales & Equipment**  
626 Broadway, Cincinnati 2, Ohio

**RACON SOUND BOOKLET**

A 4-page booklet with practical instructions and wiring diagram for the home-building of an economical, professional type 1,000-cycle crossover network, has been released by Racon Electric Co., Inc., 52 East 19th Street, New York 3.

A full range of specific inductance, capacitance and resistance values are given, plus complete coil winding information, to adapt the crossover network for use with cone speaker impedances of from 4 to 16 ohms. Steps for the installation of crossover networks, wide range tweeters, and standard cone speakers are also described in detail.

\* \* \*

**SYLVANIA GERMANIUM DIODE MERCHANDISER**

Germanium diodes, types 1N34A and 1N58A, recently announced by the electronics division of Sylvania Electric Products Inc., will be marketed to Sylvania distributors in a 25-unit carton and counter merchandiser featuring an oval window in the top permitting visual inspection.

\* \* \*

**TUNG-SOL TUBE DATA**

A bulletin, describing the 5687 twin triode, has been released by Tung-Sol Lamp Works, Inc., Newark 4, N. J.

Offered are rating and characteristic data.

\* \* \*

**APPROVED FM-AM TUNER BULLETIN**

A four-page catalog covering a high-fidelity FM-AM tuner, model A710, has been published by Approved Electronic Instrument Corp., 142 Liberty St. New York 6.

\* \* \*

**KAMEN COAX PAPER IN JANUARY**

THE CONCLUDING installment of the Ira Kamen article on coax cable installation originally scheduled for December will appear in the January issue of SERVICE.

\* \* \*

**NEWCOMB HIGH FIDELITY AMPLIFIER**

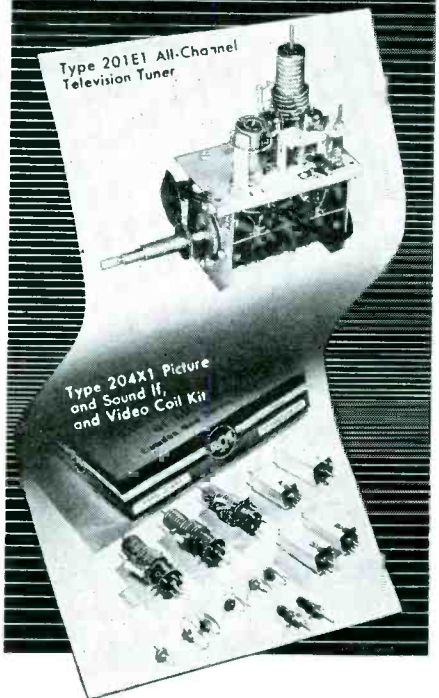
A 25-watt amplifier with a frequency response from 20-20,000 cycles, that offers 6 input channels, five for microphone and one for phono with built in preamp to permit use of magnetic pickups, has been announced by the Newcomb Audio Products Company. All 6 channels may be remote controlled from the audience by a control unit. A locked cover over controls prevents tampering with adjustments.

Bandwidth control is said to provide adjustment of frequency bandwidth of the amplifier in keeping with the program quality, leaving tone controls free to provide correct balance between highs and lows. Plug-in input transformers permit long mike lines where desired. Visual indicators reveal power output in watts and indicate distortion.

Distortion at rating is said to be less than 3% with 90% of full output at less than 1%.

**RCA**  
**TELEVISION COMPONENTS**

**The standards for TV set construction**



● You don't have to shop around for television parts. RCA has a complete line of genuine components and units for replacement needs . . . or shop construction of a top-quality television receiver.

The parts and units you need are all described in a new bulletin now available from your local RCA Distributor. Or write RCA, Commercial Engineering, Section 56LV, Harrison, New Jersey.

**Always keep in touch with your RCA Distributor**



# SOLVE your hi-fidelity problems with University TWEETERS

WIDEST SELECTION • BEST VALUE • HIGHEST QUALITY

## SINGLE UNIT TWEETERS

**MODELS 4408, 4409—600 CYCLE TWEETERS:** Recommended for highest quality reproduction systems requiring a low crossover frequency. Cobra shaped horn results in perfect wide angle distribution. Frequency response 600 to 15,000 cycles. Model 4408 handles 6 watts and 4409 25 watts.



**MODEL 4407 ADAPTER MOUNTS 4401 TWEETER IN ANY 12" CONE UNIT:** Converts any 12" cone speaker into a wide-range coaxial reproducer in a few minutes. Installation is extremely simple and results in a dual speaker occupying little more space than the original cone speaker. Complete with 4401 tweeter.



**MODEL 4401—2000 CYCLE TWEETER:** An economical 6 watt unit for converting any good 10-15" cone speaker for extended response to 15,000 cycles. Wide Angle horn, compact design and low price bring excellent high fidelity well within the popular price range.



## DUAL TWEETERS



**MODEL 4402, MODEL 4404:** Model 4402 reproduces to 15,000 cycles. Cross over at 2000 cps. Horizontal dispersion 100°, Vertical 50°. Handles 12 watts. Compact design mounts in any radio, phono, or speaker cabinet. Model 4404 incorporates 4402 tweeter in handsome walnut cabinet complete with high-pass filter and high frequency volume control. Any one can install.

## CROSSOVER NETWORKS



**MODEL 4405 HIGH PASS FILTER:** An effective and economical unit for preventing lows reaching the tweeter unit. Contains high frequency control to balance highs and lows. Cutoff frequency 2000 cycles.



**MODEL 4410, 4420 LC CROSSOVER NETWORK:** Genuine LC frequency dividers for segregating highs and lows. Not to be confused with ordinary high-pass filters. Crossover frequencies: Model 4410 600 cycles, Model 4420 2000 cycles. Attenuator controls included and wired.

Write today for illustrated literature — address inquiries to Department C

# University

**LOUDSPEAKERS • INC**

80 SO. KENSICO AV., WHITE PLAINS, N.Y.

## JOTS AND FLASHES

TV's boom in popularity appears to have made quite an impression on many large apartment realtors, who have begun to make wide-scale plans for antenna outlets for their tenants. In New York, builders of three huge projects, including the Schwab House, with seven hundred apartments, agreed to install antenna systems which will enable over a thousand families to plug into wall assemblies for antenna connection. . . . R. W. Fordyce has succeeded E. C. Bonia as sales manager of the Bendix television and receiver division of Bendix Aviation Corp. . . . John Winter is now executive vice president of the House of Television, Inc., 40 West 4th Street, N. Y. C. . . . Bruno New York, Inc., 460 W. 34th Street, N. Y. C., have been appointed distributor for the Jerrold Mul-TV system. . . . John F. Rider, Publisher, Inc., 480 Canal Street, N. Y. 13, N. Y., has been elected to an associate membership in R.M.A. . . . *Aero-Tenna*, an indoor TV antenna, recently announced by Aero Needle Co., 619 N. Michigan Avenue, Chicago, will be distributed nationally. . . . Al Elmer has been named manager of the new Atlantic City, N. J., store of Almo Radio Co., at 4401 Ventnor Avenue. . . . George W. Davis, 1406 S. Grand Avenue, Los Angeles, Calif., has opened his own office as a manufacturers' rep. . . . William O. Schoning of Lukko Sales and Aaron Lippman have been named chairman and vice chairman, respectively, of a distributors advisory committee, recently set up by the Radio Parts and Electronic Equipment Shows, Inc. Other members of the committee are: Sam Poncher, Newark Electric; Lewis J. Bonn, Lew Bonn Co.; Merle Applebee, Burstein-Applebee; H. L. Dalis; William A. Wilson, Hughes-Peters, Inc.; R. V. Weatherford, R. V. Weatherford Co.; Milton Deutschmann, Radio Shack Corp., and John Stern, Radio Electric Service Co. . . . Ben Wilzig and Ed Deutsch have formed the Marathon Sales Co., 466 W. 42nd Street, New York 18, N. Y. . . . Benray Distributors, 506 Coney Island Avenue, Brooklyn 18, N. Y., have been appointed exclusive distributors for American Television and Radio Co. auto radio replacement vibrators in the Flatbush area of Brooklyn. . . . Edward J. Bacher is now the National Union Tube sales manager to initial equipment accounts in the Chicago area and adjacent states. Bacher was formerly with RCA. . . . The 40th anniversary banquet of the Radio Club of America was held recently in New York. Guest of honor was Major General Harry C. Ingeles, formerly chief signal officer and at present president of RCA Communications, Inc. . . . An eight-page flyer describing a variety of test and TV kits has been released by the Heath Co., Benton Harbor, Mich. . . . Ben Joseph, 551 Fifth Avenue, N. Y. C., has become a Tricraft Products Co. rep in metropolitan New York. A. P. Williams, RR 1 Box 62, St. Joseph, Mich., and Jack West, 6747 N. Octavia Avenue, Chicago, will represent Tricraft in Michigan and Illinois and Wisconsin, respectively. . . . William H. Sahloff, formerly merchandise manager and vice president of Montgomery Ward, is now manager of the G. E. receiver division. . . . Paul Nichols and Robert Sargent have become regular members of the New York chapter of The Reps. Jerry Greenberg is now an associate member.

## ADVERTISERS IN THIS ISSUE

SERVICE INDEX—DECEMBER, 1949

ALLIANCE MFG. CO.	39
Agency: Foster & Davies, Inc.	
AMERICAN ELECTRICAL HEATER CO.	40
Agency: Duignon, Taylor & Bruske, Inc.	
AMPERITE CO.	36
Agency: H. J. Gold Co.	
ANCHOR RADIO CORP.	47
Agency: Symonds, MacKenzie & Co.	
CHANNEL MASTER CORP.	6, 7
Agency: Serge Loukin	
CLAROSTAT MFG. CO., INC.	46
Agency: Austin C. Lescaubour & Staff	
CLEVELAND ELECTRONICS, INC.	41
Agency: Bonsh Ad Agency	
CLIPPARD INSTRUMENT LABORATORY	46
Agency: The S. C. Baer Co.	
CORNELL-DUBILIER ELECTRIC CORP.	Inside Front Cover
Agency: Reiss Advertising	
CROWN CONTROLS CO., INC.	43
Agency: Don Kemper Co., Inc.	
ALLEN B. DUMONT LABORATORIES, INC.	5
Agency: Austin C. Lescaubour & Staff	
GENERAL ELECTRIC CO.	4, 21
Agency: Maxon, Inc.	
GENERAL ELECTRIC LAMP DEPT.	31
Agency: Batten, Barton, Durstine & Osborn, Inc.	
THE HEATH COMPANY	44
Agency: G. Dean Aved. Advertising	
HOT NAILS, INC.	38
Agency: A. D. Adams, Advertising	
HYTRON RADIO & ELECTRONICS CORP.	9
Agency: Bennett, Walther & Menadier, Inc.	
INSULINE CORPORATION OF AMERICA	44
Agency: Bass & Co., Inc.	
J. F. D. MFG. CO., INC.	36, 42
Agency: Shappe-Wilkes Inc.	
KEN-RAD DIV.—GENERAL ELECTRIC	1
Agency: Maxon, Inc.	
P. R. MALLORY & CO., INC.	Inside Back Cover
Agency: The Atkin-Kynett Co.	
MACHINERY SALES & EQUIPMENT CO.	47
Agency: Rleser-Guenther, Inc.	
MERIT COIL & TRANSFORMER CORP.	42
Agency: Symonds, MacKenzie & Co.	
MUELLER ELECTRIC CO.	40
PARK METALWARE CO., INC.	43
Agency: Melvin F. Hall Agency, Inc.	
PHOENIX ELECTRONICS, INC.	34
Agency: Milton Richards	
PRECISION APPARATUS CO., INC.	32
Agency: Shappe-Wilkes Inc.	
QUAM-NICHOLS COMPANY	45
Agency: Triangle Adv. Agency	
THE RADIART CORP.	25
Agency: Stern and Warren	
RADIO CITY PRODUCTS COMPANY	34
Agency: Janan Advertising, Inc.	
RADIO CORPORATION OF AMERICA	43, 45, 47, Back Cover
Agency: J. Walter Thompson Co.	
RADIO MERCHANDISE SALES, INC.	38
Agency: Nottingham & Plameuf	
JOHN F. RIDER PUBLISHER, INC.	28, 29
Agency: Shappe-Wilkes Inc.	
HOWARD W. SAMS & COMPANY, INC.	3
Agency: George Brodsky, Advertising	
SNYDER MFG. CO.	17
Agency: Brooks and London	
STANDARD TRANSFORMER CORP.	37
Agency: Burnet-Kuhn Adv. Co.	
SYLVANIA ELECTRIC PRODUCTS, INC.	10
Agency: Newell-Eumett Co.	
TECH-MASTER PRODUCTS, INC.	42
Agency: Bass & Co., Inc.	
TELREX, INC.	33
Agency: George Homer Martin Associates	
TRIPLETT ELECTRICAL INSTRUMENT CO.	8
Agency: Western Adv. Agency, Inc.	
TURNER CO.	35
Agency: W. D. Lyon Co.	
UNIVERSITY LOUDSPEAKERS, INC.	48
Agency: George Homer Martin Associates	



**High Temperature  
is Tough  
on Long Life...**



*But*

**Mallory Capacitors  
Can Take It!**

**I**t takes a superior capacitor to operate at 185° F. And MALLORY CAPACITORS DO IT!—tests have proved that the characteristics of Mallory Capacitors are practically unchanged after 2000 hours at a temperature of 185° F.

Without a high degree of purity and cleanliness no capacitor could give this remarkable performance.

**NEW IMPROVEMENTS IN MALLORY FP CAPACITORS . . . Feature stronger anode tabs—withstand higher discharge currents—improved high surge separators—still greater heat resistance—extra heavy rubber seal—heavier cathode tab—special etched cathode.**

Mallory capacitors are untouched by human hands; production workers wear rubber gloves. And Mallory specifications on chloride content of the gauze are even more rigid than on hospital gauze, for gauze is the base on which aluminum is sprayed to create the anode plate.

You can count on Mallory Capacitors for longer shelf life—longer life in an inactive set—lower RF impedance—and ability to withstand higher ripple current.

Mallory Capacitors cost no more than ordinary capacitors—they're easy to install, and when they're installed they're *dependable* . . . and that means the kind of service that satisfies customers. Order from your Mallory distributor.

*Don't Miss the Mallory Television Service Encyclopedia.  
Get Your Copy From Your Mallory Distributor . . . Only 35c!*

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

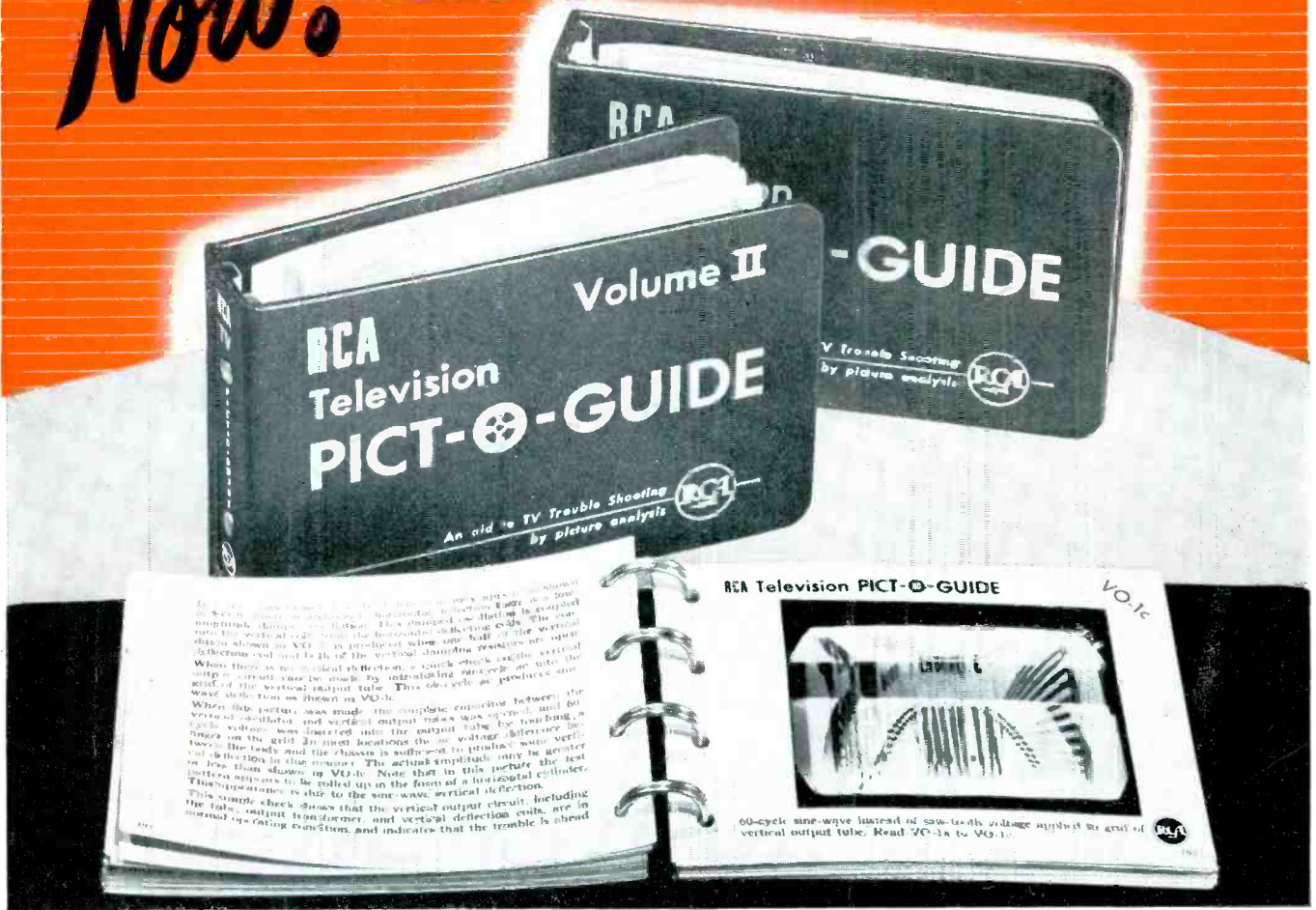
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .  
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .  
VIBRAPACK\* POWER SUPPLIES . . . FILTERS

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

**APPROVED PRECISION PRODUCTS**

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

**Now!** *Two great volumes...*



**For quick and accurate TV trouble shooting...**

**Cunningham brings you the indispensable Pict-O-Guide**

VOLUME I of the RCA Television Pict-O-Guide has been acclaimed as one of the greatest practical and instructive aids to TV receiver trouble shooting in the field.

Now—in addition—there is a second Volume, with twice as many pages, over 25,000 words of down-to-earth, up-to-the-minute text, covering the simplified time-saving method of TV trouble shooting by picture analysis.

The pictorial data and descriptive material in these Pict-O-Guides provide you with practical information on alignment, interlacing, focusing, blanking, sync, and

interference... basic, eyewitness information applicable to TV receivers, regardless of make!

**HOW TO GET YOUR COPIES:**

To get one or both Volumes of the RCA Television Pict-O-Guide, ask your Cunningham Distributor today for the folder "One Picture is Worth More Than 10,000 Words." It explains how to obtain either or both volumes at no extra cost to you with your purchase of Cunningham tubes. But don't delay... the supply of Pict-O-Guides is limited!



**CUNNINGHAM TUBES - BUILT FOR SERVICE**

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